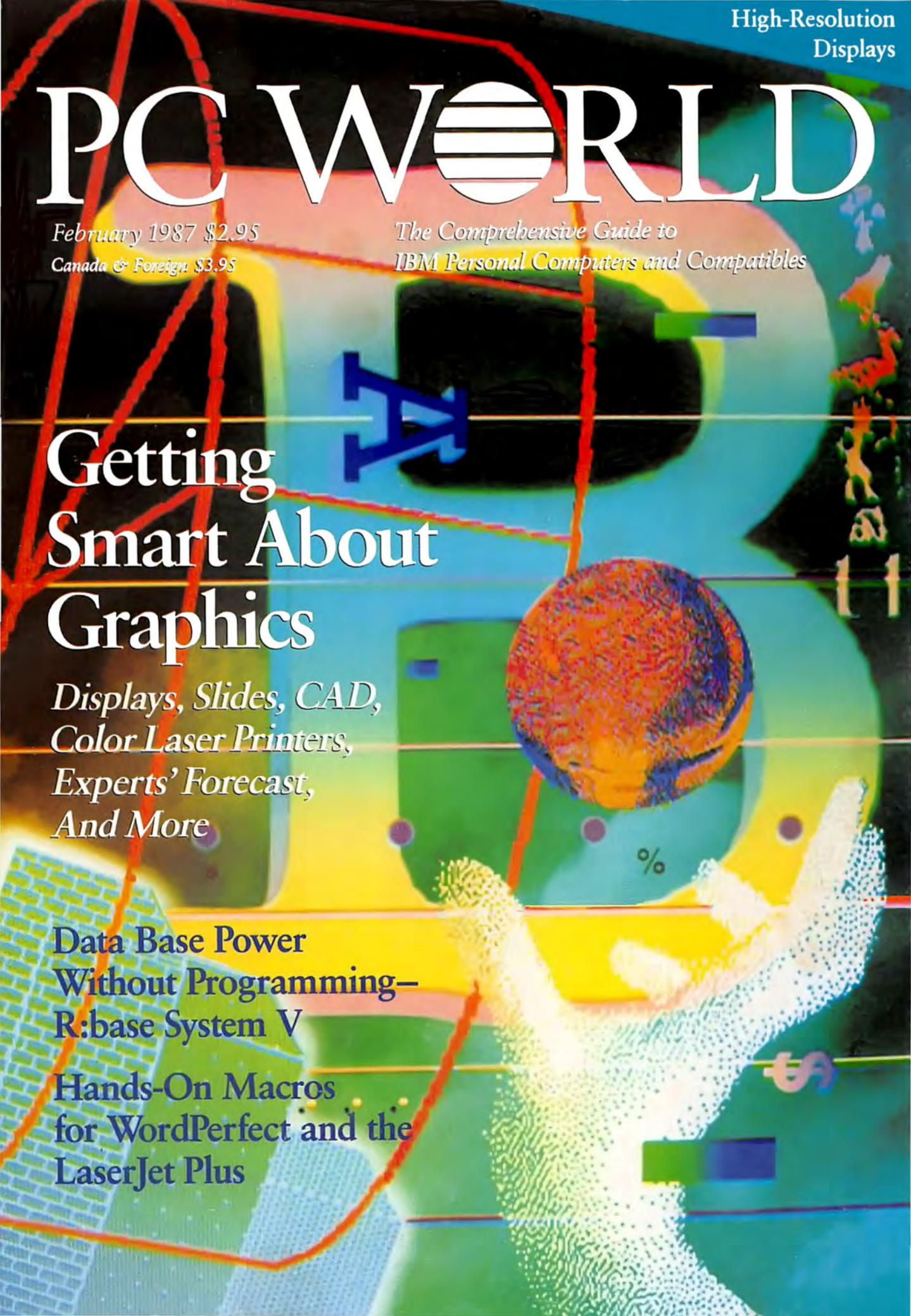
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**System requirements**

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

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**System requirements**

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***Turbo Pascal 3.0.***
*Includes 8087 & BCD features for 16-bit MS-DOS and CP/M-86 systems. CP/M-80 version minimum memory: 48K; 8087 and BCD features not available. 128K.*

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

**System requirements**

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

## How to use Eureka: The Solver

*It's easy.*

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

*You can then tell Eureka to*

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

### Eureka: The Solver includes

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

### Some of Eureka's key features

*You can key in:*

- *A formula or formulas*
- *A series of equations—and solve for all variables*
- *Constraints (like X has to be < or = 2)*
- *A function to plot*
- *Unit conversions*
- *Maximization and minimization problems*
- *Interest Rate/Present Value calculations*
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# SuperKey®: The Productivity Booster

**Only $99.95!***

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## SuperKey keeps your secrets

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> **Jim Seymour, MicroBusiness**

*Turbo Lightning adds instant spell-checking and a thesaurus to all your spreadsheets, electronic mail, documents, memos, or whatever programs you use.*

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*** IBM PC, XT, AT, PCjr, and true compatibles only. PC/MS-DOS 2.0 or later.

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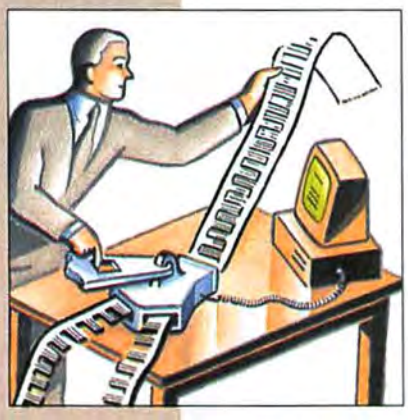
*February 1987*

198 **Display Intelligence**

Don't enter the wilds of graphics display hardware unarmed. With this primer you can outfit your PC with the ideal combination of monitor and display board.

210 **PC World Graphics Forum**

In a lively roundtable discussion seven industry leaders plumb the motives and methods driving PC graphics, from its role in the workplace to the future of high-resolution displays.



230 **R:base: The Promise Expressed**

*dBASE* may finally have met its match. With the debut of *System V*, the *R:base* clan extends its menu-driven Express concept to every major program module—and allows users and developers alike to create turnkey systems without ever leaving a menu.

## Getting Started

198 Display Intelligence, *Eric Knorr*

## Community

210 PC World Graphics Forum, *Edited by Eric Knorr*

## Review

230 R:base: The Promise Expressed, *William Urschel*

240 VersaCAD Tries Harder, *Steven Lord*
The number two CAD program includes new drawing and customizing features that may give *AutoCAD* some stiff competition.

250 Pictures for an Exhibition, *Cindy Hamburger*
Want more control of your business graphics? With a film recorder you can make presentation-quality slides and transparencies without leaving your office.

260 Print Along the Dotted Line, *Bill Crider*
Three versatile dot matrix printers, the Epson LQ800, the Toshiba P321, and the NEC Pinwriter P6, can print near letter quality text or turn out drafts in a jiffy.

268 IBM Business Adviser: What Cost Accounting?, *Charles Rundgren*
A four-module accounting package, the *IBM Business Adviser* eases data entry, but the price in dollars and megabytes is high.

## State of the Art

278 The Color of the Future, *Wesley Nihei*
Full-color versions of today's laser printers wait in the wings. But manufacturers want to see strong demand for the high-price devices before plunging ahead.

## Hands On

284 WordPerfect Meets LaserJet Plus, *Daniel J. Rosenbaum*
New technology isn't always easy to use. Here's how to harness the powers of *WordPerfect*, the LaserJet Plus, and soft fonts to produce polished output.

292 Custom LaserJet Forms, *Peter Neuhaus*
Still trying to squeeze customized business forms from the LaserJet Plus? With *Polaris Forms* and a little know-how, you can make changes at will and banish art costs forever.

## Departments

15 David Bunnell

35 Harry Miller

43 Letters

73 Product Outlook, *Ken Greenberg*
High-resolution displays

108 PC World View, *Edited by Eric Bender*
Remember the mom-and-pop computer store?

118 From the Hardware Shelf, *Edited by Eric Knorr*
The ProSync/MultiSync marriage

157 From the Software Shelf, *Edited by Robert Luhn*
Financial forecasting on the cheap, and QuickBASIC unleashed

305 Password: Communicate, *Edited by Jeremy Joan Hewes*
Inexpensive on-line financial analysis

321 The Help Screen, *Karl Koessel*

349 *.*, *Edited by Steven Cook*
A typo trapper for X-MAKER fans

365 Kevin Strehlo

## Computer Mail-Order Shopping Guide

332 A convenient shopping guide

## Index

377 Advertisers

## PC World Directory

378 A classified guide to products and services

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*February 1987*
*Volume 5, Number 2*



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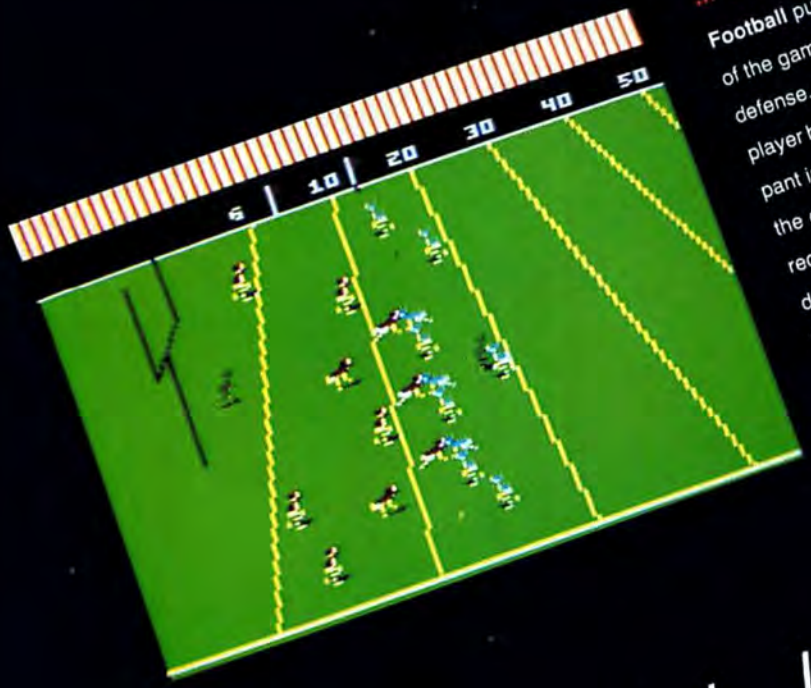

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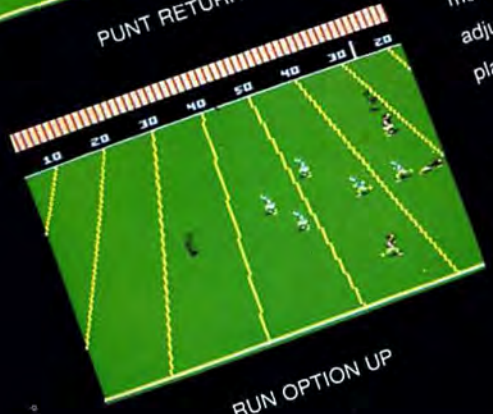

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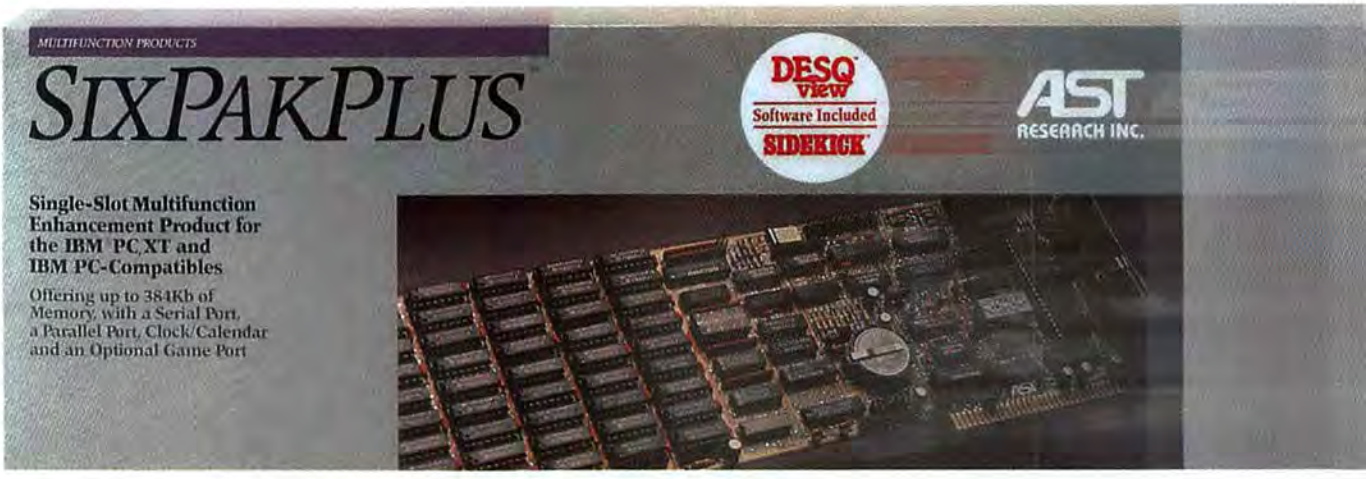


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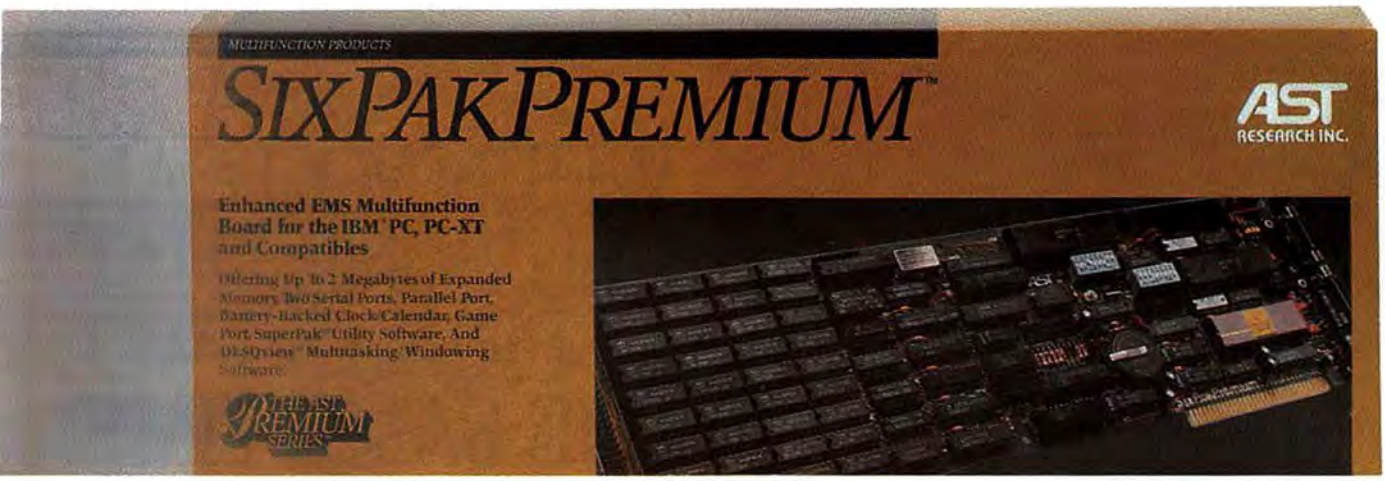


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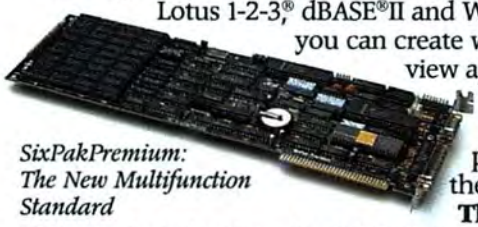

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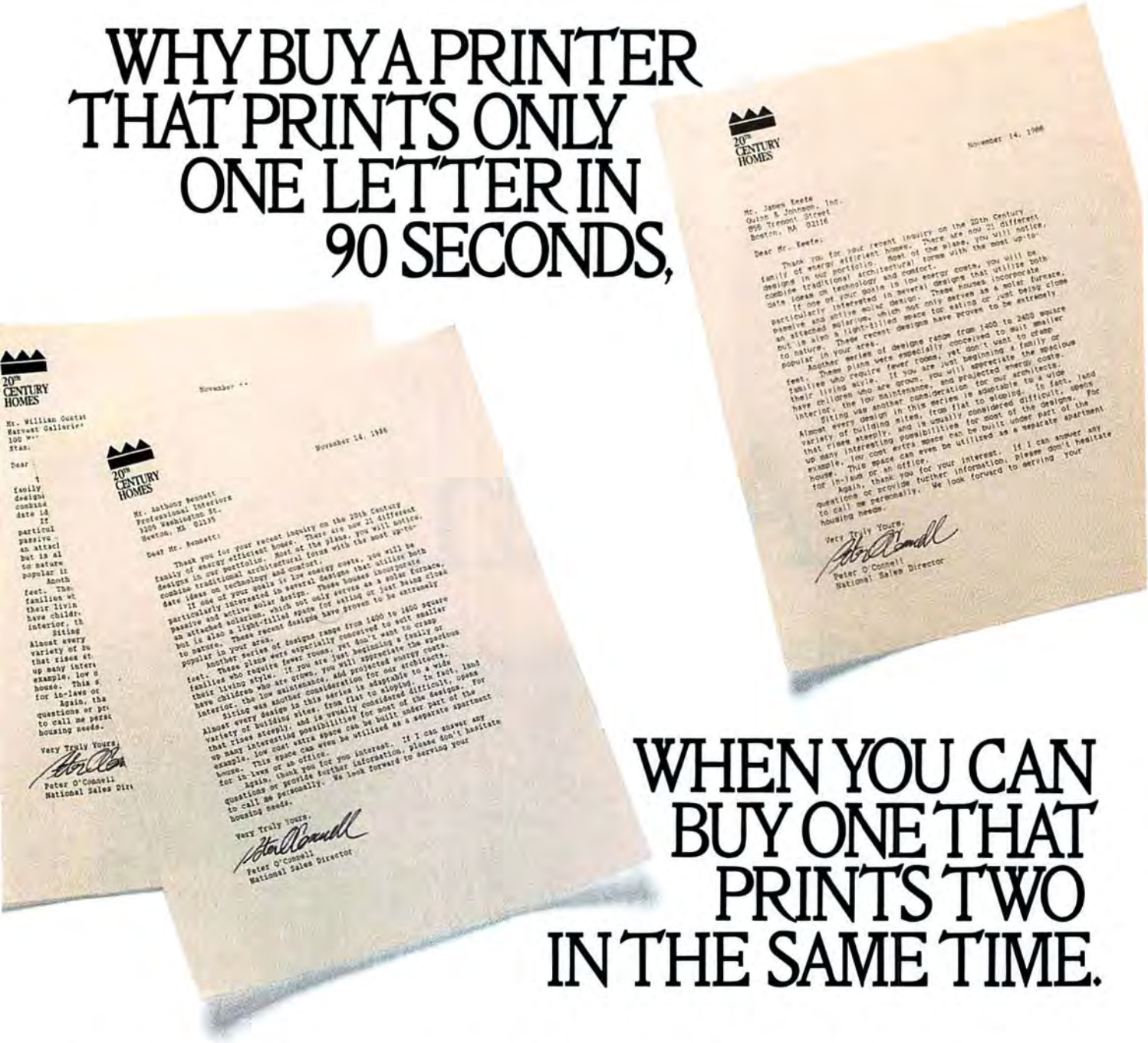


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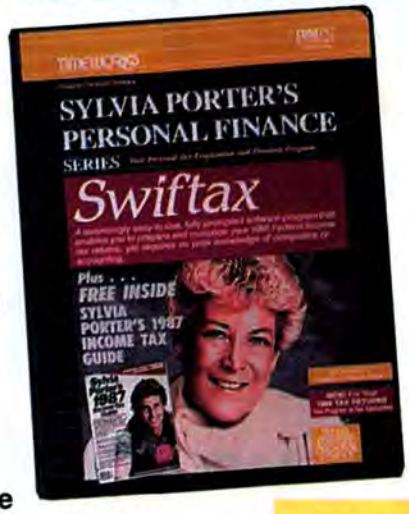


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David Bunnell

# The PC Revolution in Higher Education

The focus of creative computing has now shifted from corporate America to the campus. Are we going to flunk the test or pass with on-line colors?

Recently I caught a plane to Pittsburgh, Pennsylvania, where I attended what I thought was the most stimulating computing event of the past ten years.

It was the Educom '86 conference. Educom, the national educators' consortium of nearly five hundred universities and colleges, is committed to furthering higher education through computing. The theme of this particular conference was "At the Point–Where Education, Research, and Technology Converge."

Everyone present at this point of convergence in Pittsburgh could feel the powerful future of computing. There among the city's extinguished steel mills–relics of the first industrial revolution, laced with a fine layer of snow–in a meeting cohosted by the technical powers of Carnegie-Mellon University and the University of Pittsburgh, I had a good glimpse of where this second industrial revolution (our own information age) is leading us.

The smokestacks have been replaced by advanced workstations, the blast furnaces by expert systems, and the molten steel by an outpouring of high-grade knowledge. The vision is astonishing.

I discovered incredible innovation, enthusiasm, and potential applications for personal computers and workstations at this conference of 1600 scholars. I was astonished to see that Apple Computer had sent a delegation of 100 people to attend Educom. IBM easily matched that number.

Other computer companies represented at the conference–only a small handful, really–included AT&T, Microsoft, Hughes Aircraft, Digital Equipment, and Steve Jobs's NeXT, Inc., which must have had nearly 100 percent of its small, dynamic staff in attendance.

All these companies are working on programs for the burgeoning field of higher education. We

*(continues)*

# Lotus HAL Lets You Do More With (And Get More From) 1-2-3 Than Ever Before.

Lotus HAL™ is a memory resident companion product for Lotus 1-2-3* that enhances the full range of 1-2-3's capabilities—and adds new ones.

It increases 1-2-3's power and flexibility, so you can work more efficiently and become more productive than ever before.

## Benefits For All 1-2-3 Users

Lotus HAL works by giving you easier access to all of 1-2-3's numerous capabilities. And it's extremely useful for 1-2-3 users of all levels.

If you're new to 1-2-3, Lotus HAL will let you use it with greater confidence and speed.

If you're familiar with 1-2-3, Lotus HAL will make it easier for you to access additional power and capabilities.

And if you're an advanced 1-2-3 user, Lotus HAL will show you new features and functions that will add extra flexibility to the power of 1-2-3 you've already tapped.

How does Lotus HAL do all this—for all users?

## Easier Commands

Lotus HAL makes executing 1-2-3 procedures even easier than before. Because it accepts phrases like "total sales," "graph Jan to Mar," or "copy this to A10," etc. In fact, Lotus HAL's vocabulary includes English words and phrases. So you can customize a command dictionary of your own—with the words and operations you're most used to and most comfortable using.

Since Lotus HAL makes 1-2-3 more accessible for all users, you'll learn more—in less time—about all the capabilities of 1-2-3.

For instance, if you're presently using only the spreadsheet, Lotus HAL will show you how to create graphs and do database functions—far more simply than ever before.

## Time-Saving Shortcuts, Easy-To-Create Macros

With Lotus HAL, you'll take shortcuts and accomplish multi-step tasks quickly and easily. So you'll greatly reduce errors—and save time.

And, with a simple "undo" command, Lotus HAL even lets you recover from errors you've already made. So if you're a novice user, you'll learn faster and with greater confidence. And if you're an experienced user, you can experiment more freely and do "what ifs"—without fear of having a mistake destroy hours of work.

Lotus HAL also makes developing macros simpler than ever—so simple, in fact, that even novice users can create 1-2-3 macros with Lotus HAL. And no matter how familiar with 1-2-3 you are, you'll benefit from being able to write and test macros to make sure they do what you had in mind.

## New Power

Lotus HAL will let you take 1-2-3 as far as you need. And if you've been taking it far already, Lotus HAL offers you new commands that will further enhance your productivity.

For example, Lotus HAL lets you replace items anywhere in the worksheet (even within formulas), and create a dynamic link between cells in multiple worksheets. It also lets you audit your worksheet—so you can find mistakes without having to review the entire sheet "manually."

Best of all, while Lotus HAL greatly enhances 1-2-3's commands, it doesn't change either 1-2-3 or the worksheet. It's always available, but it never gets in your way. And you can share data as freely when you're using Lotus HAL as you did when you were using 1-2-3 alone.

In fact, you can do everything you've ever done with 1-2-3 even better...plus a great deal more.

And since Lotus HAL is part of the 1-2-3 system—and the Lotus family—you get an unparalleled commitment to customer service and support that will keep you up and running.

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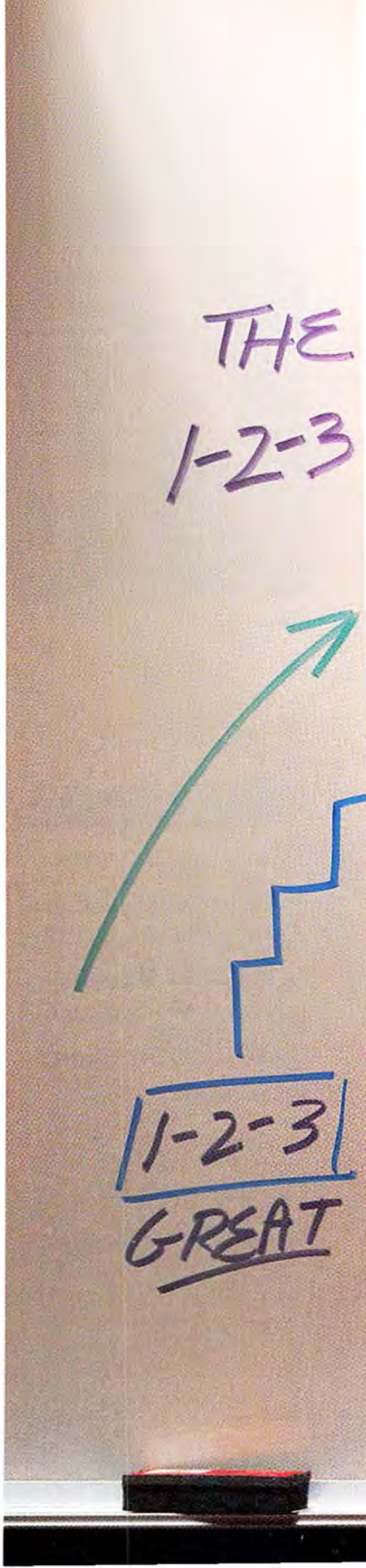
Lotus HAL is distinguished from HAL which is a trademark of Qantel for its Hotel and Leisure Software.

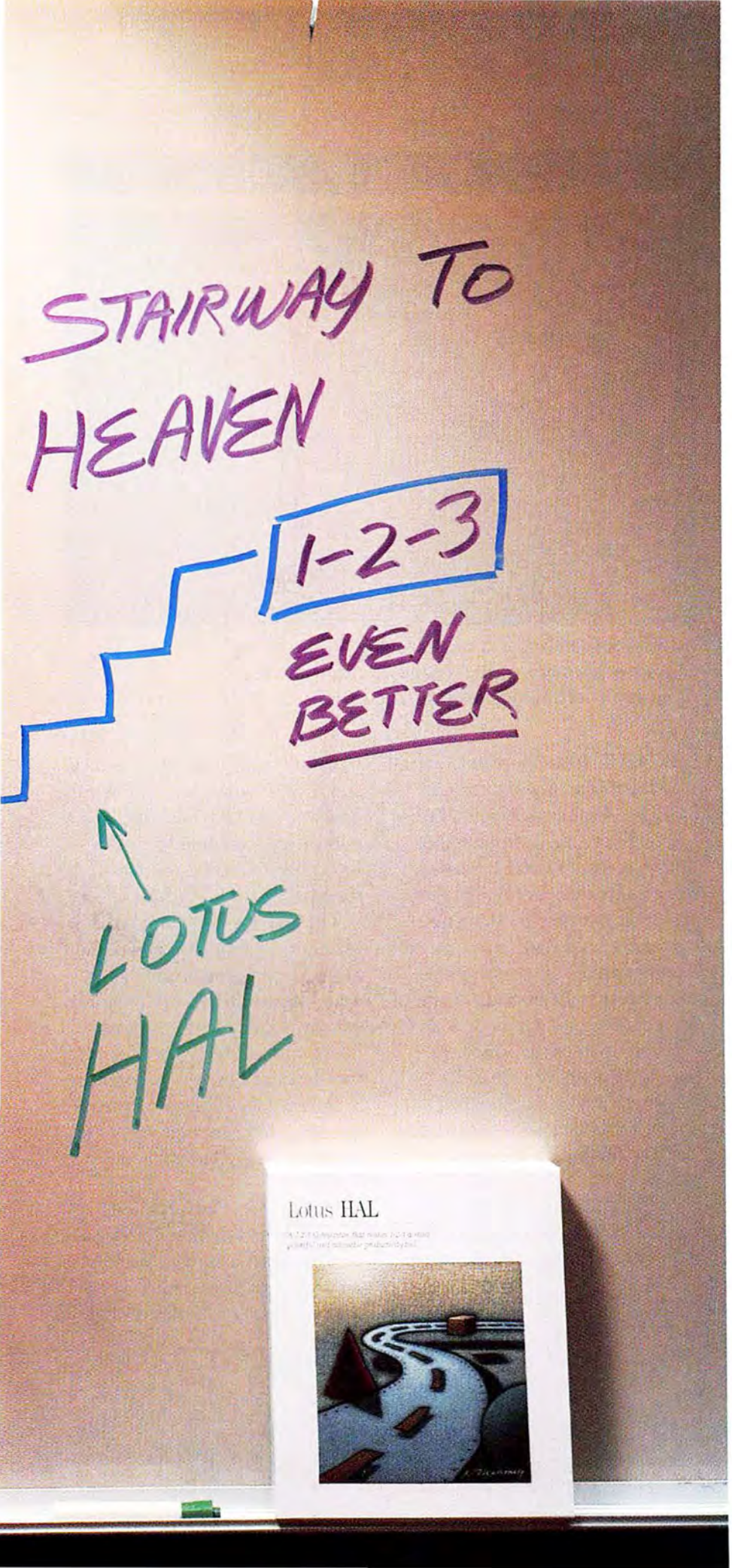
**System Requirements.**

Lotus HAL requires 1-2-3 Release 1A, Release 2 or Release 2.01 for personal computers from IBM,* COMPAQ, and AT&T, plus 1-2-3 Certified Compatibles; DOS 2.0 or higher. Please refer to your 1-2-3 package or 1-2-3 documentation for appropriate hardware configurations and DOS requirements or consult your dealer.

Lotus HAL resides in memory with 1-2-3 and operates with it; a minimum system configuration of 512K is required.

*Lotus HAL does not operate with 1-2-3 for the IBM PCjr (ROM version), IBM PC Convertible or Release 1A for the IBM 3270 PC.



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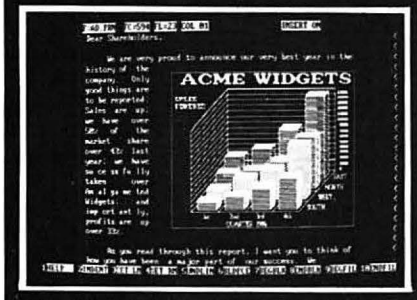


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David Bunnell

**At Educom's national conference in Pittsburgh, the educators' message to the computer industry was to push the technology to its furthest limits.**

have no reliable projections of just how big this area will become. However, I came away from Educom with one very strong impression. It seems to me that while the business world's message to the computer industry is, "Don't be innovative with hardware; stick to the standards," the educational community is clamoring, "Push the technology as far as you can!"

Not only does the hunger for high technology resemble the feeding frenzy of a school of piranha, but educators want tomorrow's technology at cafeteria prices.

As Steve Jobs remarked in his keynote speech at Educom, "Since 1984 [when the Macintosh was introduced] your needs have grown, and it seems you want a lot more. You want a 10MB machine, and I guess it should come as no surprise that you still think you should have it for $3000."

The higher education market is certainly an anomaly. It's the only group of computer users I've found that writes most of its own software. To show they mean business, these technoacademics have launched their own incentive program, called Educom Software Initiative, to encourage software development by faculty and students.

This program includes the awarding of cash prizes, proposed credit toward tenure for professors who develop "courseware," general academic recognition—and, of

*(continues)*

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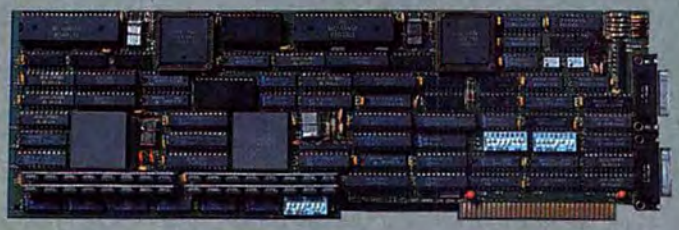

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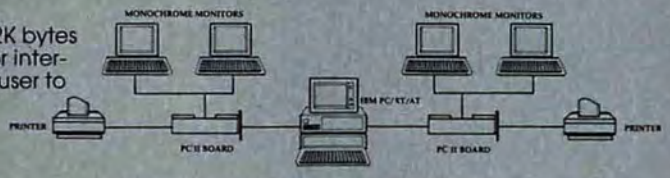


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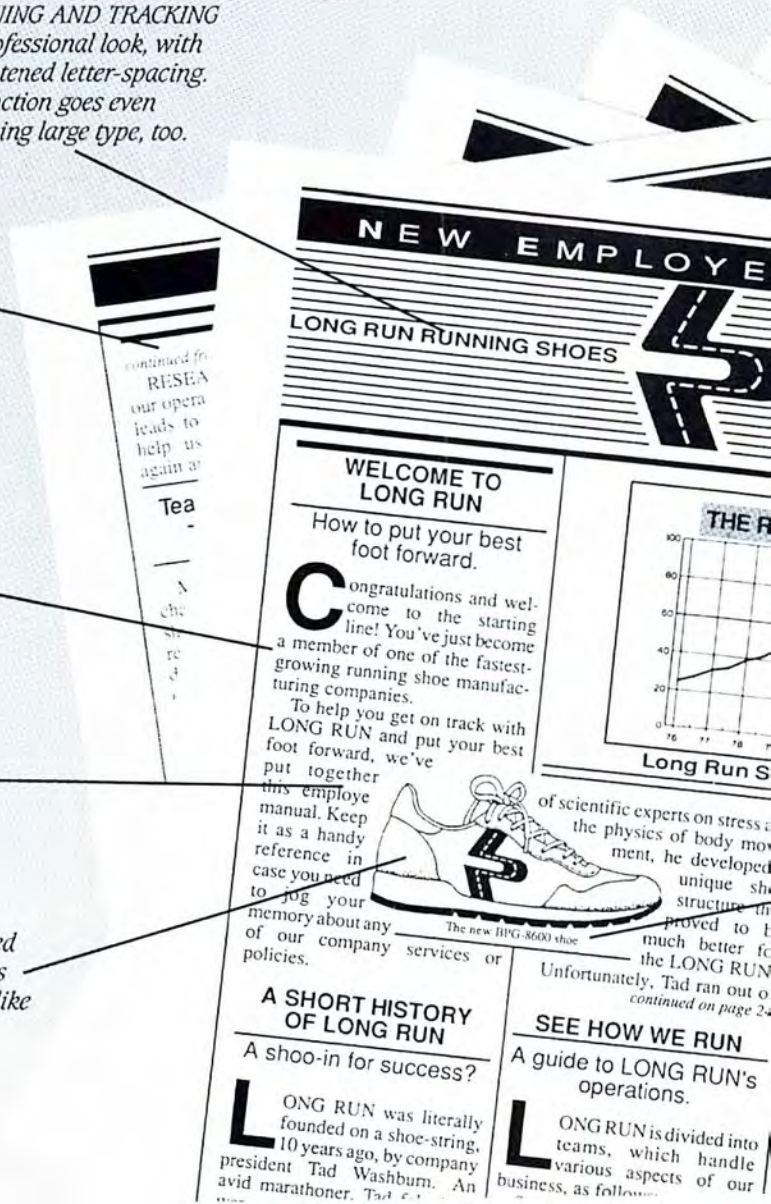


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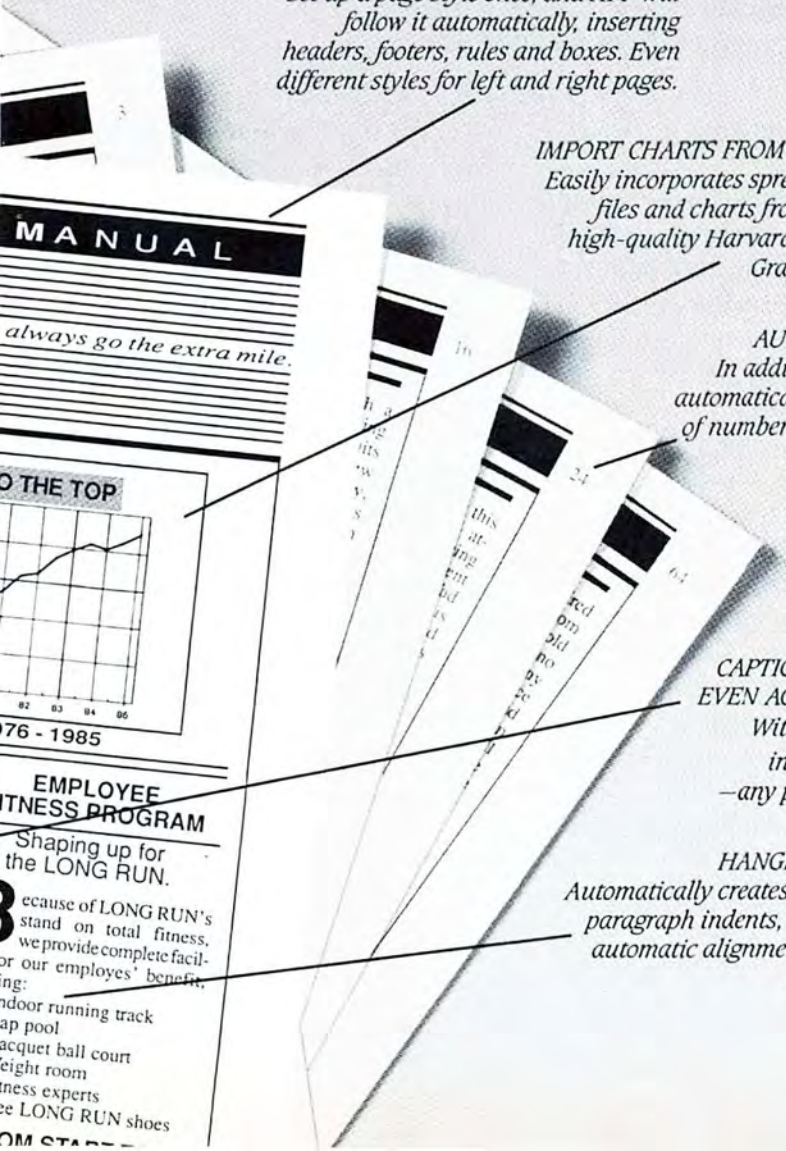


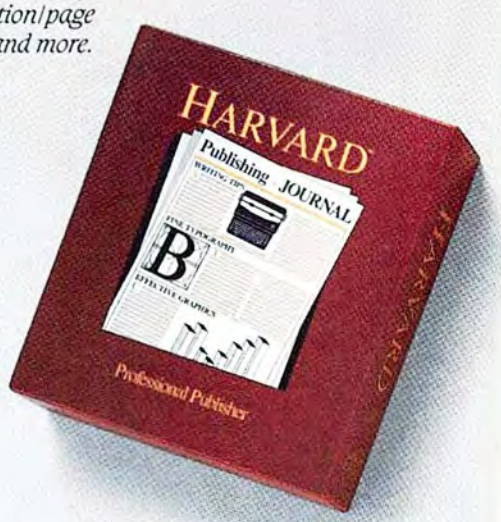


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**Circle 78 on reader service card**

David Bunnell

**There was incredible enthusiasm for developing innovative personal computer and workstation applications at this conference of 1600 scholars.**

course, royalties on courseware sales.

Then there's the incredible seventy-million-dollar Project Athena at MIT, funded by IBM and DEC, in which scholars are working to fuse film and computing into a new medium for making supersimulations.

For example, for a biology course at MIT, scholars have created software that simulates an electron microscope. The computer appears to zoom in on (or away from) an image; what it actually does is access from the data base a series of pictures that are progressively smaller or larger, instead of enlarging or reducing the image.

MIT is also working on a telescope simulation that lets you explore the heavens star-by-star and galaxy-by-galaxy. There's also a submarine simulation that plunges you 20,000 feet beneath the Atlantic through a series of 50,000 pictures.

Another important area of ongoing research is the Athena Language Project, which combines computers with video for studying foreign languages. Researchers are testing various methods to see what works best.

The Spanish-language program is an interactive mystery story set in Bogotá, Colombia. It's a whodunit that lets you take part in the action—in Spanish.

The French program, on the other hand, is reminiscent of the well-publicized Project Aspen interactive videodisk, in which you get to know every nook and

*(continues)*

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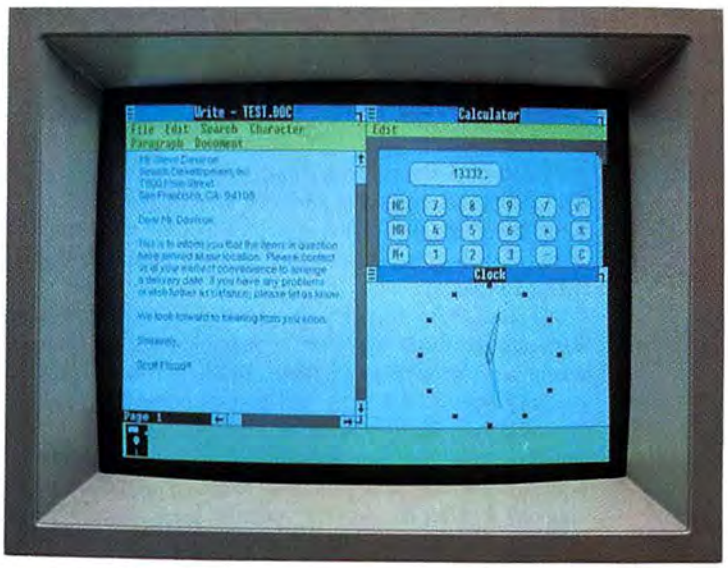
# The me always the

*–192K.* For all its pluses, networking has a minus.

*–66K, –128K, –128K.* A word of warning: Too many pop-ups can have a negative effect on your memory.




*–320K.* Windowing can give you a whole new outlook. It can also gobble up a whole lot of memory.

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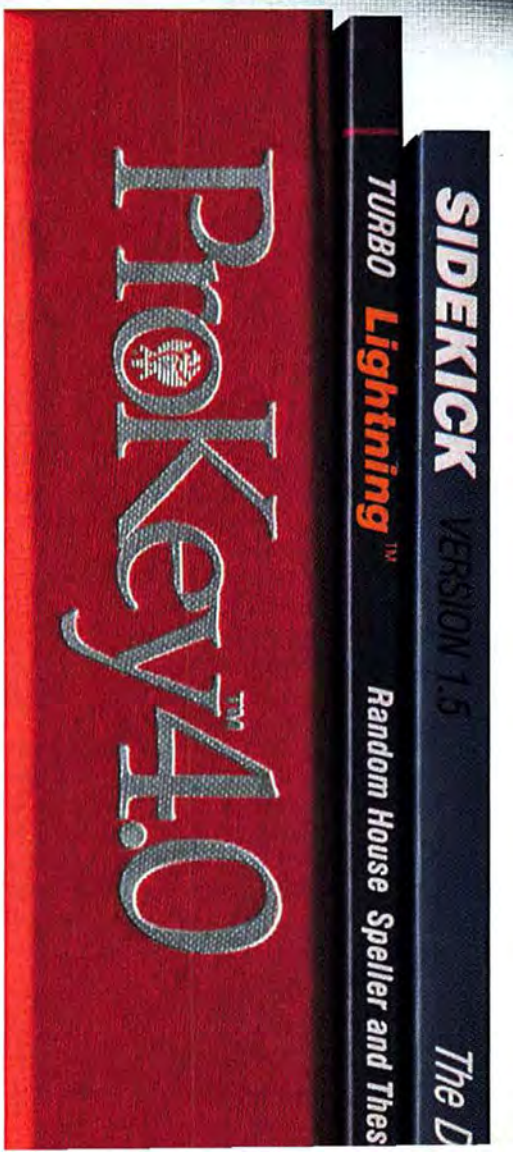

# mory is first to go.

-*128K*. Everyone will tell you downloading is where it's at. Which is why expanded memory is where you should be.

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**David Bunnell**

[redacted]

cranny of Aspen, Colorado. The French program gives you a series of realistic situations for practicing French. You go into a shop, ask prices, buy things—or, if you prefer, you can play a passive role and just window-shop, observing others going through the business of shopping in France.

What gives this program extraordinary implications for higher education is its potential connection to a much bigger, all-purpose knowledge base, accessed through a campus network.

Voilà. You're in French 101 or Advanced French, whichever the case may be, and you're strolling along the banks of the Seine. You cross over to visit Notre-Dame, perhaps chat with the local street vendors, and start studying the architecture. Then something interesting happens: You switch the computer to an architectural data base and find out about the structure of the cathedral.

The goal is to have all courses access the same central data base. While in Pittsburgh I visited Carnegie-Mellon, and there I felt another jolt of enlightenment when I was introduced to Project Andrew. The university is building a campus network that will connect 10,000 personal computers and 300 advanced workstations. All the wiring has already been done. Every classroom, every dorm room, and every computer station on campus is now connected. Currently, about 1400 personal computers are hooked into the system,

*(continues)*

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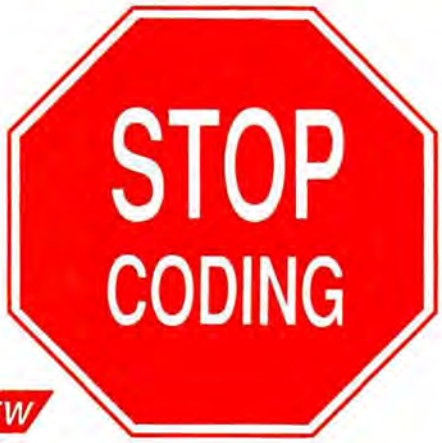


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**Circle 783 on reader service card**




and some 3100 students and faculty members are on line, sending electronic mail and accessing various data bases and bulletin boards. The implication of Project Andrew, as CMU president Richard Cyert points out, is that it will open the door to lifelong learning.

For the first time in the history of education, the university will be able to broadly extend education to graduates. Alumni in mid-career will be able to take various refresher courses simply by accessing Project Andrew from their offices and homes around the country.

As an event, Educom '86 was truly a milestone. It proved once again that innovation is not dead. It was proof, too, that people can gather together and put pressure on the computer industry—and be heard. It was empirical evidence, by anyone's lab criteria, that new roles for the computer outside the business world will emerge in the future.

Furthermore, it's clear that software being developed in universities will be used in the business world as well. In the next few years, the university setting will become the new battleground where companies like IBM, Apple, DEC, and NeXT will be competing mightily to provide the best advanced 10MB workstation for the campus of the future.

Of paramount significance to computer companies is the fact that Educom's Software Initiative has set a firm policy on software

*(continues)*

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copying, observance of copyrights, and respect for intellectual property. A number of programs have been introduced to educate faculty and students about these issues. Universities have been urged to place sanctions against violators of the Educom code.

A recent Educom survey shows that about 75 percent of universities in the country now have programs to discourage software piracy.

This ought to remove any paranoid bugaboo software publishers might have about shipping their products into some "black hole" on campus.

Perhaps the biggest revelation I had at Educom was that the focus of truly creative computing and applications has shifted from corporate America to the universities.

Make no mistake about it, this is a major shift. In American universities intelligent people are taking the tools of computing and pushing them to their limits. They are *enhancing* computing. Meanwhile, in corporate America the opposite is often the case. People take sophisticated tools and use them to perform mundane tasks.

So it was encouraging for me to see that innovation is not dead. And it's not playing hooky either. It's alive and well—and has moved from the Fortune 1000 to the hallowed halls of the campus.

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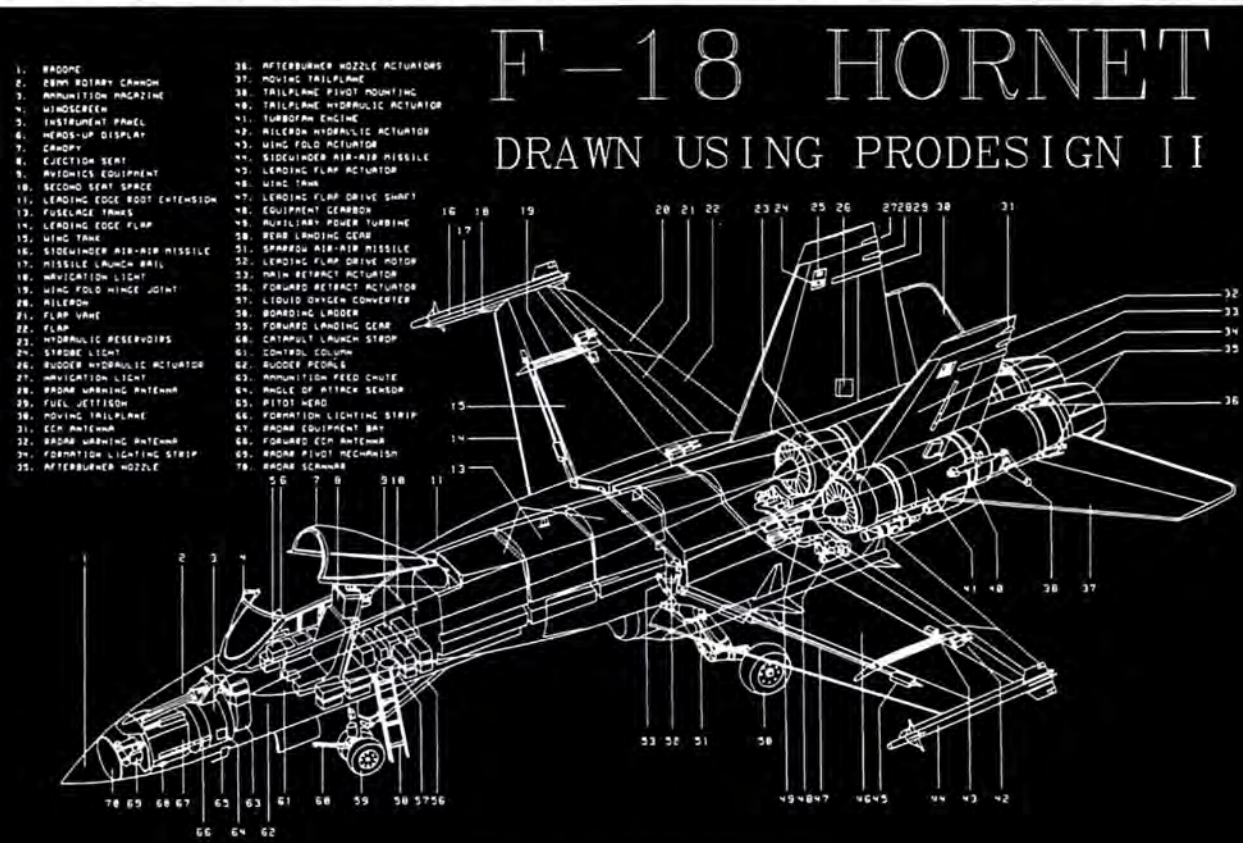


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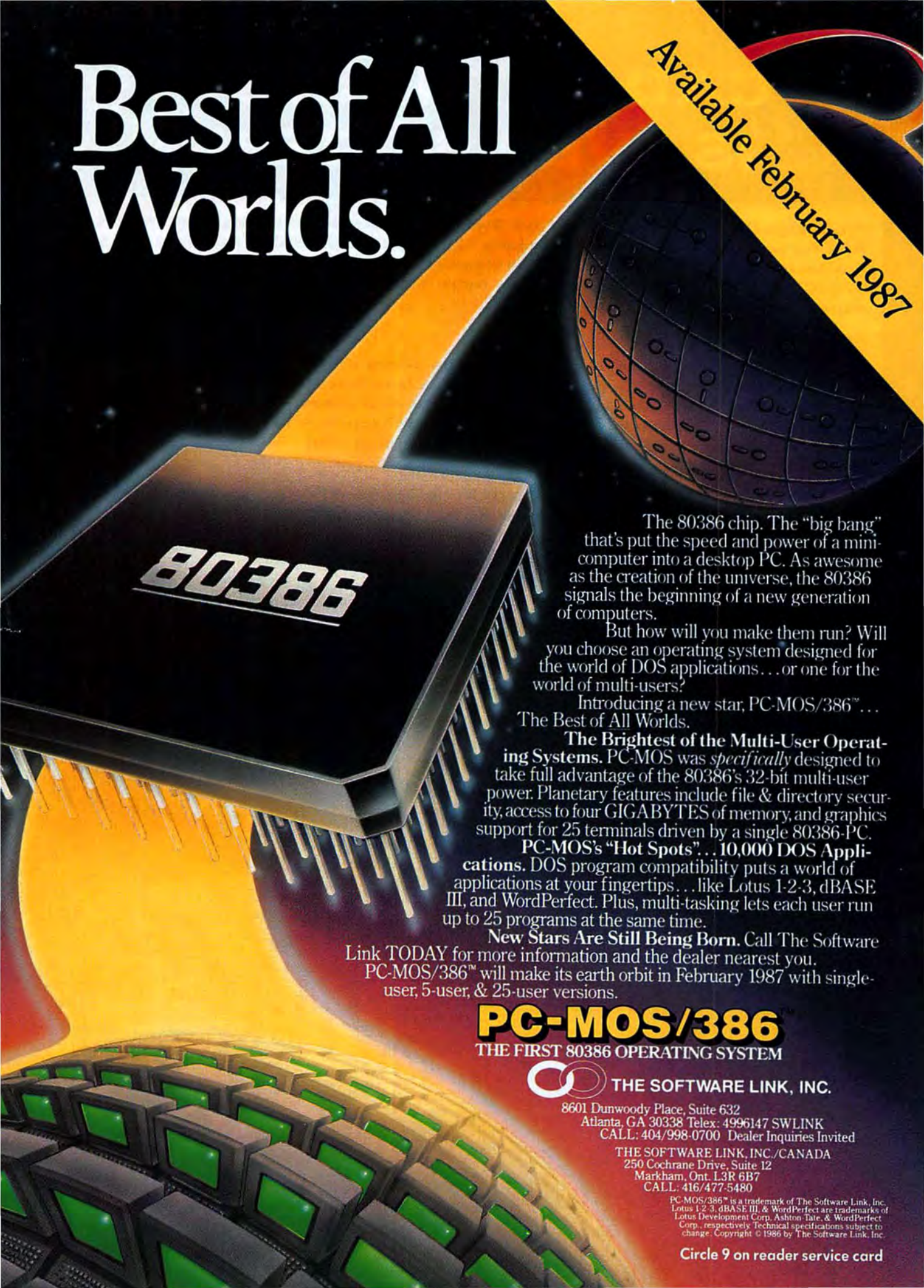


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Harry Miller

# Worth a Thousand Words

Toward an emphasis on visual thinking and an awareness of basic design principles

I normally favor the school of thought that holds we should teach the PC and its software to work and "think" in human terms rather than the other way around. After all, that's what automating the office should be about. However, there are areas where well-designed software can train us to think in useful ways. Clearly, graphics is one of those areas.

Do you think of declining revenues and increasing expenses as an opportunity to improve company efficiency, as a personal failure by the sales director and chief financial officer, or as a space marked in red between two lines that slope the wrong way? When you hear a colleague's name, do you visualize a box on a production flowchart, a dotted line on an organization chart, or a face behind the third door from the water cooler? Is competing for market share an all-out, head-on race, or is it simply a matter of trying to put someone else's slice of the pie on your plate?

Conceptualizing in graphic terms is a trait that most of us must develop; expressing those concepts visually is likewise an acquired skill. But if you want to be an effective, efficient, and productive communicator, the time you spend honing those skills may yield some very large payoffs. Success comes to those who can get their points across quickly and memorably. And nothing beats a picture for speed of information transfer and longevity of recall.

Thinking graphically can also be a vehicle for thinking clearly. That is, graphics programs can function as thinking tools. They can help focus your ideas and develop the form and structure of your presentation, be it a slide show for upper management or a chart that constitutes the bulk of a memo to your staff.

Business graphics software can give you a leg up on the communications game, but you should bear some basic principles in mind when you use any of these packages. First, be sure to define your message clearly. Charts should almost always be commentary; more than just the data itself, you

*(continues)*

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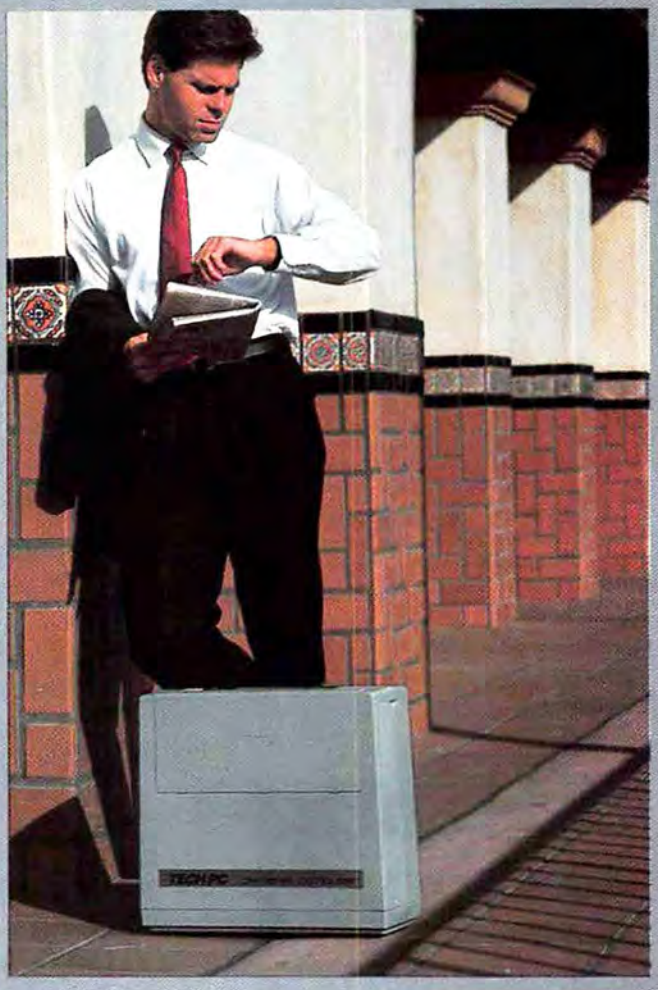

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want to get across your opinion of what it means. And graphics software is rich with tools to convey your opinions. By using different chart types, scaling, titles, and data groupings, you can draw a number of radically different conclusions from the same information. In short, you can fit the form of an image to its content.

Next, you can use visual cues to draw the viewer's attention and interest to key points. Effective use of color, contrast, shading, grids, and juxtaposition of shapes can propel an idea to center stage. The balance or intentional imbalance of an image can likewise help clarify a difficult concept. Clever use of icons and clip art can fix information in the viewer's mind. Graphics elements such as boxed text and bulleted lists are also effective devices.

Finally, note that business graphics are strongest when they simplify and summarize complex data. Although the viewer wants to know that you have the data to back up your statements, weighty detail detracts from an image's visual punch.

The more accustomed you get to thinking visually, the sharper your graphics skills will become. But you should also expect software vendors to lend a hand. When you read "PC World Graphics Forum" in this issue, you'll discover that key industry leaders bemoan the low level of graphics literacy found among otherwise well-educated users of business graphics software. To a large extent, though, that illiteracy provides an opportunity for software to act as a graphics coach. With templates, examples, and defaults, good graphics software can impart a designer's visual sensibility to the least aesthetic among us. And it's clearly in the interest of software developers to do so, for the more successful we become at conceiving and expressing vital information in graphic form, the more we'll want to use their graphics packages to get our points across.


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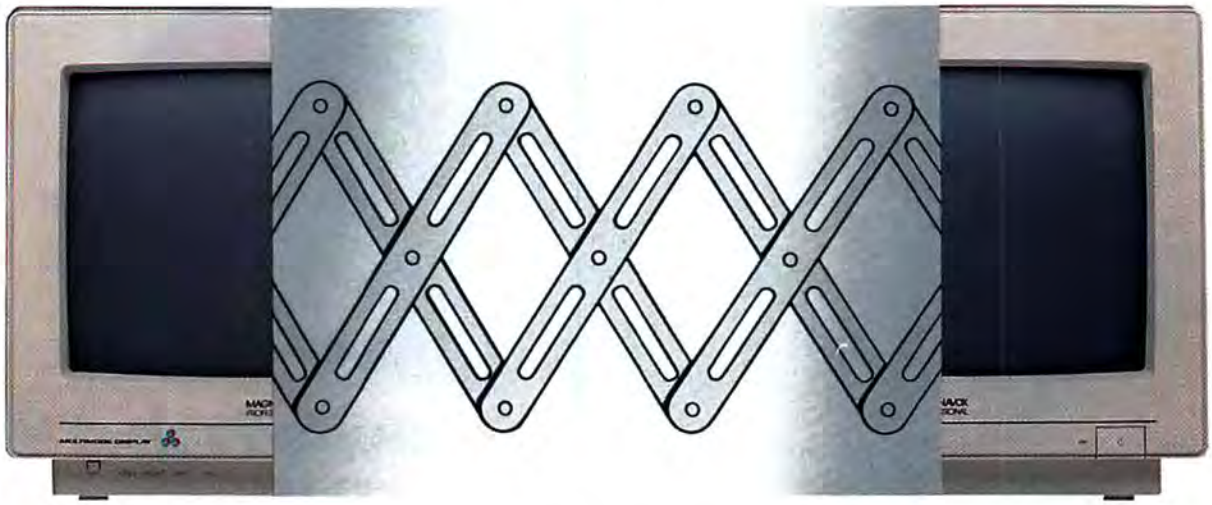

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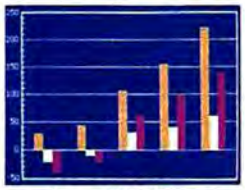

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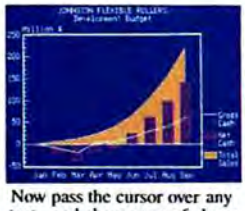

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# Letters

***Reactions and responses from the PC World community***

**Always Something Useful**
David Bunnell's editorial challenging the morality of Georgia's antisodomy law ["Coming Out of the PC Closet," *PCW*, November 1986] may play well in San Francisco, but it's going to raise hell in most parts of the country. I did, however, find Janet Crider's article on mail merge, "Word's Responsive Merge," in the same issue very helpful when it came time to express my disgust to some of your magazine's largest advertisers.

*Paul Parker*
*Bellaire, Texas*

Now I understand why your magazine comes in a plain brown wrapper.

*Gary Reudeaux*
*Saint Petersburg, Florida*

**The Courage to Speak**
I'd like to express my surprise and appreciation for your opening editorial in the November 1986 issue of *PC World*. The antisodomy laws in the state of Georgia and elsewhere are anathema to the spirit of our Constitution and, as you point out, run counter to the foundations of the personal computer revolution. I'm proud to be a subscriber to a publication courageous enough to address issues outside its editorial focus.

*Daniel Weisberg*
*Chicago, Illinois*

I'd like to take this opportunity to thank you for your courageous and extremely articulate support of the gay community and your sound condemnation of the Georgia sodomy statute. Your analysis of the situation and suggestions for action are right on target.

*Wayne MacDonald*
*Northampton, Massachusetts*

**Technology Knows No Boundary**
David Bunnell is wrong if he believes a letter-writing campaign will change Georgia's antisodomy law. The law is the law. If the people of Georgia don't like it, *they* will change it. I don't like states with personal property taxes, so I don't live in one. Similarly, people who feel Georgia's antisodomy law is oppressive need not live there.

Mr. Bunnell intimates that the law in question deters high-tech development in Georgia because gays will not feel secure living there. He writes that "Many programmers, designers, and engineers who happen to be gay have been the brains behind some of the most significant products that helped revolutionize our information-driven society." I don't argue this point at all except to make the complementary point that the rest of the significant revolutionary developments must have been made by people who were not gay. Sexual preference has no effect on a person's ability to make contributions to the personal computer industry.

*William Stephens*
*Easton, Pennsylvania*

**More to Life Than PCs**
Good for you! I was surprised to see your editorial about the Georgia antisodomy law since I don't expect to see social commentary in a personal computer magazine. I was delighted to see you take a stand on a very important issue. Computer technology doesn't exist in a vacuum, and its social impact is germane to our lives. I'm sure

*(continues)*

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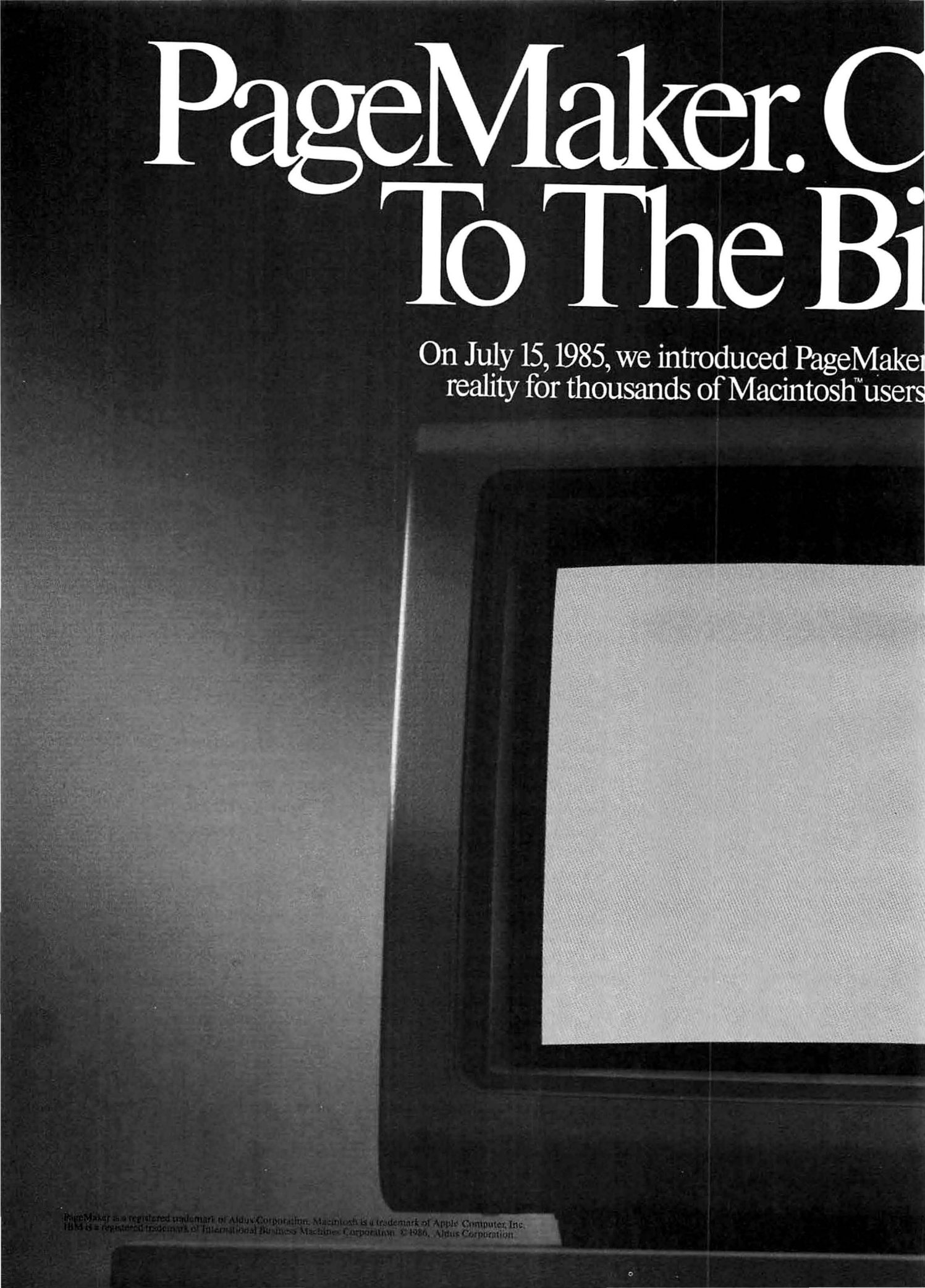

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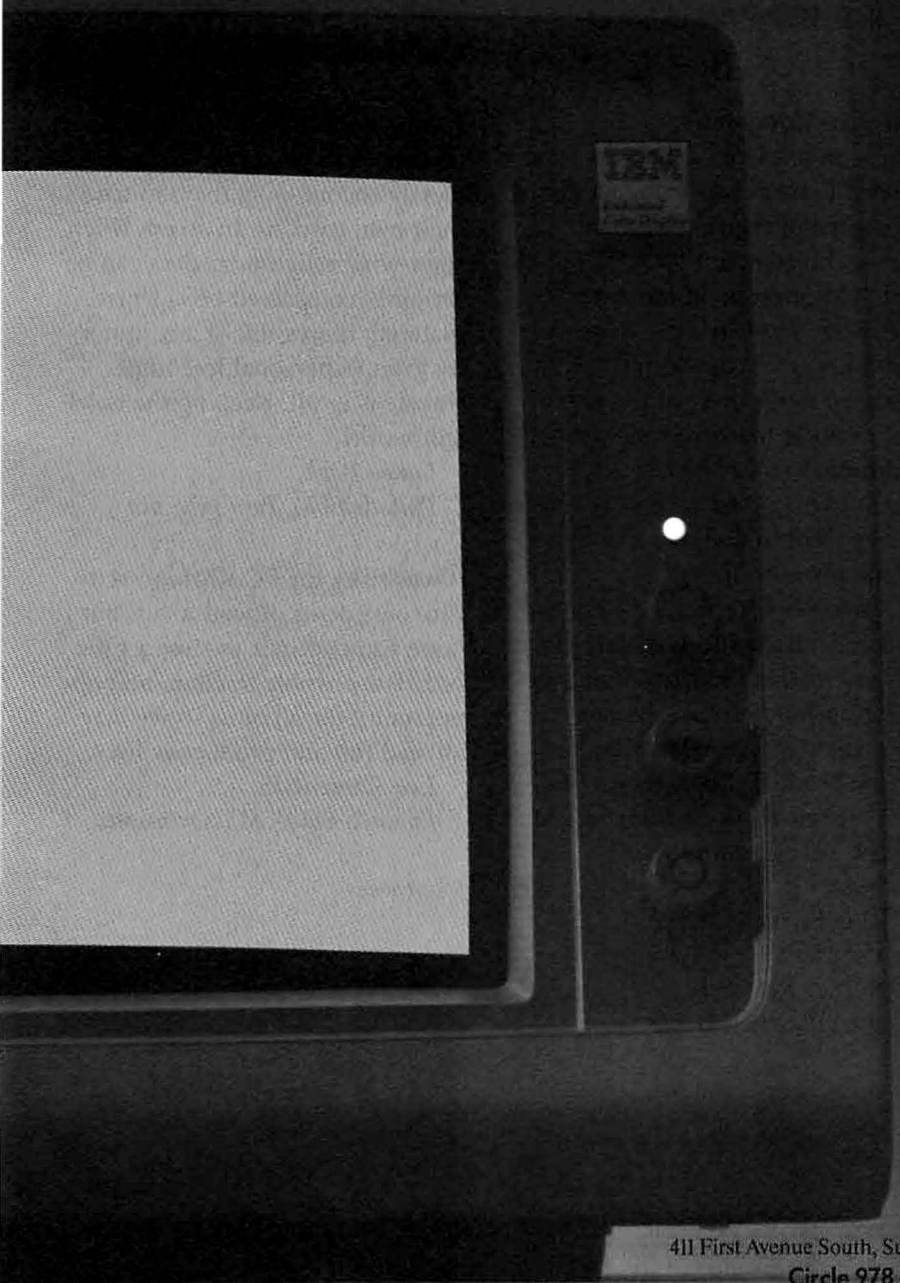

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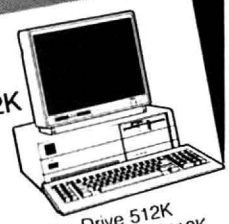

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you've received letters telling you to stick to PCs and mind your own business, but I'm glad to see you stand up for your values.

*William Meacham*
*Austin, Texas*

Your departure from the topic of personal computers has resulted in one of your finest editorials. I shall indeed write to Georgia's Governor Harris.

*Samuel Starr*
*Rose Valley, Pennsylvania*

### Stick to Computers

In "Coming Out of the PC Closet" David Bunnell warned readers that the spirit of the PC community is being threatened. I founded Quadram Corporation in the state of Georgia, and I strongly disagree with his views and with the way he used the "power of the press" as a vehicle to express a personal opinion. I realize he has every right to his opinions, just as I have every right to disagree and discontinue my advertising.

I don't believe that I'd be considered a backwoods country boy by saying that I find absolutely no relationship between the supposedly oppressive law that has made headlines for Georgia and the technical information sought by PC users reading your publication.

*Tim Farris*
*President*
*BOCA Research*
*Boca Raton, Florida*

I remind you that the only value your magazine has is its information and technical support for the hundreds of thousands of PC owners who are your readers. We aren't interested in your opinions on social reform, and we don't wish to pay good money to read about your campaign for gay rights.

*Bill Little*
*Rock Hill, South Carolina*

### Freedom of Thought

It's about time someone with access to a public forum provoked readers to think, rather than merely encouraging them to tend their own gardens. In an era when right-wing religious zealots can be seriously considered presidential material, repression of any minority group's personal freedoms threatens us all. Keep up the excellent work!

*James Beck*
*Philadelphia, Pennsylvania*

It was risky for *PC World* to venture outside its official focus, but I hope you continue to support the broadest possible freedom and opportunity for all of us so we may all lead full and productive lives.

*Lee Kamentsky*
*Jamaica Plain, Massachusetts*

*(continues)*

# *"Dac-Easy Accounting staged an astounding coup in the accounting category..."*

*PC WORLD*
October 1986

**150,000** and more every day. That's how many smart buyers have already chosen to save thousands of dollars in their decision to computerize their books. Recently the readers of PC World confirmed this new trend in accounting software by voting Dac-Easy Accounting as their favorite, outperforming the second place finisher with over five times as many votes.

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| VOTES | PRODUCT/MANUFACTURER |
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| 32% | Dac-Easy Accounting, Dac Software, Inc. |
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| 4% | Solomon III, TLB Inc. |
| 4% | Accounting Software, Open Systems |
| 4% | Peachtree's Business Accounting System |
| 45% | Others |
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***"Dac-Easy Accounting is everything its designers say it is . . . It is also flexible enough to fulfill the accounting needs of almost any type of business."***

*Journal of Financial Accounting*, 1985

***"I've never before in a review come right out and told readers to buy a product, but I'm doing it now. Dac-Easy is an incredible value."***

*PC Week*, August 27, 1985

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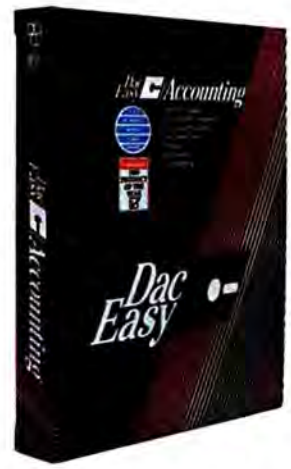


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### Divine Programming

I was very disappointed to learn that your magazine promotes homosexuality. This subject has no place in a technical magazine whose subscribers pay to learn about computers–not the pros and cons of homosexuality. When God "manufactured" man, he "programmed" him for certain "functions." One of those was heterosexuality.

*Paul Koehler*
*New Braunfels, Texas*

If *PC World* intends to promote homosexual life-styles, then I will no longer support your magazine, regardless of how much I might like it.

*V. E. Smolik*
*Atchison, Kansas*

### Save One, Save All

I applaud David Bunnell's commentary on Georgia's antisodomy law. While I am not gay, I support a person's right to choose his or her own life-style. Any infringement on individual rights must be resisted as vigorously as possible. Georgia's enactment of its law is only a symptom of the nationwide disregard for individual rights. It shouldn't have been necessary for Bunnell to even mention the contributions of gays in the computer industry. The fact that any minority group's civil rights are threatened is sufficient reason to publish

*(continues)*

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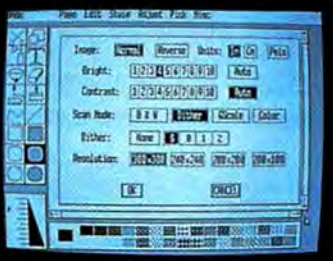

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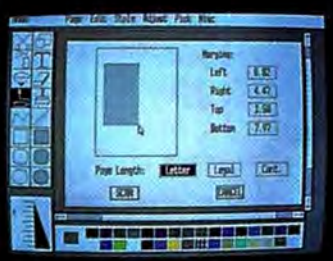

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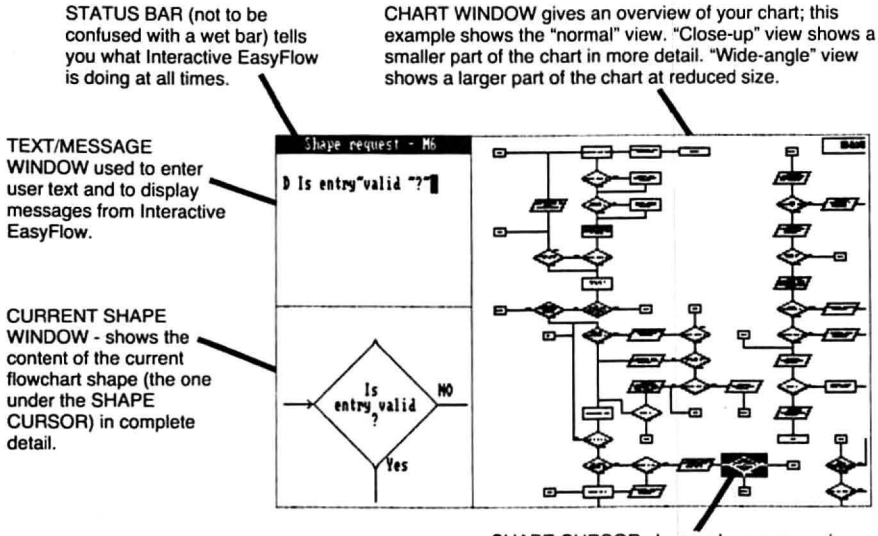


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his article. It's rare to find such enlightened commentary on a highly controversial subject in a magazine devoted to technology.

*W. B. Williams*
*Jenison, Michigan*

You'll no doubt catch flak for expressing "moral" concerns in *PC World*, but I for one find it refreshing to finally hear someone in the PC business publicly acknowledge the important contributions made by gays in the personal computer industry.

*John McKernon*
*New York, New York*

**Prelude to Disaster**

After reading Kevin Strehlo's column "Where Are the Spreadsheet Disasters?" [*PCW*, October 1986], I'd like to argue that spreadsheet errors leading to disasters are a nonissue. Any analyst or analyst's supervisor using a spreadsheet must accept responsibility for the calculations (formulas) and the results from that spreadsheet. An analyst or supervisor who fails to document or to check for commonsense results is not doing his or her job. Finding fault with a spreadsheet when disaster strikes is an extension of the old adage, "A poor craftsman always blames his tools."

*Dwight Dingwall*
*New York, New York*

*(continues)*

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Why a party? Well, it's because we've been told that more than a few of IBM's customers have been "going away" ever since we introduced our A★Star™ PC/AT compatible microcomputer. Now that we've announced our new A★Star II, we figure a lot *more* of their customers will be going away. That's because the A★Star II is the *only* "network ready" PC/AT compatible that can operate at 6, 8, 10 *and* 12 MHz. And because it's available in a super selection of models starting at only $995!

The A★Star II is not just another clone, it's better...*much* better! Not only is it faster and more powerful than IBM's model, it's also incredibly less expensive. Better yet, the A★Star II is built and backed by Wells American - a company that's been making microcomputers *longer* than IBM. (We bet that surprises even you!) Plus, the A★Star II is serviced nationwide by RCA Corporation - one of the world's largest and most respected consumer electronics firms. And if that's not enough, every unit includes free schematics and a money back guarantee!

If you'd like to be a part of our IBM going away party, clip and return the coupon or call us at the number below. But don't tell IBM! If they find out how many of their customers are going away, they might just go away themselves! Of course, that would be okay with us. We never *really* invited them anyway!

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**Circle 486 on reader service card**

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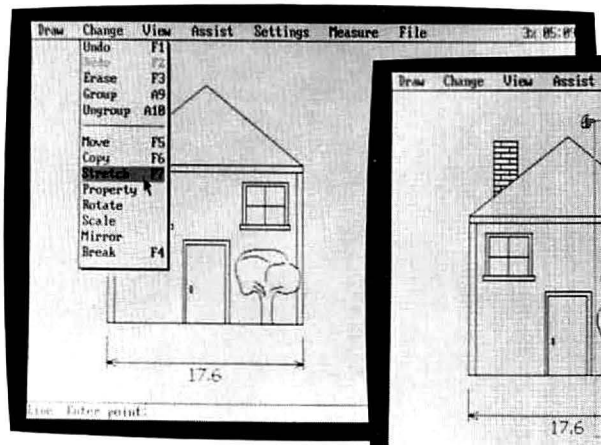
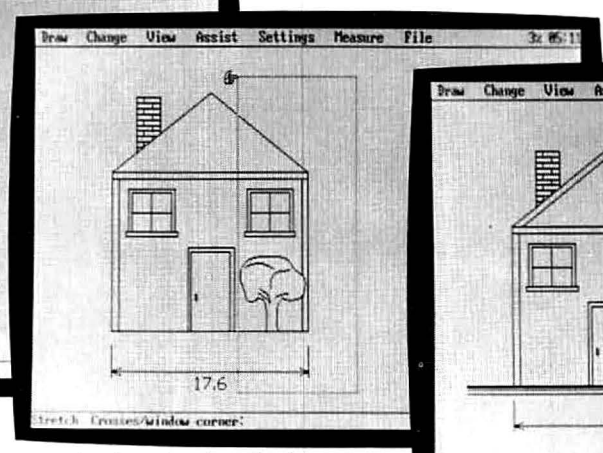
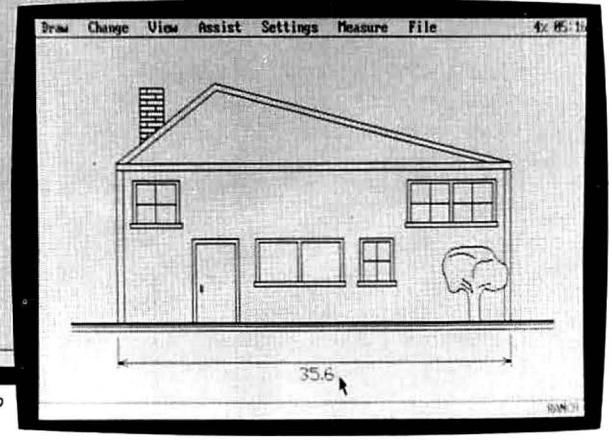



*You've drawn your cottage. With your mouse, choose Stretch from the Change menu...*




*Select the portion of your drawing you want to stretch...*




*Move the pointer, click, and the job's done. (The dimension changes automatically.) Add the finishing touches, and your ranch house is complete.*

Only five years ago, computer-aided design was affordable only by the very largest companies. Then came AutoCAD,® which brought CAD to the personal computer, and to the desktops of more than 60,000 architects, engineers, and designers.

But what about you? Are you one of the tens of millions of others who draw? At home: laying out your office, designing your dream house, or making carpentry plans. At work: making facility layouts, assembly instructions, shop-floor setup diagrams, and inspection checklists. Or at school: learning the principles of drawing and design.

You're probably still drawing the hard way—by hand. You can't justify the price of a full CAD system, nor do you want to spend the time to master a system with the complexity and power demanded by a full-time professional. Now, there's a computer-aided design tool for you.

## Introducing AutoSketch

AutoSketch is full-function computer-aided design software for creating line art. You draw with a mouse, using pull-down menus and dialogue boxes. If you're like most AutoSketch users, you'll be drawing in less than an hour. Your drawings will be far more accurate, and you'll spend less time creating them. With AutoSketch, you can revise a drawing and make a new clean copy in seconds: no more erasure marks or redrawing the final version.

## A New Way To Draw

AutoSketch automatically draws lines, arcs, circles, polygons, and smooth curves. You can add text of any size. You can build libraries of frequently used symbols, draw in colors, and use differing line types to distinguish objects. You can even draw on multiple layers and look at them in any combination.

## Freedom to Experiment

Once you've drawn something, you can move, copy, rotate, mirror, and erase until it's just right. You can work on objects as a group, or break groups apart. Change your mind? You can Undo anything you've done. Change your mind again? Use Redo and put it back.

## Accuracy You Can Count On

AutoSketch drawings are precisely dimensioned, with an accuracy of more than six decimal places. You can have AutoSketch dimension your drawings just by pointing to the distances to be measured. When you scale or stretch the drawing, the dimensions change automatically. You can "zoom in" to work in detail, then "zoom out" to see the whole picture. AutoSketch even allows you to measure angles and areas, so you'll know how much carpet to buy for that new room you're planning.

## Make A Hard Copy Easy

When your design is done, you can make a paper copy on any one of a large selection of printers and pen plotters. And you can print any section of your drawing as well, at any scale you like.

## Enhanced Speed

If you have an 8087 or 80287 math coprocessor, you can run AutoSketch as much as three times faster. With the enhanced version of AutoSketch, which requires a math coprocessor, you can experience up to nine times the speed, and for a price — $99.95 — that isn't nine times higher.

If, over time, you want to go further with computer-aided design, you can move on to AutoCAD 2.5 and take your AutoSketch drawings with you—they're fully compatible.

Find out for yourself why so many professionals draw with computers. If you have a PC, you can enter the age of computer-aided design for just $79.95. Why wait? For the name of an authorized dealer near you, call (800) 445-5415. Or simply order direct with a credit card by calling (800) 772-9200, ext. 329.

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AutoSketch runs on IBM PC, XT, and AT PCs and 100% compatibles. We recommend 512K RAM minimum and two floppy disk drives or one floppy disk and a hard disk. AutoSketch supports the Hercules™ Graphics Card, the IBM Color Graphics Adaptor (in monochrome mode), or the IBM Enhanced Graphics Adaptor with 256K graphics memory and the Enhanced Graphics Display. You can use the Microsoft® mouse (or compatible), or a joystick as your pointing device. Output may be printed on Epson, Hewlett-Packard LaserJet,™ IBM Proprinter XL,™ Okidata, TI Omni,™ or PostScript™ printers. Hewlett-Packard and Houston Instrument pen plotters are supported.

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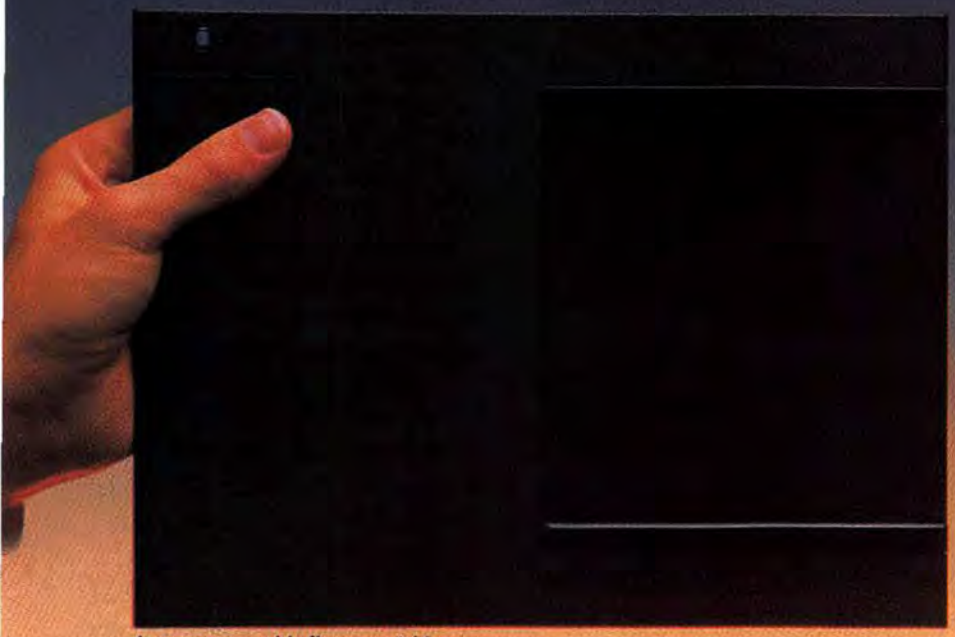
# NEW FROM SYSGEN: THE COMPARISON IOMEGA® DOESN'T WANT YOU TO SEE:



*Iomega removable floppy cartridge.*

*New DuraPak removable hard disk cartridge.*

| Bernoulli Box® | Sysgen™ DuraPak™ |
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| 10 Mbytes per cartridge | 15 Mbytes per cartridge |
| $1795 for first drive* (plus $280 for bootable controller, for a total of $2075) | $1295 for first drive* (includes bootable controller and installation hardware) |
| Floppy-based technology (average media life expectancy: "hundreds of hours") | Hard disk technology (average media life expectancy: 11,000+ power-on hours) |
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| Large, 8⅛" x 11" cartridges | Pocket-sized 4¼" x 4⅜" cartridges |
| 90-day warranty | Full one-year warranty on drive and media |

Sysgen's new DuraPak gives you all the transportability, security and unlimited expansion that have made removable media so popular—in a smaller, more convenient, more *reliable* format. No wonder it's so widely used in government and military applications: It's a *better* removable mass storage system for the IBM® PC/XT,™ PC-AT™ or compatibles. At an absolutely unbeatable price.

**Want to compare dual-drive configurations?**

DuraPak gives you all the advantages listed above, at prices that make the competition look positively *greedy*: Sysgen's 30 Mbyte dual-drive DuraPak system costs you $2095, *including* bootable controller. Iomega's 20 Mbyte dual-drive Bernoulli system costs you $2695, plus $280 for their controller. And at $3775 for their 40 Mbyte dual-drive system with controller, it's easy to understand why *they* don't want you to see this comparison!

***Like what you see? Find out more: Call our toll-free hotline for your copy of the Sysgen product family brochure, or for the DuraPak dealer nearest you.***

***Literature Hotline:***
***1-800-821-2151*** ***Dept. 51***

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Circle 711 on reader service card

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**Seeing Isn't Necessarily Believing**

If you hear a lie often enough, you will believe it. Apparently David Bunnell has swallowed one such "lie," as evidenced by his column "A Tale of Two Systems" [*PCW*, October 1986], in which he claims that "the Mac's screen resolution is far superior to that of the IBM PC."

Sometimes there's a grain of truth in a lie. In this case, the grain of truth is that Apple uses a tiny screen to display the output of a display adapter that's capable of only mediocre resolution. The results may look sharp, but take the output of a Hercules Graphics Card and put it on the same size screen, and it'll look better yet.

Unlike the Macintosh, the IBM PC's open system enables the user to choose display adapters. The Hercules Graphics Card displays 720-by-348-resolution graphics and has an enhanced text mode. The IBM Enhanced Graphics Adapter supports 640-by-350 resolution in 16 colors and has several configurations. Compare either of these to the Mac's puny 512 by 342.

These are the low-priced adapters. Spend a little more money for the IBM Professional Graphics Adapter and get 640-by-480 resolution with 256 colors. An even more expensive brand X system can get you 2048 by 2048 in color! You can't believe everything you read—or see.

*Seymour Metz*
*Annandale, Virginia*

*(continues)*

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You get letter-quality reproduction in a printer that looks great on the bottom line.

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Like the P321, the P341e uses our 24-pin printhead that lasts up to four times longer than other printheads, and has made us the number one seller in the business.

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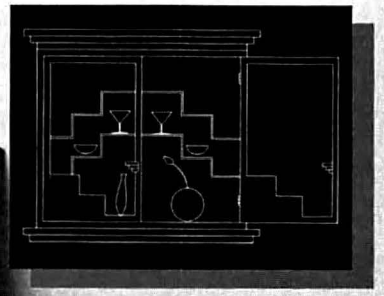

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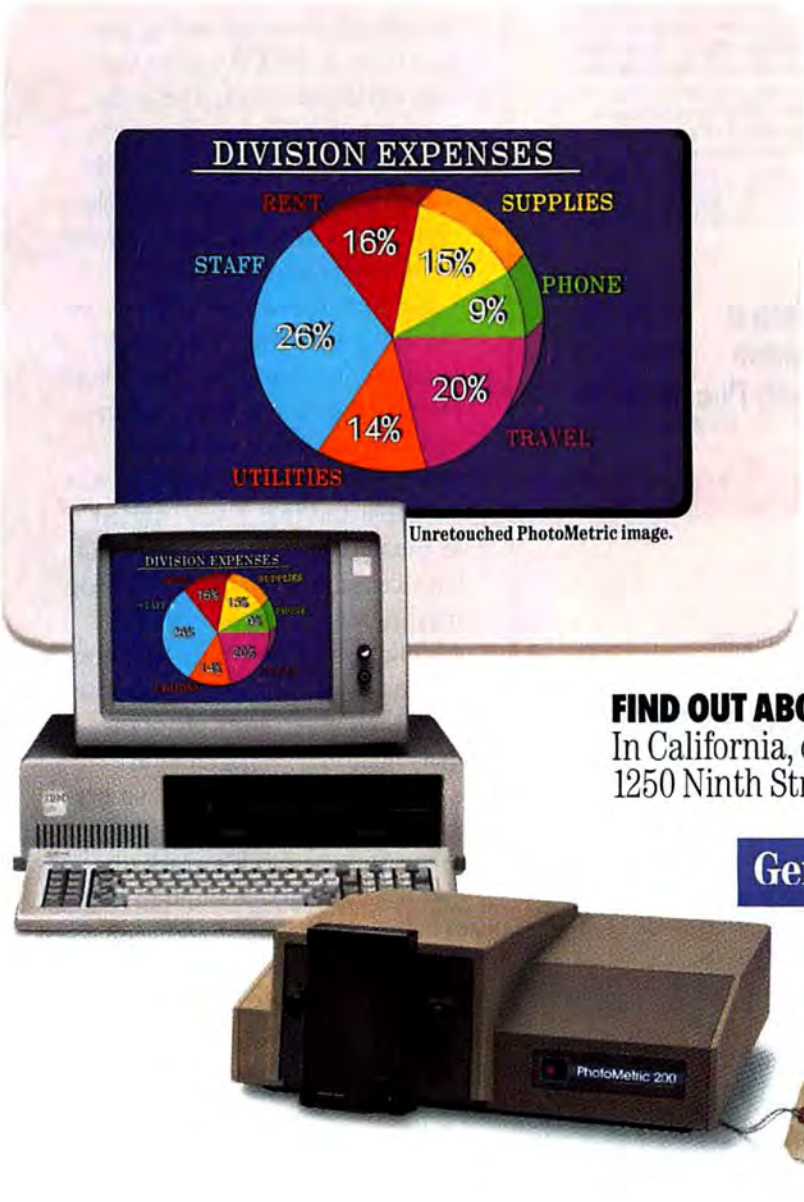


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### MECA Made My Day

I purchased *Managing Your Money* before reading "Andrew Tobias: Right on the Money" [*PCW*, October 1986]. Had I read your article first I might not have bought the program. I began to have problems getting the software to accept the current date. My husband brought your article to my attention. It states, "Don't even think about throwing your questions at MECA's technical support department. The company is notorious for its impenetrable phone lines." I felt like I had thrown my money down the drain, but I decided I had nothing to lose by trying to call.

To my surprise, my call was answered in two rings and a technical support representative solved my problem in a matter of minutes. She informed me that a newer version of the software was available and that I was entitled to the update. When I told her of your critique, she said MECA had tried to rectify the problem by adding technicians to its telephone support staff. The quick response to my call is certainly proof of that.

Most businesses could do a better job of satisfying the needs of its customers, and it's gratifying that MECA cared enough to listen to criticism. A word to consumers: Don't abandon companies that try, abandon those that don't care.

*Pat Gauley*
*Conway, Arizona*

*(continues)*

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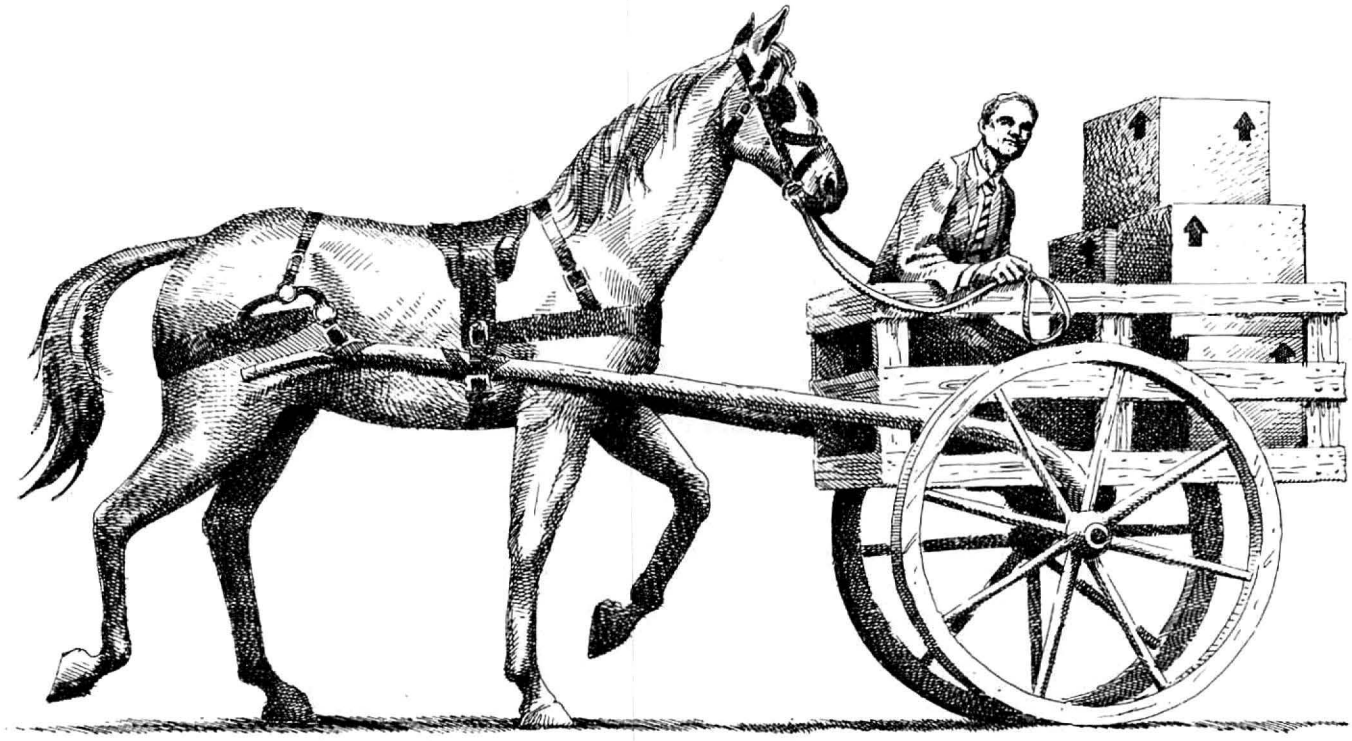
Note: Photos show color and resolution obtained on an IBM PC equipped with an IBM Enhanced Graphics Adapter. Monochrome display is generated when an IBM Color/Graphics Adapter or compatible graphics adapter card is used.



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With as many features as wordprocessors selling for 10 times the price, Electric Pencil PC was designed to be sophisticated enough for the professional user yet simple enough for the beginner. Our "Quick Start Guide" will have you writing, editing, and printing in less than 20 minutes. Once you have the basics, any of 500 functions are available with a simple key-stroke. The on-screen help and extensive tutorial windows are like having a manual on disk.

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MINIMUM HARDWARE REQUIREMENTS:
IBM-PC/XT/AT or compatibles and Tandy 1000. 128K memory, one disk drive, PC-DOS, MS-DOS 2.0 or higher. Color or monochrome monitor.

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Circle 817 on reader service card

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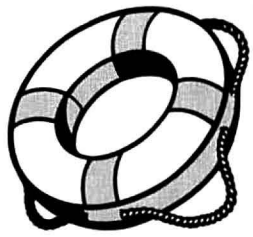

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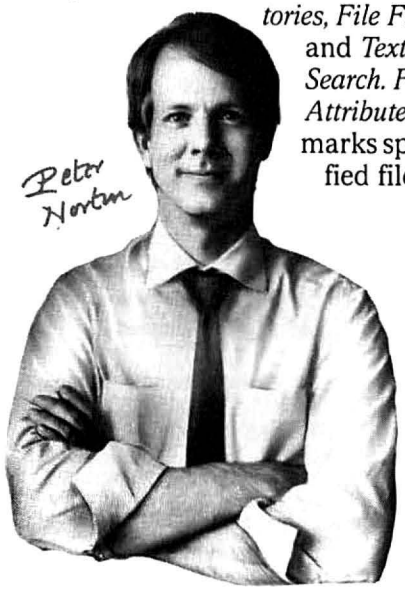


The Norton Utilities. Designed for the IBM® PC, PC-AT, and DOS compatibles. Available at Computerland and most software dealers. Order direct for $99.95 from Peter Norton Computing, Inc., 2210 Wilshire Boulevard, Santa Monica, CA 90403. 213-453-2361. Visa and Mastercard welcome.

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### The PC Prescription Postmortem

"The PC Prescription" [*PCW*, October 1986] was very interesting and provided a relatively good overview of clinical pharmacokinetics software. However, the authors overlooked the pioneering work of Dr. Lewis Sheiner of the University of California, San Francisco, and his colleagues. Sheiner's method of serum drug level analysis accomplishes several of the things that the article stated are "up-and-coming." One of those is serum drug level measurements, which are weighted with respect to time and produce calculations that take into account the likelihood that a given level is within the range of expected probability. This is the "skeptical" program mentioned in the article. Sheiner's method currently represents the cutting edge of pharmacokinetics software and has been widely reported in medical literature.

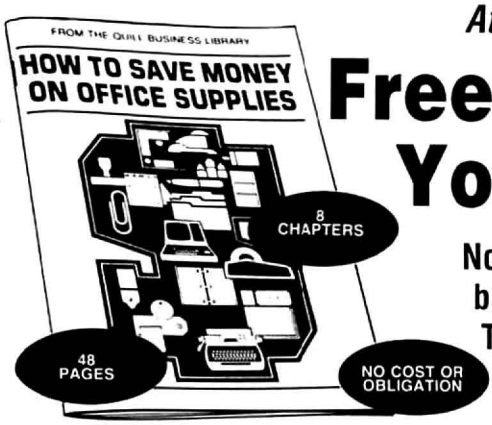
*Philip Anderson, Pharm. D.*
*San Diego, California*

### Requiem for the PC

I see the sun setting on the day of the personal computer—at least the PC for the individual. There's no way I can afford to pay the prices for technical assistance noted in "'Software Support . . . Please Hold'" [*PCW*, November 1986]. There are many individual users in similar circumstances, and apparently we'll be left out in the cold.

I suppose one could compare PC service costs to the cost of

*(continues)*

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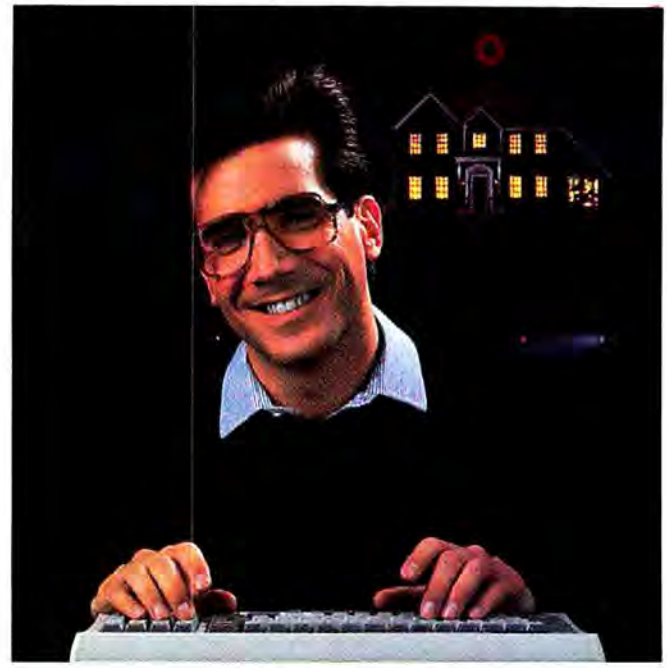

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maintaining an automobile. I, for one, can barely afford the costs of running a used car.

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*C. Morgan*
*Berkeley, California*

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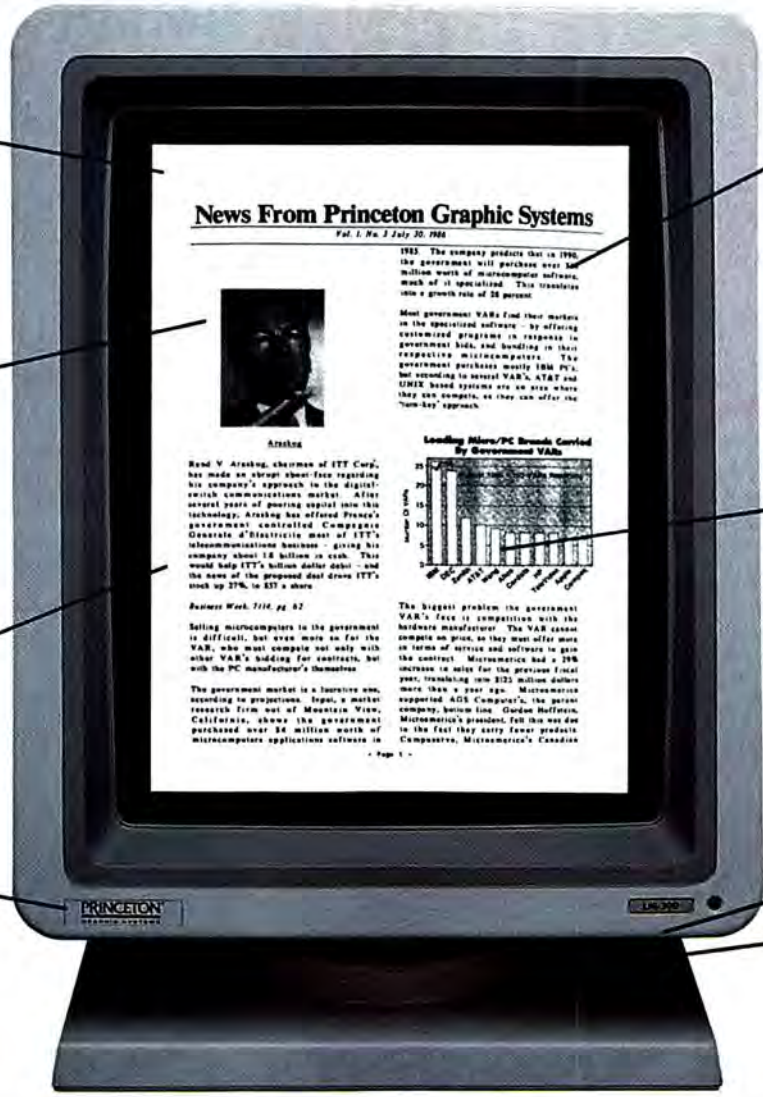


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ALEX DOBOSS

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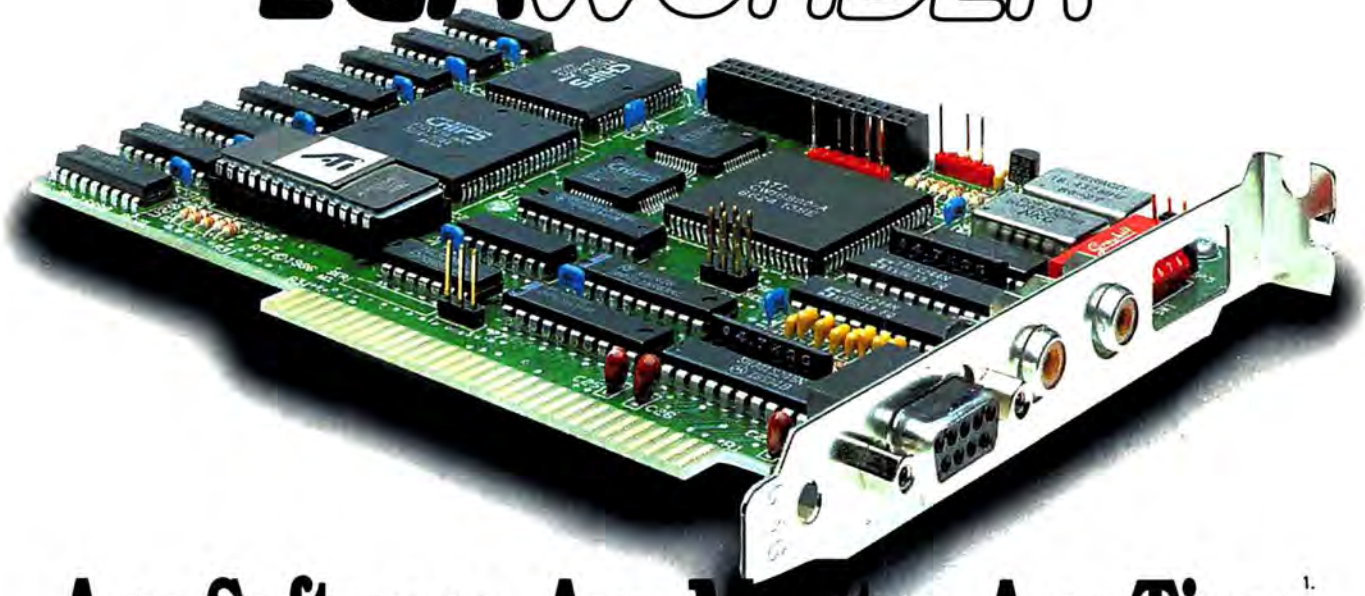

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CGA Software | 132 Column Software

**EGA Wonder runs EGA, CGA, MDA, Hercules and 132 Columns on an Enhanced Graphics Display. CGA text is improved to 8 x 14 and graphics are double scanned for a high quality display.**

## TTL Monochrome Monitor and Compaq PC Portable[2]

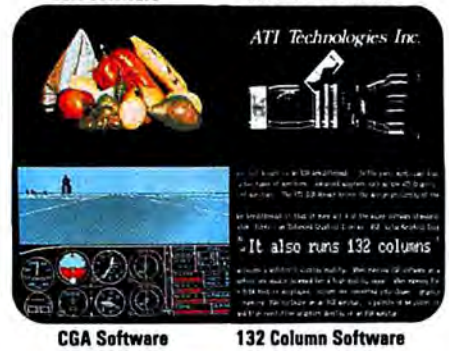
EGA Software | Hercules Software

CGA Software | 132 Column Software

**EGA Wonder runs EGA, CGA, MDA, Hercules and 132 Columns on a TTL Monochrome Monitor and Compaq PC Portable[2] . Colors of EGA and CGA are converted into shades, graphics are full screen and no pre-boot drivers are required.**

## RGB, Composite Monitors, and the IBM Portable PC

EGA Software | Hercules Software




CGA Software | 132 Column Software

**EGA Wonder also runs EGA, CGA, MDA, Hercules and 132 Columns on an RGB Monitor, Composite Monitor, and the IBM Portable PC in 64 colors (shades). EGA and Hercules software are interlaced for high resolution text and graphics.[3]**

Composite monitor and PC Portable display not shown.

| Features | ATI EGA Wonder | Paradise Auto Switch | Quadram and Video 7 |
|---|---|---|---|
| Compatible to EGA, CGA, MDA, Hercules | ✔ | ✔ | ✔ |
| 256K Video Memory | ✔ | ✔ | ✔ |
| Automatic Switching Between EGA and CGA Color Modes and Among EGA, MDA, and Hercules Modes | ✔ | ✔ | |
| Runs EGA, CGA, MDA, Hercules and 132 Columns on an EGA Monitor | ✔ | | |
| Runs EGA, CGA, MDA, Hercules and 132 Columns on an RGB Color Monitor | ✔ | | |
| Runs EGA, CGA, MDA, Hercules and 132 Columns on a TTL Monochrome Monitor | ✔ | | |
| Runs EGA, CGA, MDA, Hercules and 132 Columns on a Composite Monitor | ✔ | | |
| Runs EGA, CGA, MDA, Hercules and 132 Columns on an IBM Portable P.C. | ✔ | | |
| Warranty | 2 Yrs | 1 Yr | 1 Yr |
| Suggested List Price | $399 | $595 | $599 |

*Trademarks: Paradise Auto Switch – Paradise Systems Inc; Quad EGA+ is a trademark of Quadram Corp.; Video-7 – Video-7, Incorporated; IBM PC Portable – IBM – International Business Machines. Compaq — Compaq. Inc

1. "Any Software, Any Monitor, Any Time" applies to IBM graphics, standards, monitors, software.
2. Optional Compaq Expansion Module (no 132 Columns) suggested list price $99.
3. Flickering effect of interlacing reduced with purchase of anti-glare screen filter.

### Upgrade to EGA Without An EGA Monitor

The **ATI EGA Wonder** goes far beyond software compatibility. It is the result of intensive development by one of the most revolutionary technology companies today — **ATI Technologies Inc.**

The **ATI EGA Wonder** is not just better technology. It is the solution for upgrading to EGA without an EGA monitor.

Only the **ATI EGA Wonder** displays EGA, CGA, MDA, Hercules and 132 column software on an Enhanced Graphics Monitor, an RGB Color/Graphics Monitor, a TTL Monochrome Monitor, a Composite Monitor, or the internal monitor of the PC Portable.

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AMT's LAP/PRO 1 is not a toy, but a powerful, feature-packed computer in a highly compact, 10-pound package. This advanced model is based on a CMOS 80C88, and executes all market-standard IBM® software. Features 512K of user RAM; 3.5-inch, 720 KB floppy disk; 80x25 back-lit LCD display with 640x200 resolution; pro fessional, 76-key keyboard; and ports for serial and parallel printers, external disk drive, RGB, and video.

A full range of low cost options includes external 5.25-inch, 360 KB and 3.5-inch, 720 KB floppy disk drives; 300 baud modem; MS DOS 2.1 and GW BASIC; and handsome carrying case.

## POWERHOUSE LAP/PRO 10.™ $1499.

LAP/PRO 10 is truly a computer for all seasons. Unplug it at your office, pop it into its handsome fabric-and-leather carrying case, and take it in the car, on a plane, anywhere your data needs to go. Ready to operate in seconds.

**

This full-featured, high-power system is far superior to the IBM® Lap Top. The standard, AC-powered model gives you an advanced, 16-bit 80186 CPU; 640 KB of main memory; dual 5.25-inch, 360 KB floppy disks; 96-pin expansion port; serial and parallel communication ports; and a high-contrast, 80x25 back-lit LCD display with 640x200 pixel resolution. A 300/1200 baud modem, MS DOS 2.1®, and carrying case are optional.

Fully IBM-compatible, LAP/PRO 10 handles MS-DOS® in its various versions, as well as a full range of IBM application software. The enhanced keyboard is IBM PC®-compatible, too, with 83 keys, including 10 function keys, cursor keys, and a 10-key numeric pad!

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# Product Outlook

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

Unparalleled resolution for desktop publishers, Lotus retools Freelance, new help for sales professionals, sending graphics by modem, EGA-flavored text on a vanilla monitor, and more

*Ken Greenberg*

## Crystal Clearly Resolved

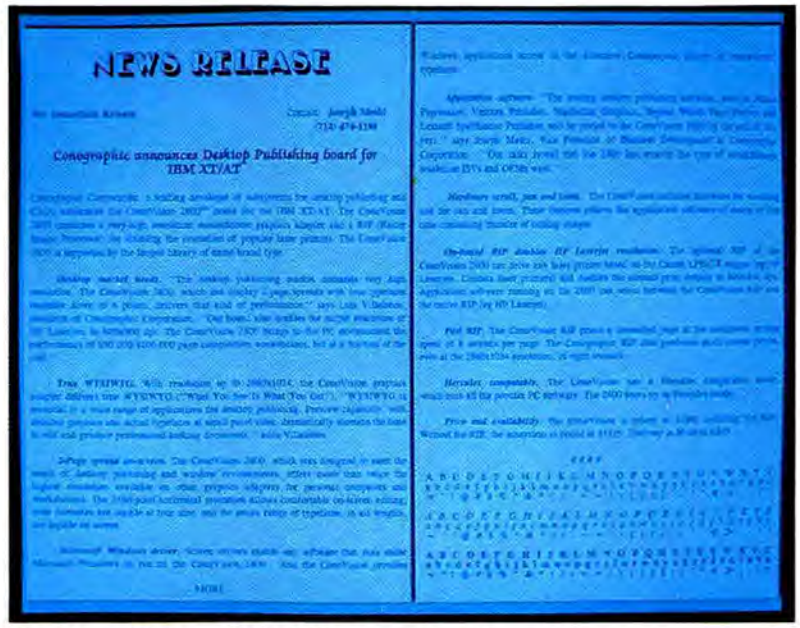
Even the best PC-based desktop publishing programs quickly hit a hardware wall, unable to coax graphics boards into what-you-see-is-what-you-get resolution at the smaller point sizes.

Conographic—whose patented curve technology is substantially more efficient than bit-mapped or vector graphics—has demolished that wall with its ◆**ConoVision** 2800 graphics board. Boasting a maximum black-and-white resolution of 2880 pixels by 1024 pixels, the ConoVision 2800 can display two pages on screen and render typefaces in actual size and weight, down to a readable razor-sharp 6 point.

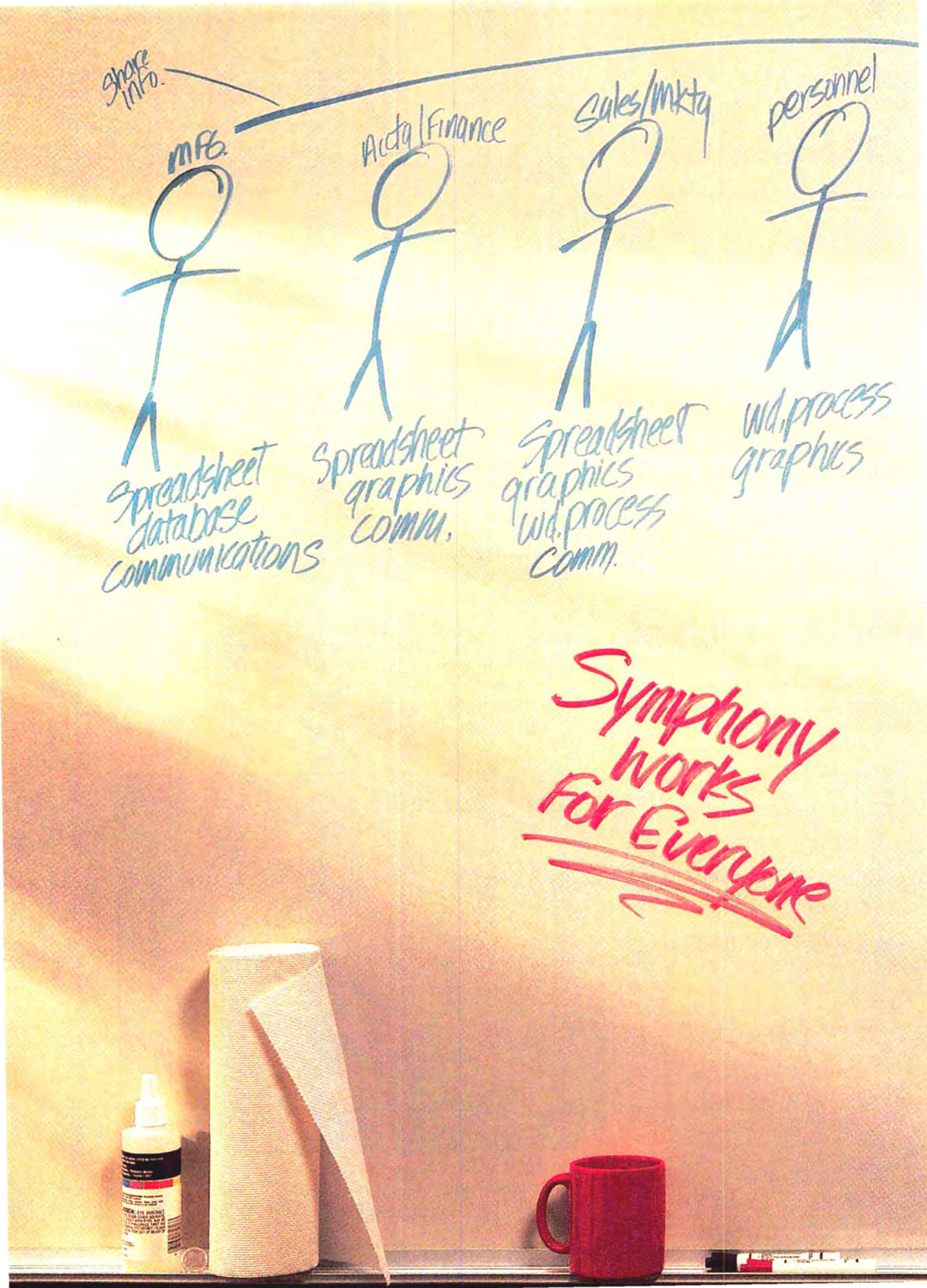
The board's magic is not limited to on-screen display; with the addition of optional RIP (raster image processing) hardware, the ConoVision 2800 can increase HP LaserJet resolution to 600 by 300 dpi—and generate hard copy at a rate of better than 7 pages per minute. The board, which sports 512K of RAM but lacks a coprocessor, handles zooming, panning, and scrolling by itself. These gifts make the ConoVision 2800 an ideal vehicle for the preliminary printing of material bound for the typesetter or the proofing of page designs.

The ConoVision 2800 is Hercules compatible, and with drivers for *Microsoft Windows, PageMaker,* and *Ventura Publisher,* its advantages can rise above the purely theoretical. Although Conographic designed the product expressly for desktop publishing, the company eventually plans to target the CAD market as well. The board is $1985 with RIP; $1325 without. For interested parties, Conographic is packaging the

*(continues)*




**The ConoVision 2800 delivers a stunning what-you-see-is-what-you-get display, with even the smallest point sizes crisp and legible.**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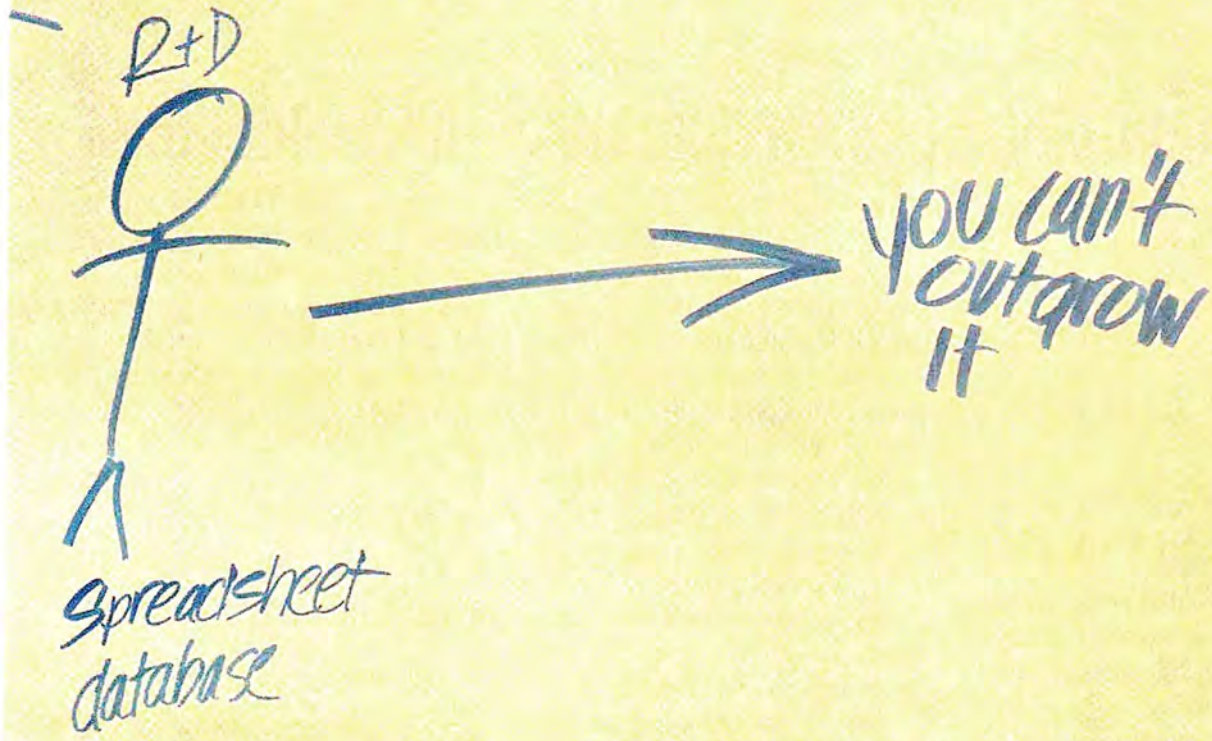


Symphony® is the one software product no business person can afford to be without. Based on the 1-2-3® spreadsheet technology, Symphony pulls together five key functions in one program. Functions that help a marketing manager work smarter. Give a financial analyst a clearer picture. Run an entire company more effectively.

Symphony is designed to stay ahead of your expanding needs. Its five functions can handle a wide range of business requirements. But should you have more specialized needs, you can incorporate Lotus® add-in products, or any of the more than 250 applications created by independent software developers.

Symphony. Business software you'll never outgrow.

# Lotus Symphony

*A complete general-purpose software tool built around the world's leading spreadsheet technology.*

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ConoVision 2800 with a 19-inch black-and-white Moniterm monitor. Conographic Corp., 17814 Fitch, Irvine CA 92714; 714/474-1188.

## Drawing on Experience

Lotus has moved aggressively to place its imprimatur on *Freelance,* the principal program it acquired when the company swallowed Graphic Communications last year. The result is ◆***Freelance Plus,*** now a $495 one-stop presentation graphics solution, adept at both charting and freehand drawing.

Although you can feed data directly into the *Freelance Plus* charting module, bringing *1-2-3* or *Symphony* worksheet (.WK1 or .WR1) files into the fold has become a seamless process: There's no need to convert the files to the .PIC or .PRN format first. *Freelance Plus* also reads *dBASE* files directly.

Where the *Freelance* symbol library is concerned, the rich get richer—500 images are now at the ready. Resourceful users can craft sophisticated graphics images from the library's basic offerings. The package is also replete with an assortment of predefined text charts.

Sales and marketing departments are apt to find their bearings with ◆***Freelance Maps,*** a collection of modules—priced at $145 a throw—that detail U.S. counties, cities, ZIP code areas, congressional districts, and the like. Or you can buy the entire country for $495. Lotus Development, 55 Cambridge Pkwy., Cambridge, MA 02142; 617/577-8500.

## Measure for Measure

When it released its new scientific word processor *Manuscript* (see "Jonathan Sachs After 1-2-3," *PCW,* December 1986), Lotus in fact gave birth to twins. The second new product is ◆***Measure,*** a *1-2-3* companion program. *Measure* feeds technical data into *1-2-3*


# POWER OF

## THE EPSON® LASER PRINTER IS HERE.

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The Epson GQ-3500 laser printer. A machine that can bring the power of a printing press to your office, and add new authority and polish to everything you write. With elegant layouts. Professional-looking text. Bold, fully-formed headlines. And attention-getting, 300 DPI graphics.

Let's get down to specs.

The Epson GQ-3500 has what it takes to handle an enormous variety of high quality printing jobs, from correspondence and newsletters to reports with integrated graphics. Seven resident fonts and two user accessible IC card slots give you a wide selection of type styles and sizes to choose from, and built-in 640K memory lets you print up to one-half page of 300 DPI graphics. To make things even easier, the GQ-3500 also comes with the new SelecType IV Control Panel, for upfront, push-button command of eleven key printer functions.

All of this in a machine that's 37% smaller and 49% lighter than the HP Laserjet Plus.™ A machine that works

and *Symphony* worksheets on call. The $495 program can directly communicate with a universe of data collection products via RS-232C or IEEE-488 connections. *1-2-3* macros work without a hitch; it's even possible to automate the entire data acquisition process, from collection to analysis to display.

## Help for Sale

To paraphrase Einstein, sales is 1 percent art, 1 percent science, and 98 percent personal style. Sales pros in search of a program that skips the art and the science in favor of cultivating personal style may have a friend in ◆***SaleMaker,*** from Software of the Future.

At $495, *SaleMaker* might well give sales-specific software the cachet it currently lacks. With the program and a telephone, telemarketers can juggle leads and prospects, client histories, useful tidbits, crucial reminders, and more. The handiwork of sales professionals, *SaleMaker* strives, in the company's words, to "duplicate the nonlinear, many-pathways-to-the-same-solution" modus operandi of those in sales.

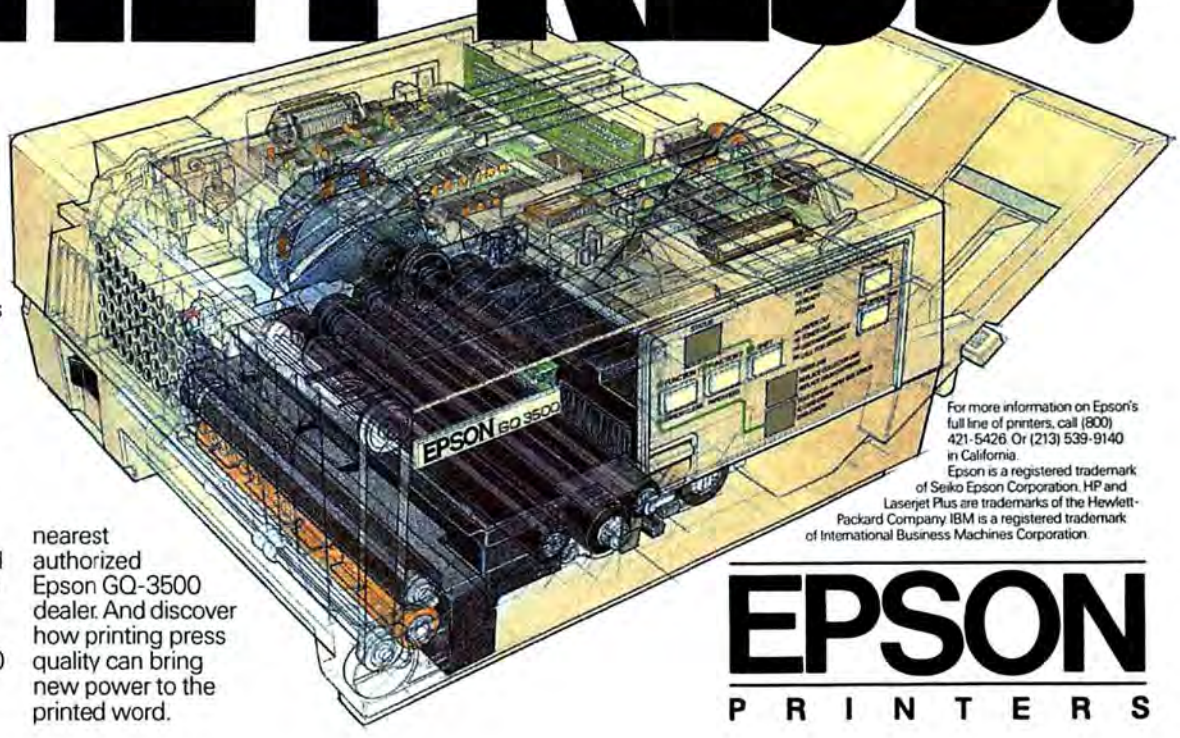
The program's *Framework*-like interface fits that approach nicely. The screen is rife with pop-up windows that open onto separate program components. Decorating the display are a memo pad for phone notes, a bulletin board for messages, and a window for boilerplate correspondence created with LetterMaker, *SaleMaker*'s modest word processor.

What could have been clutter proves instead to be a handy way to move around in real time. At those moments, for example, when a client has just put you on hold, you can interrupt any function to access any other, or branch to pages for sales presentation or product information.

Like most sales packages, *SaleMaker* traces its lineage back to data management. You can search on a variety of user-defined keys,

*(continues)*


THE PRESS.

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For more information on Epson's full line of printers, call (800) 421-5426. Or (213) 539-9140 in California.
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PRINTERS

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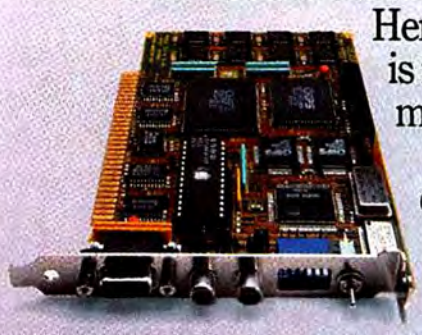
That, in turn, means sharper lines. More brilliant colors. And less strain on your eyes. (Of course, you can't see more than your monitor will display. So for more than 640 x 350, the VEGA Deluxe requires a Multisync® or equivalent.)

The VEGA Deluxe is compatible with every other video standard: EGA, CGA, Hercules and MDA. And it automatically selects which standard is right for your software's needs when used with a compatible monitor.



Not only that, the VEGA Deluxe includes high-resolution drivers for Microsoft Windows and Lotus 1-2-3 with 120 columns and 43 lines. EASYCAD, EGA Paint, GEM, Dr. Halo, In•A•Vision, Windows Draw, Windows Graph, and many more now support VEGA Deluxe high resolution.

Want more information? Just call 1-800-238-0101 for the name of the Video Seven dealer nearest you. (In California, call 1-800-962-5700.)

And get ready for a real eye-opening experience.

Video Seven Inc., 47320 Mission Falls Court, Fremont, CA 94539.

VIDEO SEVEN

High resolution modes require TTL color monitors capable of 25 KHZ and 29.4 KHZ. Trademarks: VEGA Deluxe – Video Seven Inc.; Hercules – Hercules Computer Technology; MultiSync – NEC Information Systems, Inc.; EASYCAD – Evolution Computing, EGA Paint – Rix SoftWorks, Inc.; GEM – Digital Research Corp.; Dr. Halo – Media Cybernetics; In•A•Vision, Windows Draw, Windows Graph – Micrografx, Inc. Registered trademarks: IBM – International Business Machines Corporation; Video Seven – Video Seven, Inc.; Lotus 1-2-3 – Lotus Development Corp.; Microsoft – Microsoft Corp. Video Seven reserves the right to change specifications without notice.

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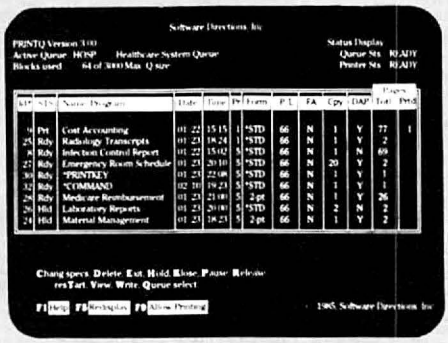

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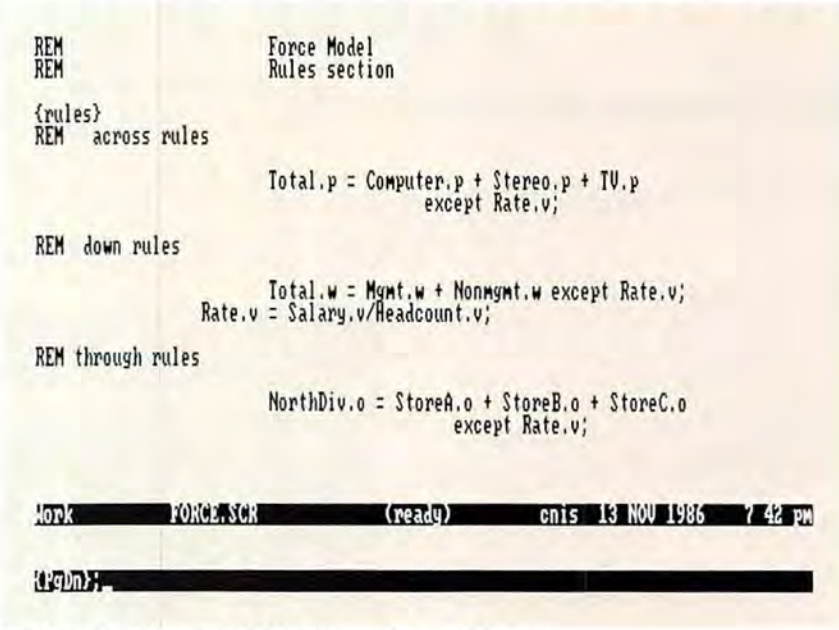


**With Bell Atlantic's MVP Spreadsheet Plus, you can use a word processor to define model logic for columns, rows, and pages—described here as across rules, down rules, and through rules.**

## Putting in Your Two Cents

Document sign-off is, in most offices, an odious job at best and one often at odds with peak productivity.

With that in mind, Brøderbund Software has introduced ◆***ForComment,*** an appendage to a variety of word processors that takes the tedium out of soliciting feedback on essential documents. *ForComment* lets key players amend and edit text for attribution, thereby creating an audit trail of editorial opinion that should boost interoffice accountability. *ForComment* annotations ride along with a copy of the original document, and all pithy insights can be printed.

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## Fashionably English

If you loathe the cryptic syntax of spreadsheet addressing, take a gander at ◆***MVP Spreadsheet Plus,*** Bell Atlantic's answer to Lotus Development's *HAL.*

For the phone company's $495 multidimensional spreadsheet, however, plain English isn't a front end, it's the warp and woof of the product. At the same time, Bell Atlantic has recognized that computers don't speak English all that well. Cleaving to every copy of *MVP* is a compiler, good for translating completed models—which can be built with a word processor—from the vernacular to binary form.

Although a product with a seemingly broad base, *MVP* is aimed squarely at budgeting work groups and financial analysts in corporations and government. Bell Atlantic is selling *MVP* as a supplement to existing spreadsheets,

*(continues)*

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There is nothing magical about it. You learn the process of building a computer program step-by-step with McGraw-Hill *Concept Modules* sent to you one at a time, once a month. Each of the ten modules in the Series takes you through an important step in the development of the structure and detailed logic of a program, including testing, debugging, and documentation.

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In the first Module, for example, when your sample program (Declining Interest Loans) appears on your screen, you'll find errors on certain program lines. You'll also see that the program is only three-quarters completed.

Now comes the fun part. You'll discover how this program is built, and in the process you'll learn how to identify and correct errors. And by the end of Module 1, you'll actually have completed this program yourself.

But there's more. Special graphics on your screen work in conjunction with the accompanying guide to amplify, illustrate, and deepen your understanding of software design principles.

**The Crucial 95%—Learn the Foundation of Computer Programming**

While the Series includes interactive disks that run on specific computers, everything you learn you can apply to any language or machine. Why is this possible? Because McGraw-Hill knows programming is far more than coding a program into the computer using a specific language. In the real world of computers, 95% of the programming process is carried out using design techniques that are independent of specific language or machine. It is this crucial 95% that you thoroughly understand and master in the Series.

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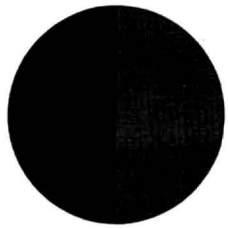
TEXAS INSTRUMENTS
IBM
AD ANTAGE

# TI's new OmniLaser™ page printer can turn your PC into a desktop publishing system.

**Combined with the right software, you can now have a publishing house right on your desktop.**

TI's OmniLaser with any IBM®-compatible, Apple® or virtually any PC, and the right software, can help you reduce costly typesetting, outside design work and printing. The quality of your business communications will be greatly enhanced and more eye appealing, lending more credibility to your message. At 300 dots per inch resolution, the difference between laser printing and daisy wheel or dot matrix is more than mere improvement. It's light-years ahead.

The OmniLaser Series 2000 family from Texas Instruments is available in three desktop models designed to address workstation and shared-resource environment needs (8 or 15 pages per minute depending on model). Both the 2108 and 2115 feature the PostScript™ page description language which allows full integration of text, graphics and scanned images on a single page. And the Model 2015 was designed to handle text and business graphics in a shared-resource environment. All three OmniLasers, with their standard interfaces and emulators, allow you to take full advantage of your present business computer applications as well. And they'll give you unparalleled resolution in both text and graphics. Blacks are black, whites are white, and you control the shades of gray.



Ours Theirs

*The OmniLaser uses the direct positive-imaging exposure process as opposed to the reverse-imaging exposure process used by many other laser printers. The difference, as shown above, is obvious.*

**The second generation can do more, but costs less.**

Overall, TI's second generation laser printers offer up to 10 times the duty cycle, 15 times the machine life and five times the paper capacity offered on their first generation counterparts. These advances, coupled with lower maintenance costs and user-replaceable consumables, significantly reduce the costs of ownership. In fact, at pennies per page, the OmniLaser's per page cost is among the lowest in the industry.

**TI OmniLasers and the power of PostScript.**

PostScript is a description language that can drive OmniLaser Models 2108 and 2115 printers to their full capabilities. Whether you're composing newsletters, product data bulletins, ad proofs, business presentations, technical manuals, or any type of document, you'll find that with the power of PostScript, the only limit to what you can do is your own imagination.

**OmniLasers. They bring power, flexibility and affordability to the world of desktop publishing.**

Turn your desktop into a publishing house. For more information on the new OmniLaser 2000 Series page printers from Texas Instruments, call toll-free **1-800-527-3500.**

TEXAS INSTRUMENTS

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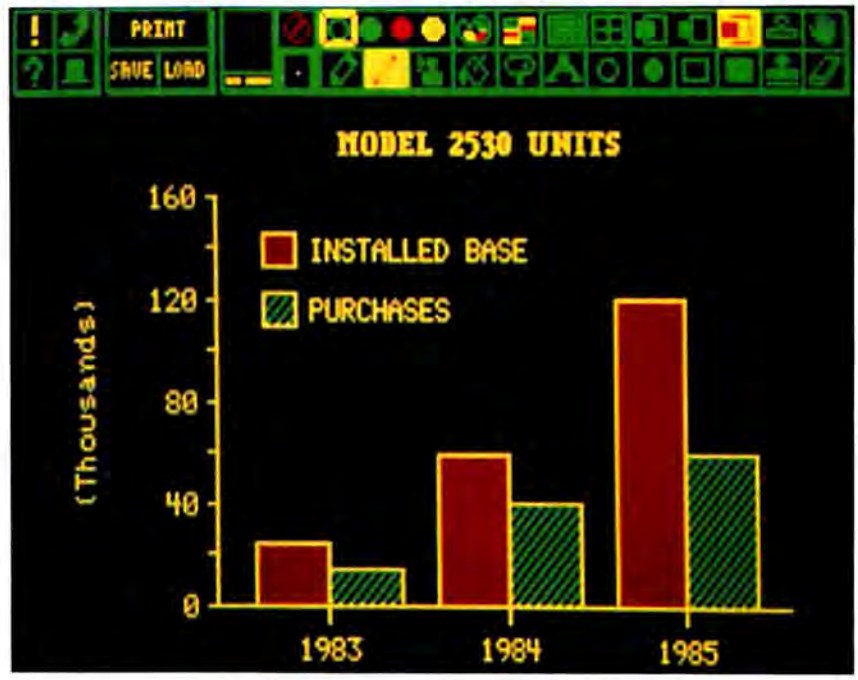
PostScript is a trademark of Adobe Systems Incorporated.
Apple is a registered trademark of Apple Computer, Inc.

perhaps mindful of the blood spilled in *Javelin*'s attempt to stage a coup against *1-2-3*. The program reads .WKS and DIF files.

Alone or in concert with another package, *MVP* is heady stuff. You can alter calculated cells, link worksheets, incorporate mainframe data, recalculate cells selectively or a step at a time, increment quantities, rotate rows and columns, and lock specified data. *MVP*'s backward calculation capability permits proportional adjustments in related formulas. And you can follow as many as 15 critical cells in on-screen *MVP* windows.

If tracing your tracks is a priority, you can entrust *MVP*'s transcript feature to record every keystroke in a session. You can also edit transcripts to create macros retroactively. Like *HAL*, *MVP* includes an undo command. The program's reporting facility lies outside the spreadsheet domain, thereby leaving model data intact. Bell Atlantic NSI, 13100 Columbia Pike, Silver Spring, MD 20904; 301/236-6294.




**Thanks to a special data compression capability, TeleVision is capable of transmitting vivid graphics over electronic mail.**

## Better Than Watching Television

Picture this: You've just sent a 40K proposal to headquarters over MCI Mail. Drafting the report exacted its toll in blood and sweat, but you've met your deadline—almost. You still need to hustle to your local overnight courier with the two dozen supporting charts and graphs.

An unpleasant but familiar scene? LCS/Telegraphics wasn't terribly keen on that scenario either; the company developed ◆ ***TeleVision*** to eliminate the overnight courier shuffle. This full-fledged, $99 communications package is distinguished by a talent for sending images through virtually any electronic mail system. *TeleVision* will deliver graphics to mailboxes on CompuServe, EasyLink, MCI Mail, The Source, and GTE TeleMail, among others.

*TeleVision* relies on a proprietary data compression scheme to move pictures along at a good clip. Transmitting a full-page CGA image at 1200 bps reportedly requires about 45 seconds. The program is equally adept at squeezing and sending enhanced *1-2-3* graphs and *1-2-3* worksheet files. XMODEM support ensures data integrity.

With *TeleVision* picture libraries parked on GEnie, Delphi, and Omninet, you can download clip art and then use the program's graphics editor to fiddle with those images. A nifty mouse-to-mouse feature enables you to edit someone else's work—remotely. LCS/Telegraphics, 261 Vassar St., Cambridge, MA 02139; 617/547-4738.

*(continues)*

## Turbo Pascal Enthusiasts!

# Announcing the GSI PASCAL DEBUGGER.

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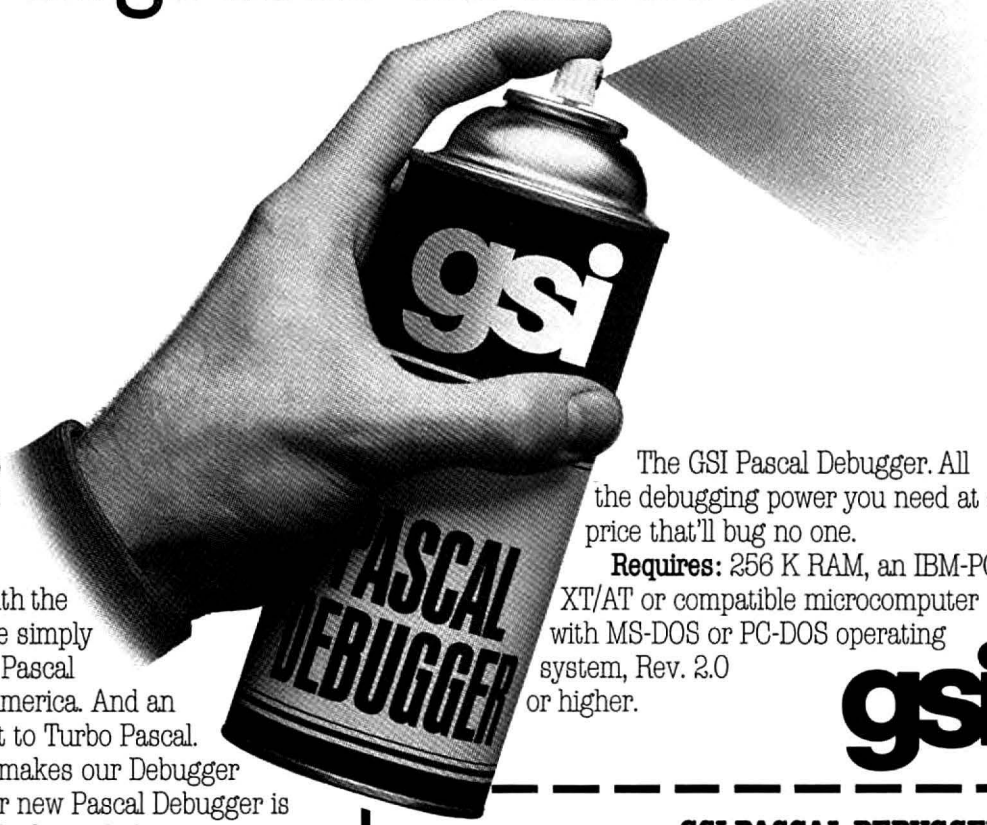


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The Citizen™ Premiere™ 35 gives you all the features of a high-end daisywheel printer, without the high-end price. For hundreds of dollars less, you get all the speed and features you'd expect from other quality 35 cps daisywheel printers, plus something no one else can give you. The same precision and engineering that go into our timepieces.

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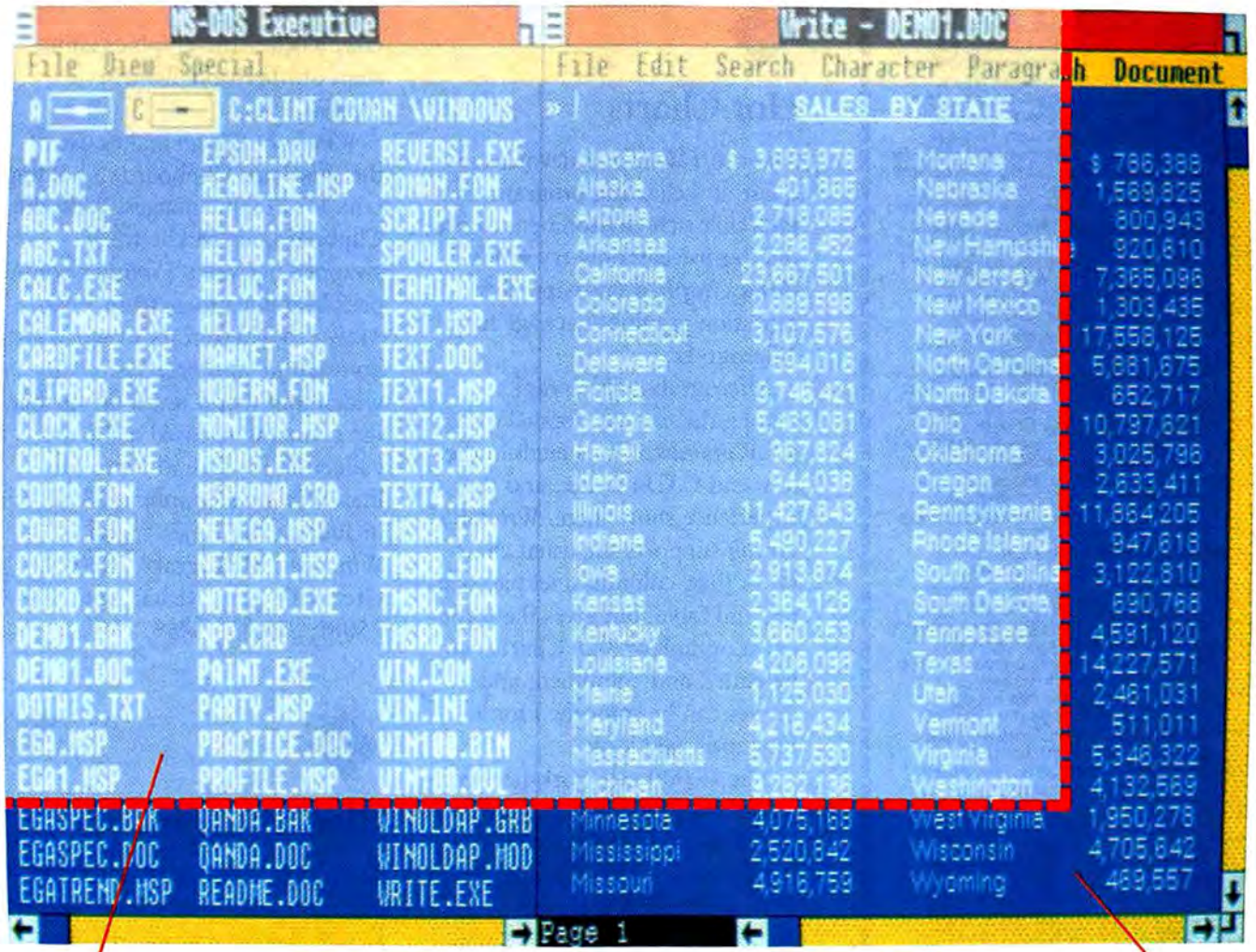
# How to use 137% of your Multisync™ monitor.

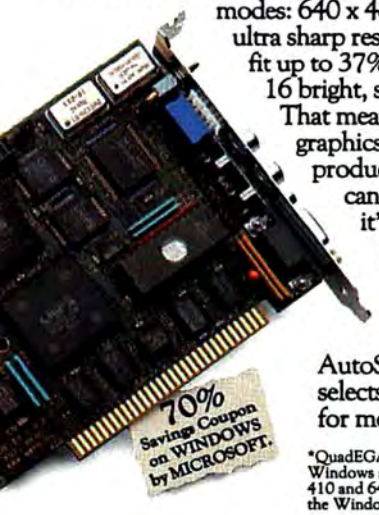



*With a standard EGA*

*With QuadEGA ProSync*

## QuadEGA ProSync™

QuadEGA ProSync takes full advantage of your Multisync monitor by delivering two additional enhanced graphics modes: 640 x 480 and 752 x 410. The ultra sharp resolution lets you comfortably fit up to 37% more data on your screen in 16 bright, solid colors with crisp detail. That means you get more text and more graphics. The end result is increased productivity. Because, not only can you work with more data, it's easier to read, too.

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It's easy to run your favorite programs with QuadEGA ProSync. Our AutoSelect feature automatically selects the correct display mode for most software.

*QuadEGA ProSync includes drivers to run Microsoft Windows and software that runs under Windows in 752 x 410 and 640 x 480 modes, and a coupon good for 70% off the Windows package.

Together with your Multisync, QuadEGA ProSync delivers the leading edge technology that lets you make the most of desktop publishing, presentation graphics, and software that works best in the ultra high resolution mode.*

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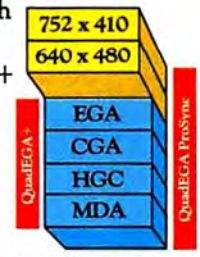


*QuadEGA ProSync delivers a total of six graphics modes!*

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## Hot Charts

*Microsoft Windows* devotees in quest of a charting program that puts that rich environment to productive use can now try ◆***Windows Graph,*** a bit-mapped presentation graphics package from Micrografx.

Micrografx, which ranks among the first vendors to write for *Windows,* cut its teeth in the low-end CAD market, and that experience shows here. *Windows Graph* supports the usual chart types (bar, column, line, pie, scatter, and table) but gives them the extra oomph of 3-D. Charts can be edited and combined, and curves can be smoothed for a more polished look.

The 16,000-cell worksheet component of *Windows Graph* will let you enter and manipulate data. But *Windows Graph* is apt to win friends primarily because of its ability to exploit *Windows'* data linking talents. With its support for *Windows'* dynamic "hot links," *Windows Graph* charts can be redrawn automatically to reflect ruffles in the underlying spreadsheet data. The same goes for real-time data fed to the program through a communications link. Used in conjunction with Lotus Signal, for example, you could watch the pitch and yaw of BankAmerica stock during the trading day. If you need to generate a family of graphs routinely, *Windows Graph* offers the graphics equivalent of *Microsoft Word* style sheets.

*Windows Graph* makes use of the *Windows* Clipboard, a holding tank for graphic images. With the Clipboard, art can be freely swapped between *Windows*-compatible applications, from *PageMaker* to Micrografx's own *Windows Draw* and *In-a-Vision.* To widen that world just a bit further, the company released a clip art collection for its entire product line. *Windows Graph,* at $395, includes a run-time version of *Windows.* Micrografx, 1820 N. Greenville Ave., Richardson, TX 75081; 214/234-1769.

## Blue Minions

Just as groundhogs ritually affirm the continuation of winter, so any personal computer wearing the initials IBM predictably will be embraced and enhanced by enterprising third parties. That's even true of machines as incidental as the XT-286.

Out early for the XT-286 is Computer Peripherals with its ◆**Overachiever Plus.** The all-everything board delivers 1.5MB of EMS RAM (expandable to 3MB with a daughterboard), two

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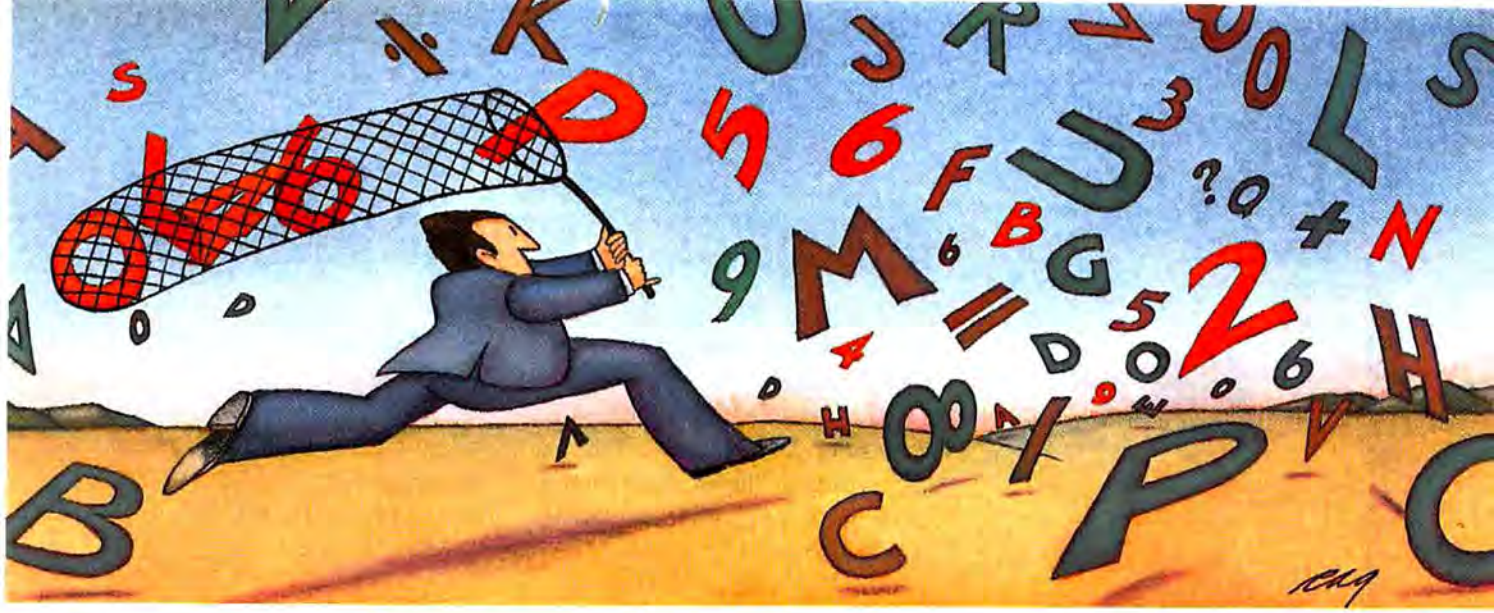


# PROBLEM: The more experience your hard disk has, the harder it has to work.

# THE SOFTLOGIC SOLUTION: Disk Optimizer™

NOW FASTER, MORE POWERFUL AND NOT COPY PROTECTED!

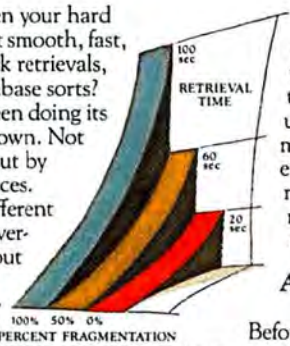
**Your hard disk will run faster when it's not chasing around after files.**

Remember the old days when your hard drive was new? Remember that smooth, fast, slick performance? Those quick retrievals, rapid saves, lightning-like database sorts?

Well ever since, DOS has been doing its best to slow your hard drive down. Not by slowing down the motor, but by breaking your files up into pieces. Storing different chunks in different places. Data files, programs, overlays and batches that started out in one seamless piece are now scattered all over.

Loading is slower. Sorting is slower. Retrieving, backing-up. Everything takes longer because your disk has to work harder.

Problem is, it's something that happens so gradually you may not notice the difference. At least, not until you see the dramatic improvement after using Disk Optimizer.



The more fragmented your files get, the longer they take to retrieve.

**File fragmentation—It's a problem you can see.**

Watch your hard drive the next time it reads or writes a file. Each "blip" of the LED means the drive-head is moving to another place on the disk—either to pick up or lay down another chunk of data.

And the truth is, head movement takes time. Far more time than actual reading and writing. What's worse, all this head movement causes extra wear and tear that can shorten the life of your drive.

**Disk Optimizer—Tunes up your disk by cleaning up your files.**

Disk Optimizer works by finding all the scattered pieces of your files and putting them back together where they belong. Next time your drive reads it, there's just one place to look.

And the results are often dramatic. Reading and writing times may be cut by as much as two thirds. Database sorts that used to take hundreds of head moves now proceed quickly and efficiently. And since head movement is now at an absolute minimum, your disk drive will lead a longer, more productive life.

**Analyze, scrutinize, optimize.**

Before you optimize, you'll probably want to analyze. So Disk Optimizer shows you, in percentages, how much fragmentation has taken place—on the entire disk, in individual directories, or for groups of files you specify using global or wildcard names.

Plus, there's built-in data security that lets you assign passwords to as many files or file groups as you want.

And the File Peeker gives you an inside look at the structure of files. It's a great way for non-programmers to learn more about computers, and a powerful tool for professionals who want to analyze the contents of their disks.

**Get your hard disk back in shape—with new improved Version 2.0**

Hard to believe, but new Disk Optimizer Version 2.0 is even better than before. Not only will it optimize your disks in far less time than it used to, but it actually speeds up retrievals even more by letting you give priority treatment to your most used files, like programs and batches.

When you think about it, it's simple. The longer you own your hard drive, the more you come to depend on it. But the longer you wait to get Disk Optimizer, the less performance you'll get.

Use it just once and discover what thousands of satisfied PC users already know—$59.95* is a small price to pay to restore the speed and performance you count on.

See Disk Optimizer at better computer dealers everywhere, or order today by calling SoftLogic Solutions at 800-272-9900 (603-627-9900 in NH). Or mail the coupon below.

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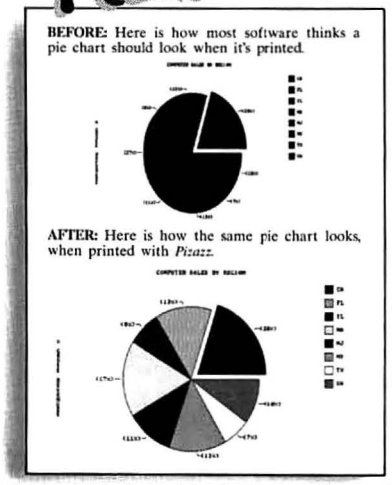


If your printed graphics look more like mud pies than pie charts, you need Pizazz.

**See What Your Printer's Been Missing**

**Pizazz takes your ideas from screen to paper.** EGA, CGA or whatever popular graphics adapter you have, Pizazz lets you print what is displayed on your screen any way you like. Most of all, Pizazz gives you what most current software doesn't—a truly easy way (only three simple keys, honest!) to effectively print color or monochrome screen images, graphics and/or text.

**What you get is what you see and more.** You've spent a lot of time getting the information on your screen just the way you want. Since Pizazz is memory resident, simply type the PrtSc key and the Pizazz Main Menu pops onto your screen. The menu is incredible—rotate, window, enlarge, reduce, position, smooth jagged edges! Pizazz lets you print more than 200 color tones, or if you have a black and white printer, 30 grey tones/patterns. When you've finished, Pizazz returns you to the exact spot from where it was called.

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serial ports, a parallel port, a clock/calendar, and a game port, plus print spooler and disk cache software—and a desktop organizer called *Flip-Up*. Pick your slot: The Overachiever Plus is available with either an 8- or a 16-bit connector. And on-board RAM can handle both the AT's one-wait state and the XT-286's zero-wait configurations; $545 with 128K. Computer Peripherals, 2635 Lavery Ct. #5, Newbury Park, CA 91320; 800/854-7600.

IDEAssociates is prepared to load up the XT-286 with all the memory the processor can address. Its ◆**All Aboard 286**—which the company dubs a "multi-multifunction-board"—contains up to 4MB of EMS RAM and (with 1M-bit chips) 16MB of extended memory. The All Aboard is a graphics triple threat, sporting EGA, Color/Graphics, and Monochrome Display capabilities. The board also includes serial and parallel ports; $995 with 128K. IDEAssociates, 29 Dunham Rd., Billerica, MA 01821; 617/663-6878.

But it's CMS, the storage subsystem manufacturer, that has gone straight to the heart of the matter—the XT-286's sleepy hard disk. The firm's $1595 ◆**K-Kit 60**, a 60MB drive, features a swift 28ms average access time, which should be sufficient to neutralize complaints that the XT-286 is useless in networked settings. CMS has also introduced a pair of external 20MB and 60MB tape backup units for the XT-286; both work equally well with Compaq's Deskpro 386. The $995 T-120 and $1595 T-160 models rely on ¼-inch tape and support streaming, file-by-file, or random access modes. CMS, 3080-A Airway, Costa Mesa, CA 92626; 714/549-9111.

## The Wonder of It All

The scourge of those who desire the EGA's florid graphics and crisp text has been the need to acquire a better (read: more costly) monitor.

Array Technologies Incorporated (ATI), a Canadian firm that raised eyebrows with Graphics Solution (see *From the Hardware Shelf, PCW,* November 1986), is back with ◆**EGA Wonder**—and seems to have the monitor problem licked. The $399 board displays enhanced graphics on any IBM-compatible monitor, a trick ATI achieved by adding a single proprietary VLSI chip to the popular Chips and Technologies EGA chipset.

With EGA Wonder, CGA monitors can display EGA-quality text and draw upon the EGA's full palette of 64 colors. Monochrome monitors simply treat those colors as shades. EGA attributes are similarly accessible to composite monitors and the internal monitor of

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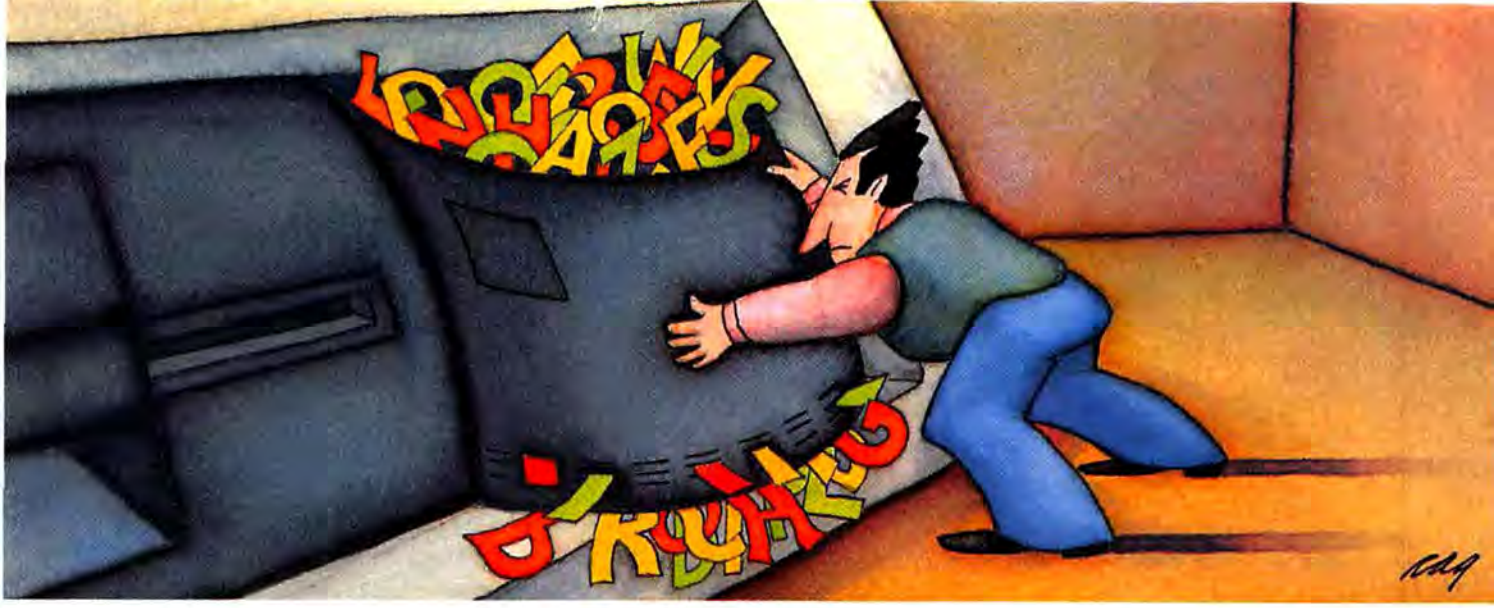


# PROBLEM: Handling your need for more megabytes, without spending megabucks on a new drive.

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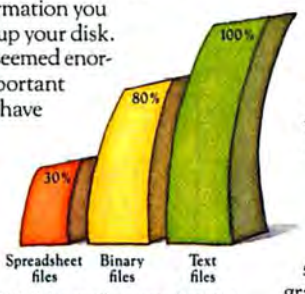
# THE SOFTLOGIC SOLUTION: Cubit™

**Now get up to twice the capacity from all your storage media.**

You know what happens. The more you use your computer, the more information you create. And the faster you fill up your disk.

The 10MB drive that once seemed enormous is now jammed with important files. That 20MB that should have lasted years is crowded in a matter of months.

Of course you could keep buying bigger hard drives. Or you could get Cubit and get the maximum storage space from the drives you already have.




With Cubit, you'll get as much as 100% compression on data files, effectively doubling the storage capacity of all your magnetic media.

**What is Cubit?**

In brief, Cubit is an advanced software tool that automatically reduces the number of bytes required to store a file, then converts the file back to its original size when retrieved. Some programmers call this effect "data compression," others, "disk expansion." Either way, the result is the same.

Here's how it works. When Cubit compresses a file, it first compares each word to its massive English word dictionary. Words that match are reduced to a predetermined code of just one, two or three bytes each. It then saves the abbreviated version to disk. Decompression works just the opposite.

To accommodate other words and symbols, Cubit uses two more compression techniques. One assigns new, shorter codes to unusual words. Another compresses according to the frequency of character strings in non-text data. So no matter what kind of files you create, Cubit ensures maximum space savings.

Best of all, you'll be using the same fast, reliable data compression techniques used on mainframe computers for decades.

**How much disk space will you save?**

Because the vast majority of data created on PC's is standard ASCII text—letters, numbers and other English language symbols—we've optimized Cubit for word processing and database files. With these, you'll get a minimum of 50% expansion on up to a full 100% or more.

At the same time, you can expect a significant 30% to 50% improvement with other kinds of data. Including spreadsheet files, program code, graph and image files, even binary data.

And Cubit works just as well with floppies and tape cassettes as it does with hard disk drives.

**Run Cubit where you want, when you want.**

Maybe you'll want to use Cubit for all your files, or maybe just some. So Cubit lets you specify exactly which files to work on and which ones to leave alone.

In RAM resident mode, Cubit works quickly and invisibly, compressing and decompressing right from within any program you run. Or use Cubit's powerful file management mode. It supports wild-card and global file names, and addresses sub-directories up to thirty levels deep.

**Save time and money, as well as disk space.**

A compressed file is a smaller file. So with Cubit, back-ups take less time, as well as less space. And communicating compressed files means significant savings on phone line charges.

Any way you look at it, Cubit will pay for itself in no time.

**So why buy a bigger drive when you can have smaller files?**

Cubit is already saving time, trouble and money for thousands of PC users nationwide – by giving them up to twice the storage capacity from all their magnetic media. And all for just $49.95* – a mere fraction of the cost and bother that come with a bigger hard drive.

Look for Cubit at better computer dealers everywhere. Or order from SoftLogic Solutions by calling 800-272-9900 (603-627-9900 in NH). Or mail the coupon below.

## Cubit™ $49.95*

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*Paul Mace Software Inc., 123 N. First St., Ashland, OR 97520*

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NOW includes **GRAFPLUS™**, a memory resident utility to produce presentation quality graphics "screen-dumps" from all popular programs. Quickgraphics screen shots from **LOTUS 1-2-3!**

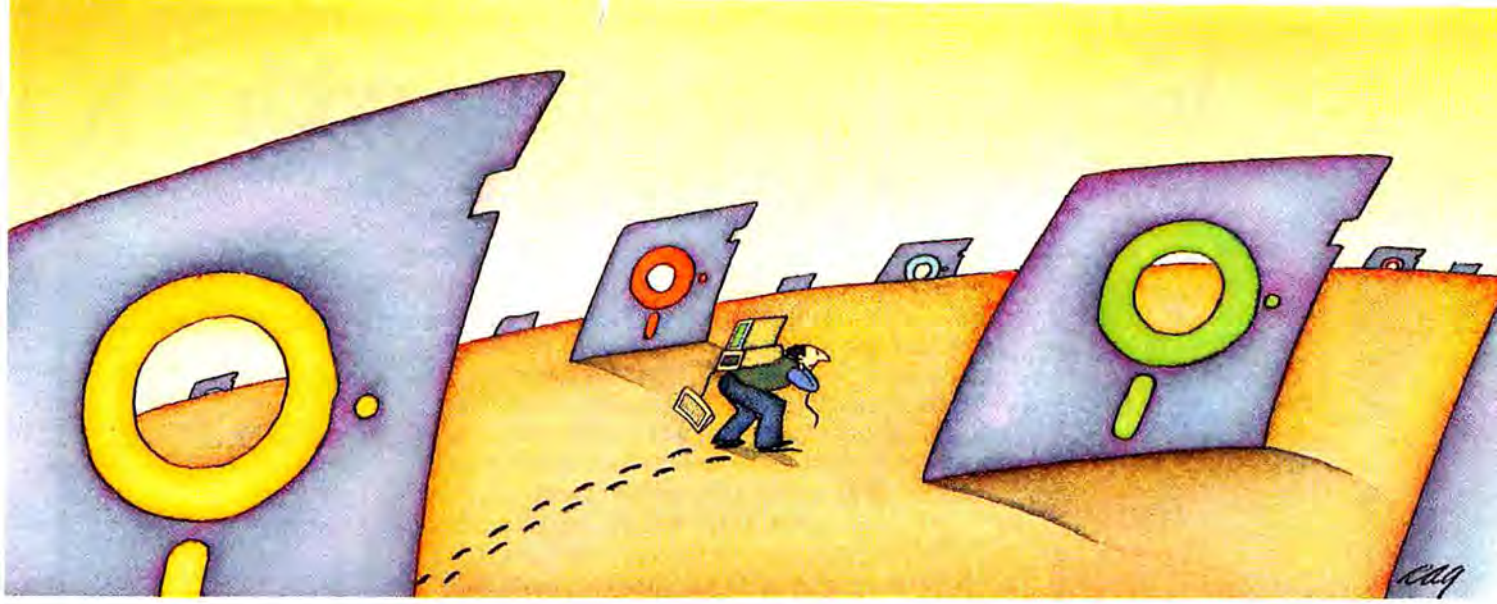
**Circle 497 on reader service card**

the PC Portable. The board even enables Hercules-compatible software to run on an RGB or composite monitor. Best of all, mode switching is completely automatic (that is, switchless and therefore painless). Array Technologies, 450 Esna Park Dr., Markham, Ontario, L3R 1H5, Canada; 416/477-8804.

## Briefly Noted

*R:base* users who've schlepped data to various presentation graphics products can now keep it all in the family with ***R:base Graphics,*** Microrim's latest expansion of its point-and-shoot Express interface technology. Thanks to a technique Microrim calls "data collapsing," *R:base Graphics* can distill an avalanche of values to their manageable–and pictorial–essence. Data can be displayed according to any of eight basic chart types, and manipulated by more than 40 financial and mathematical functions. The *R:base* FileGateway utility accepts data from *1-2-3, dBASE,* SYLK, DIF, and ASCII formats; $295. Microrim, 3925 159th Ave. NE, Redmond, WA 98073-9722; 206/885-2000.

*(continues)*



# PROBLEM: There's just no easy way to move from one software program to another.

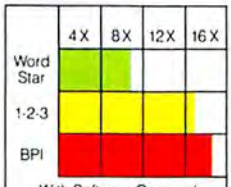
NOW FASTER, AND NOT COPY PROTECTED!

# THE SOFTLOGIC SOLUTION: Software Carousel

### Now you can keep up to 10 programs loaded and ready to run.

Hard to believe, but some people are happy with just one kind of PC software. Well, this is not a product for them.

But if you're someone who depends on many packages, all the time—someone who'd use several programs at once if you could, well now you can. With Software Carousel.




With Software Carousel running in RAM, you can load a program and retrieve a file up to 15 times faster. Test conducted on an IBM XT

### Why call it "Software Carousel"?

In some ways, Software Carousel works like the slide projector you're used to. You load a handful of pictures, view one at a time, then quickly switch to another. A simple idea, with powerful possibilities for computing.

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

Need to crunch numbers? Switch to your spreadsheet. Need your word processor? Don't bother saving your spreadsheet file. Just whip over to your document and do your work. Snap back to your spreadsheet, and it's just like you left it.

With up to ten different programs at your fingertips, you'll have instant access to your database, communications, spelling checker, spreadsheet, word processor, RAM resident utilities, languages, anything you like.

### Reach deep into expanded memory.

This could be the best reason ever for owning an expanded memory card, like the Intel Above Board, AST RAMpage, or any card compatible with the L/I/M Extended Memory Standard.

Software Carousel puts programs into this "high-end" memory for temporary storage when they're not in use. And switches them back out when you want them. It's fast, efficient, and easy.

If you want, Software Carousel will even use your hard drive for swapping. Just allocate a portion for storage, and go to work.

### Sidekick, Superkey and Ready. All at the same time.

You know what happens if you try loading two or more RAM resident utilities at once. You get crashed keyboards, frozen screens, all kinds of interference between programs fighting for control.

With Software Carousel, you can have as many accessories and utilities on-tap as you want. Just load different ones in different Carousel partitions. Since they can't see each other, they can't fight.

### The easy way to maximize PC power.

With all this power, you might think Software Carousel is complicated and difficult to use. Not so. Particularly when you compare it to other programs like Windows and TopView.

Set it up once and Software Carousel remembers forever. Better still, Carousel will often look for the programs you use most and optimize them for the quickest access.

And when you use Software Carousel with our newest product, Shear Power, you'll have at your command the most powerful integrated software environment available on PC's today.

The way we see it, there are certain things you have a right to expect from your computer. Access to your software is one of them. At just $59.95* a copy, Software Carousel is the best way to get it.

See Software Carousel at better computer dealers everywhere. Or order today by calling 800-272-9900 (603-627-9900 in NH), or mail the coupon below.

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*Speed* Our printers operate at time saving draft speeds up to 300 characters per second (cps). And give the look of typewritten text with true letter quality up to 100 cps.

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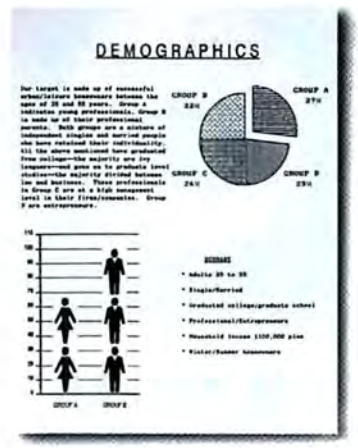
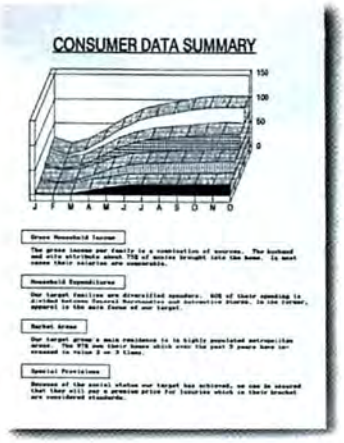
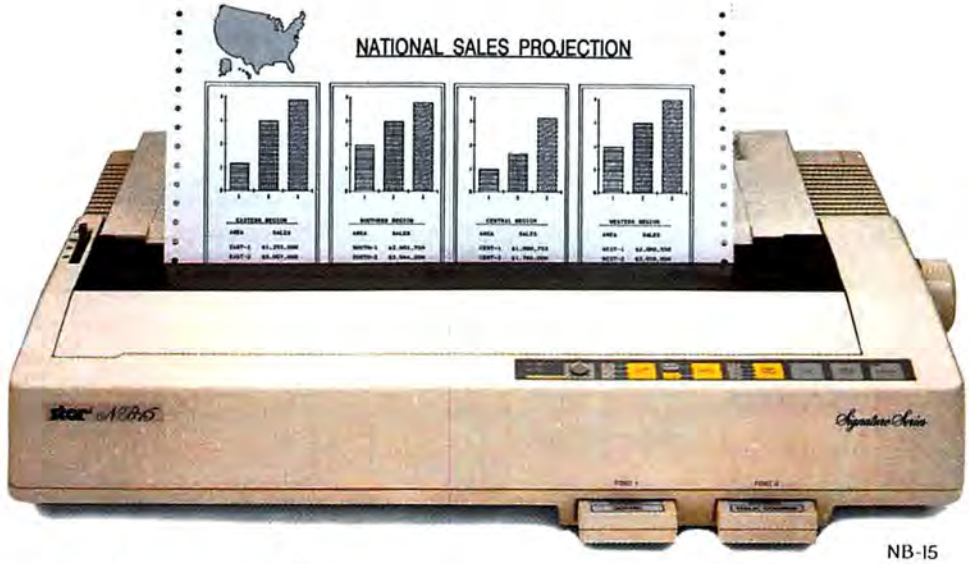
NB24-15

For more information on how a new Signature can improve your image, **call 1-800-447-4700.**






NB-15

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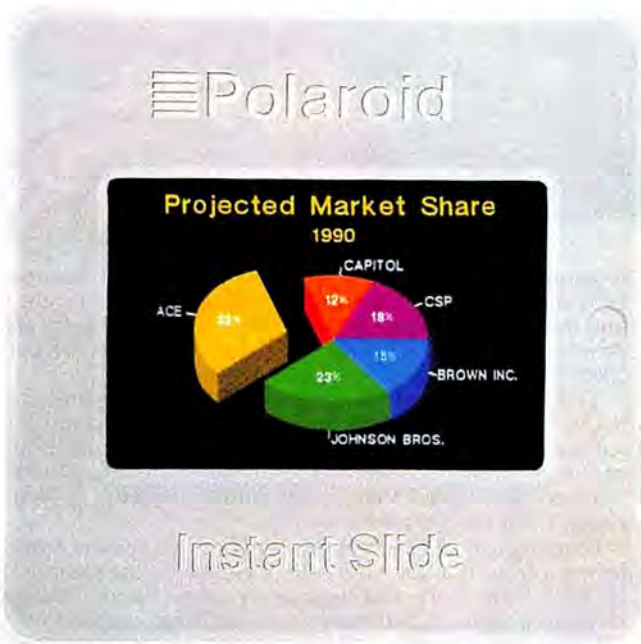
Circle 319 on reader service card

# In house.




This slide was made in house in under an hour for under $1.00.

# Poor house.

This slide was made by an outside service in over 24 hours for over $20.00.

## Presentations are on time, on budget with the Polaroid Palette.

Sending out for slides is expensive. And if you need them in a hurry, the prices can go through the roof.

But now you can change the whole picture with a brilliant solution from Polaroid.

It's called the Palette Computer Image Recorder, and it's a cost-effective way to produce color 35mm slides, as well as overheads and prints. In house. In minutes. For as little as 60¢ per slide.

Just hook it up to a compatible personal computer, and in minutes you can create colorful presentation materials. The Palette system includes a computer image recorder, the Polaroid 35mm Instant Slide System, as well as 35mm and instant print camera backs. All for just $1,999.*

What's more, Palette, as its name suggests, allows you to "paint" your PC images almost any color you want. Even if you don't have a color monitor. Imagine what that can do for your presentations.

## And now try Palette for 21 days, satisfaction guaranteed.

For a limited time, you can try Palette for 21 days, and if you're not completely satisfied, we'll refund your money in full. And, since Palette works with so many popular graphics packages, we're offering some of them – Microsoft® Chart,™ LCS/Telegraphics TelePaint,™ and BPS® 35mm Express™ – at a 20% discount – with the same 21 day satisfaction guarantee.

So don't let your next presentation drag you off to the poor house. Stay in house with Palette instead.

For the name of the participating Polaroid Palette dealer nearest you call toll free **800-225-1618**, 9 a.m. to 6 p.m. Eastern Time.

**Polaroid**

For more information, mail this coupon to Polaroid Corporation, Dept. 661, P.O. Box 5011, Clifton, NJ 07015.

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Circle 241 on reader service card

# MAKE YOUR IBM PC FASTER THAN AN AT.

## IN JUST 5 MINUTES!

# $395

**INTRODUCTORY OFFER**

## DON'T TAKE OUR WORD FOR IT. USE IT FOR 60 DAYS. IF YOU ARE NOT TOTALLY SATISFIED RETURN IT FOR A FULL REFUND.

It sounds great; the idea of a speedup board that you can just plug right in as easily as putting bread in a toaster. How wonderful to be able to convert a PC or XT to a $4000 AT without the expense. But even when you get ready to spend $395.00 you want to be sure your choice is the very best.

Here at PCSG we sell our IBM PC disk access speedup software by the thousands. But software doesn't do anything about speeding up the microprocessor (or CPU) speed. As you know the microprocessor is the brain of the computer that controls all the operations like screen updates and calculations like a spreadsheet makes.

### *Faster and smarter than an AT – PCSG guarantees it.*

We wanted to offer a speedup card that would be the compliment to our disk speedup software, (incidentally included at no extra charge.) We wanted it to be literally the most advanced, fastest, most feature rich board available today. We could only be satisfied with a board that was the finest example of the engineering art.

There is no question we have met our every objective by developing and manufacturing the *BREAKTHRU 286* card. This is the best designed and most functional speed up card available today. We guarantee it.

**HERE IS WHAT MAKES IT SO SPECIAL.**

**First, it installs so easily.** It is a half slot card, only five inches in length. You don't even have to give up a full slot. What's more, unlike competing products it works in the Compaq and most clones. The instructions are so simple we considered showing a picture of a child putting it in. Easy diagrams show how you just place the card in an open slot, remove the original processor and connect a single cable. There is no software required. From that moment you are running faster than an AT.

**Second, it is advanced.** The *BREAKTHRU 286* replaces the CPU of the PC or XT with an 80286 microprocessor that is faster than the one found in the AT. A 16K cache memory provides zero-wait-access to the most recently used code and data. In benchmark tests the card accelerated software programs—both custom and off-the-shelf anywhere from 200% to as much as 700%. Wow!

**Third, you have full compatibility.** All existing system RAM, hardware, and peripheral cards can be used without software modification. It operates with LAN and mainframe communication products and conforms to the Lotus/Intel/Microsoft Expanded Memory Specification (EMS). Software compatibility is virtually universal.

**Fourth, it is the best there is.** There are several other boards on the market. Some are priced about the same as the *BREAKTHRU 286* and some are cheaper. We at PCSG have compared them all, but there simply was no comparison. What we discovered is that many cards being sold offer only a marginal speed up in spite of their claims. We found some to be merely versions of the obsolete 8088 or 8086, and others to be just poorly engineered. The 8MHz *BREAKTHRU 286* is unequivocally the best executed and most completely reliable speedup board manufactured today.

PCSG has since early 1983 dominated the lap portable market with ROM software such a Lucid spreadsheet and Write ROM that reviewers rated as excellent. We were proud to successfully enter the IBM PC market last year with disk access speedup software. Now we are so pleased with the *BREAKTHRU* speedup card. We use them on our own PC's to make them faster than AT's. We are really excited about this product.

PCSG makes the unabashed statement that the *BREAKTHRU 286* card represents more advanced technology than boards by Orchid, Quadram, Victor, Mountain, P.C. Technologies, Phoenix . . . we could go on.

But an ad can't let you experience it for yourself. That's why we sell the *BREAKTHRU 286* on a 60 day trial. If you aren't completely satisfied return it within 60 days for a full refund. It is priced at $395. Call today with your MasterCard, Visa, American Express or COD instructions and we will ship your card the very next day.

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**Circle 604 on reader service card**

◆◆◆◆◆

Project management teams in need of more than a single project manager may like what they find in Microsoft's latest revamp of ***Microsoft Project.*** Users can now feed *Project* data to *Primavera Project Planner,* long regarded as a heavyweight at handling multiple projects. In addition, *Primavision,* a presentation graphics offering from Primavera Systems, can now create PERT and Gantt charts from *Microsoft Project* data. *Project* also works on a series of local area networks, among them Ungermann-Bass Net/One, Novell Netware, 3Com EtherSeries, and IBM's PC Network. Microsoft Corp., 16011 N.E. 36th Way, Redmond, WA 98073-9717; 206/882-8080.

◆◆◆◆◆

Micro managers who've taken a shine to developing turnkey systems for their offices might find that task a good bit more civilized with ***Polaris Rescue,*** a $149 RAM-resident utility from Polaris Software. *Rescue,* at a compact 33K, permits development and display of application-specific online help screens. Each *Rescue* file supports up to 1000 connected screens and 30 links per screen. The links and screens themselves are created with a separate full-screen editor that makes use of the

*(continues)*


# Sudden AT™ Death. What Would You Do?

***You turn on your AT™ computer and suddenly it starts to happen. Your computer starts gasping for information because your AT battery is dying. The simplest data, like the time and date, becomes a struggle. All vital signs start fading from the screen. Without action, the victim will soon lapse into unconsciousness.***

## What would you do?

Until recently you would have been powerless to save your AT computer.
Replacement batteries were not readily available. All you could do was stand by helplessly as your computer's life source drained away.
But now, with the help of IBC, you can resurrect your AT, by using IBC's simple method of CPR– Computer Resuscitation. Just plug in one of IBC's new Tadiran high-energy lithium batteries, and your AT will have a new lease on life.

The Tadiran Replacement Battery from IBC saves you from an inevitable crisis. Every one of the million ATs, compatibles and clones in use today will face this emergency in the coming months. It could happen a few weeks from now, or maybe in a year. The lifespan of currently installed batteries varies from one month to 3 years.

Don't let time run out on your computer. Protect against down time!

Buy an IBC battery now, so you always have a back-up.

**IBC Battery Features:**
- Meets or exceeds all manufacturer's specifications
- Warranted for in-use life of 3 years
- 10-year shelf-life
- For IBM/AT, Compaq 286 series, and all other AT compatibles and clones
- Easy to install

If your computer should exhibit the following warning signs, you must take action immediately!

IBM/AT is a registered trademark of International Business Machines.
Compaq 286 is a registered trademark of Compaq Corporation.

**Circle 756 on reader service card**

## WARNING SIGNS

- Clock calendar function fades and disappears
- Configuration files vanish

**Steps to Take In Case of Sudden AT Death**
- Do not panic
- Do not move injured computer
- No need to call repairman
- No need to call manufacturer

***Just call IBC, and you will get immediate shipment of your new Tadiran AT replacement battery. The life you save will be your computer's.***

Corporate quantity discount available.

INSURANCE AGAINST AT COMPUTER FAILURE.

**Don't delay. Order today.**

Please send me an IBC AT Battery for $27.50
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*640K, 1 Floppy, 20MB, AT Style KBD, One Year Warranty, FCC Approved* . . . . . **$895**

### 30MB Turbo System
(4.88/8MHz XT Compatible)
*640K, 1 Floppy, 30MB, AT Style KBD, One Year Warranty, FCC Approved* . . . . . **$955**

## MULTITECH 900 10/6 MHz $1500

Compatible Computer

- *10 or 6 MHz*
- *1.2 MB Floppy*
- *Ketboard*
- *MS DOS 3.1*
- *5 Half-Height internal Drive slots*
- *One Year Warranty*
- *Serviced Nationwide by TRW*
- *512K on motherboard expandable to 1 MB*

**Multitech Options**

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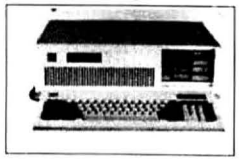
|---|---|
| *Softwhite monitor and monochrome graphics card* | $219 |
| *Color monitor and color graphic card* | $359 |
| *EGA monitor and EGA card* | $659 |
| *Multitech multifunction plus EMS, O to 1.5 MB* | $219 |
| *Daughterboard to expand to 3 MB* | $128 |

## HARDWARE

### Desktop Computer



| | |
|---|---|
| IBM PC AT 512K | 2495 |
| Compaq Deskpro 386 | 4995 |
| IBM PC XT 640K 1 Floppy | 1689 |
| IBM PC 256K | 1089 |

### Lap-Size Computer

| | |
|---|---|
| **NEC Multispeed (4.77/9.54 MHz)** | 1595 |
| Toshiba T1100 + | CALL |
| Toshiba T3100 | CALL |

### Floppy Disk Drive

| | |
|---|---|
| Fujitsu 360K | 85 |
| Teac 55BV 360K | 99 |
| Teac FG 1.2MB | 149 |
| Toshiba 360K | 99 |
| Toshiba 3 1/2" 720K | 139 |
| Toshiba 1.2 | 149 |

### Hard Disk Drive

| | |
|---|---|
| **Seagate ST225, 20MB Kit** | 379 |
| **Seagate ST238, 30MB Kit** | 479 |
| **Seagate ST4026, 20MB** | 529 |
| **Seagate ST4038, 30MB** | 629 |
| **Rodime 203E, 30 MB** | 498 |
| **Seagate ST4051, 40 MB** | 729 |
| **CDC 9415-86, 80MB** | 1295 |
| Western Digital 1002 | 125 |
| Western Digital WA2 | 239 |
| Western Digital WAH | 189 |
| Disk Manager Software | 99 |

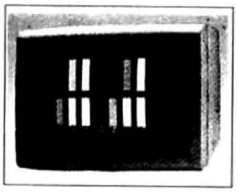
### Alternative Mass Storage

| | |
|---|---|
| **Everex Stream 60 ext** | 819 |
| Archive 60 internal | 695 |
| Irwin 10MB internal | 389 |

### Diskettes and Tapes

| | |
|---|---|
| 3M DC-600A cartridge | 26 |
| 3M DC-1000 cartridge | 19 |
| Bernoulli 20MB cartridge | 72 |
| Maxell MD2-DM 10 disks | 19 |
| Maxell MD2-HD 10 disks | 35 |

### Color Monitor



| | |
|---|---|
| **Princeton SR-14 770 × 400** | 495 |
| **Thompson color RGB** | 269 |
| Taxan 630 | 450 |
| Taxan 640 | 515 |

### EGA Color Monitor

| | |
|---|---|
| **NEC Multisync** | 569 |
| Princeton HX-12 E | 539 |
| Multitech EGA | 419 |
| Sony Multisync | 599 |

### Monochrome Monitor

| | |
|---|---|
| **Samsung amber/green/TTL** | 85 |
| Amdex 310A TTL amber | 159 |
| Princeton MAX 12 amber | 155 |
| Multitech soft white TTL | 119 |

### Printer–Dot Matrix Near Letter Quality

| | |
|---|---|
| Epson LQ-1000 | 830 |
| IBM Proprinter | 415 |
| IBM Proprinter XL | 629 |
| **Citizen 120D 120 CPS** | 190 |
| Citizen MSP 10 160 CPS | 307 |
| Citizen MSP 15 160 CPS | 414 |
| Okidata 182 120 CPS | 249 |
| Panasonic KXP 1091 120 | 270 |
| Panasonic KXP 1092 180 | 348 |
| NEC P5 290 CPS | 1053 |
| NEC P5 XL 290 CPS | 1192 |
| NEC P6 216 CPS | 475 |
| NEC P7 216 CPS | 665 |
| **Toshiba P-321 216 CPS** | 442 |
| **Toshiba P-341 216 CPS** | 699 |
| **Toshiba P-351 288 CPS** | 949 |
| **Toshiba P-351 288 CPS** | 1135 |

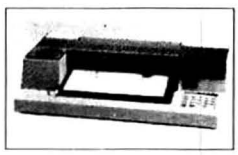
### Printer–Letter Quality

| | |
|---|---|
| Citizen Premier 35 CPS | 517 |
| IBM Quietwriter | 1215 |
| Brother M1509 180cps | 399 |

### Printer–Laser

| | |
|---|---|
| H P Laserjet 500 | 3850 |
| H P Laserjet Prof | 2350 |
| H P Laserjet Plus | 3000 |
| Toshiba Laser | call |

### Plotter



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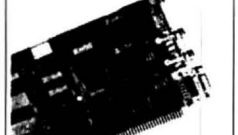
|---|---|
| HP 7475 A Plotter | 1744 |
| Houston Ins. DPM 56 | 5169 |
| Roland 880 8 pen | 966 |

### Input Device

| | |
|---|---|
| Microsoft Mouse | 119 |
| Mouse System Mouse | 139 |
| Logic Mouse | 79 |
| PC Optical Mouse w/Dr. Halo | 135 |

### Graphics Board, Monochrome



| | |
|---|---|
| Hercules Graphics Plus *(New!)* | 194 |
| Everex Edge Mono/RGB/132col | 239 |
| ATI...Mono/color/high/res | 239 |
| Clone monochrome graphic | 95 |
| Persyst Bob/MG mono/RGB | 171 |

### Graphics Board Color

| | |
|---|---|
| Paradise Mod. Graphics | 249 |
| Hercules Color Graphics *(New!)* | 149 |
| Clone Color Graphics | 85 |

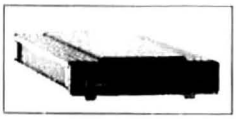
### Graphics Board EGA

| | |
|---|---|
| ATI Wonder | 299 |
| **Paradise EGA/Auto Switch** | 359 |
| Video 7 Deluxe/Auto | 389 |
| Multitech EGA | 239 |
| NEC EGA for Multisync | 499 |

### I/O Board

| | |
|---|---|
| 2 Floppies P/S/C/G/ | 89 |
| AT I/O P/S | 89 |

### Modem



| | |
|---|---|
| **US Robotics Direct 1200** | 139 |
| INCOMM 2400 Baud External | 299 |
| US Robotics 2400 PC INT | 199 |
| Everex Evercom 1200 | 129 |

### Memory Expansion

| | |
|---|---|
| **AST Premium 256K 2 MB SixPakPlus** | 234 |
| **Clone SixPack** | 89 |
| **AST Rampage PC** | 234 |
| **AST Rampage AT** | 445 |
| **Tall Tree J-Ram 3** | 184 |

### Chips

| | |
|---|---|
| 256K 150 Nano | 27 |
| 256K 120 Nano | 29 |
| 64K 150 Nano | 9 |
| 8087 | 119 |
| 8087-2 | 158 |
| 80287-3 | 199 |
| 80287-8 | 299 |

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## SOFTWARE

### Accounting

| | |
|---|---|
| Dac–Easy Accounting | 45 |
| Open System, Account Soft | 399 |

### Data Management

| | |
|---|---|
| dBASE III Plus, Ashton T | 399 |
| R Base 5000, Microrim | 308 |
| Reflex, Borland | 86 |
| Paradox Ansa Software | 442 |

### Desktop Management

| | |
|---|---|
| Sidekick, Borland | 49 |
| The Desk Organizer, Warn | 65 |

### Education

| | |
|---|---|
| Math Blaster | 25 |
| Early Learning Series | 33 |
| Newsroom, Springboard | 30 |

### Games

| | |
|---|---|
| Scenery Disks Western US | 72 |
| Flight Simulator, Microsoft | 32 |
| Jet, SubLogic Communication | 33 |
| Sargon III, Hayden Software | 29 |
| Zork I, II, and III, Inf. | 29 |
| F-15 Strike Eagle MicroPro | 29 |
| Temple Of Apshai Trilogy | 29 |
| World's Greatest Baseball | 25 |

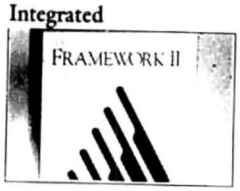
### Graphics–Business

| | |
|---|---|
| Charter-Master, Decision Re | 220 |
| Harvard Presentation Graphics | 299 |

### Graphics–CAD

| | |
|---|---|
| ProDesign II, American | 173 |
| In-a-Vision, Microsoft | 237 |
| Generic CAD, Generic | 99 |

### Integrated



| | |
|---|---|
| Framework II | 399 |
| Math Plan Word Perfect | 112 |
| Symphony, Lotus | 425 |
| 1-2-3, Lotus | 305 |
| Lotus HAL | 112 |

### Investment

| | |
|---|---|
| Andrew Tobias's MECA | 115 |
| Dow Jones Market Manager | 147 |
| Dollars and Sense | 107 |
| Market Analyzer, Dow Jones | 219 |
| Market Manager Plus, Dow Jones | 158 |

### Project Management

Harvard, Software Pub
Microsoft Project
Time Line, Breakthrough

### Tax Planning or Preparation

Tax Preparer, HowardSoft
PC/TaxCut, Best Program

### Training

Teach Yourself dBASE III
PFS: First Choice SP
Webster's New World Writer
Webster's New World Thesaurus
Print Shop Boderbund
Typing Tutor III, Simon & Simon

### Utilities

Norton Utilities, Norton
Carbon Copy, Meridian
PC Tool, Central Pnt
Copy II PC, Central Pnt
1 DIR+, Bourbaki
V Feature, Golden Bow
SQZ! Turner Hall
Fast Back, Fifth Generation
XTree, Executive Systems

### Word Processing

WordPerfect, 4.0
The Library
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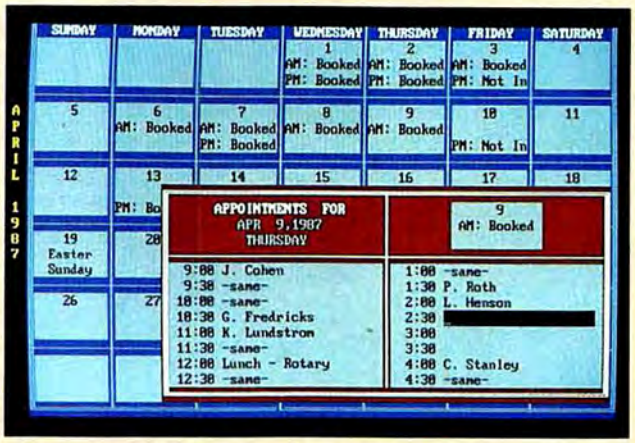
# BOB STANTON HAD A GREAT IDEA. AN HOUR LATER HE WAS TESTING IT.

Appointments. Everybody takes them — dentists, auto-body shops, dance instructors. And lots of computer applications need appointment screens.

Bob thought that a calendar made a terrific graphic metaphor for taking appointments. Simply use the arrow keys to pick an open date, then press the Enter key, and up pops an appointment window.

Lucky for Bob, he's a CLARION programmer, one of a fast growing cadre of super-productive application developers.




With CLARION's Screener utility, he painted a white calendar on a black background. Then he drew a white-on-blue track around the page and between the days. He typed in the days of the week — and *voila!* — a calendar!

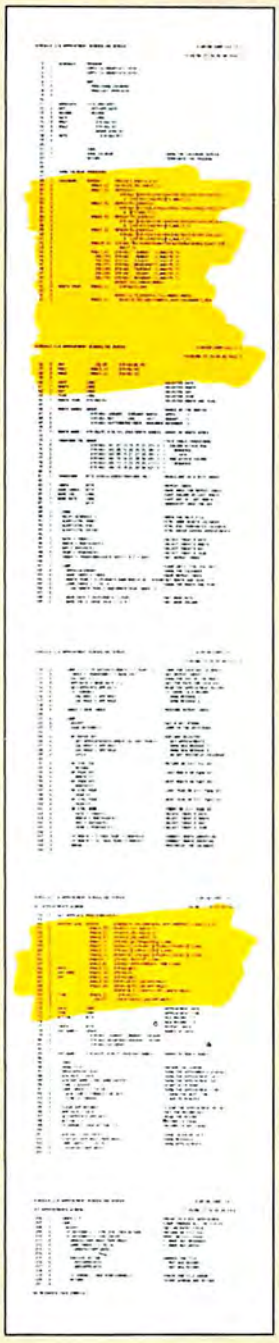
CLARION knows that a PC monitor is refreshed from memory, so it treats a screen layout like a group of variables. Just move data to a screen variable, and it shows up on the monitor.

Bob set up dimensioned screen variables for the days of the month and a screen pointer for selecting a date, and he was done. Then Screener generated the code .

Then Bob drew the appointments window, built an appointment file, filled in the connecting code and tested it — ONE HOUR AFTER HE STARTED!

Testing was a breeze. Screener doesn't just write code, it compiles your source, displays a screen, gets the changes, then replaces the old code in your program.

So here are Bob's appointment screens. You can see the source listing to the right. We marked all the code Screener wrote for him.



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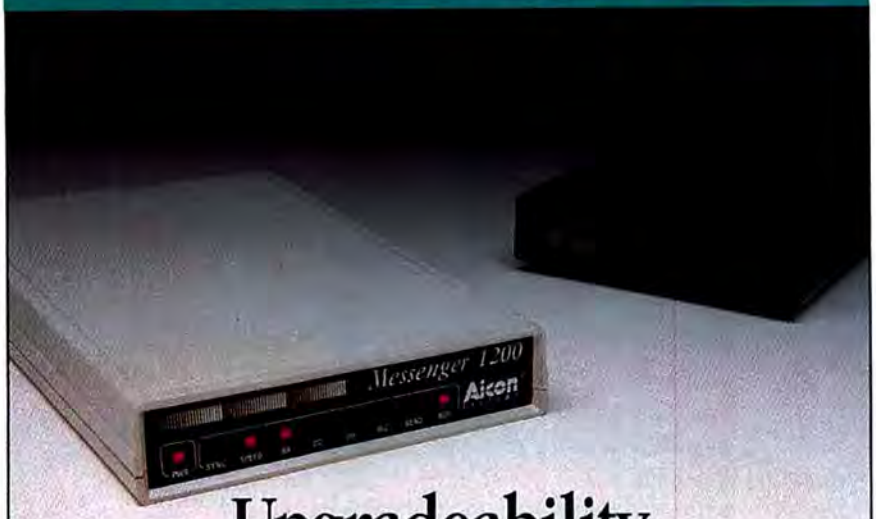


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extended IBM character set. Polaris Software, 613 West Valley Pkwy. #323, Escondido, CA 92025; 619/743-7800.

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◆◆◆◆◆

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*(continues)*

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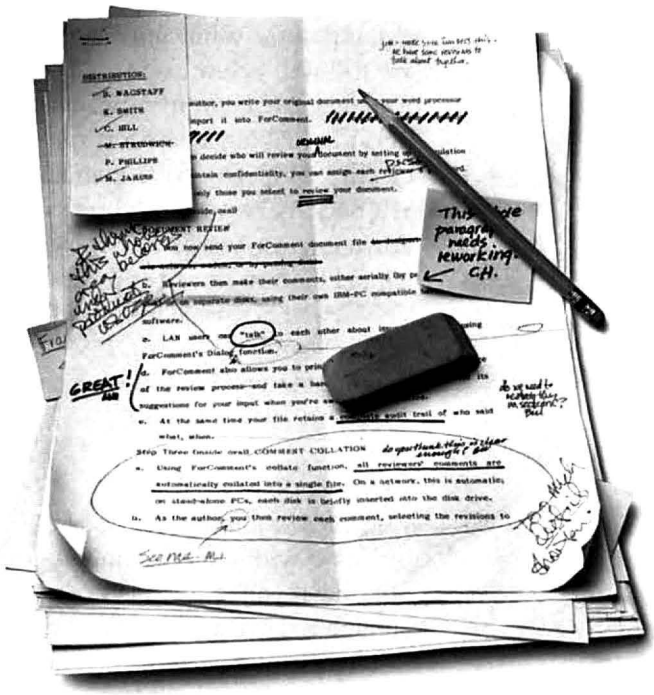

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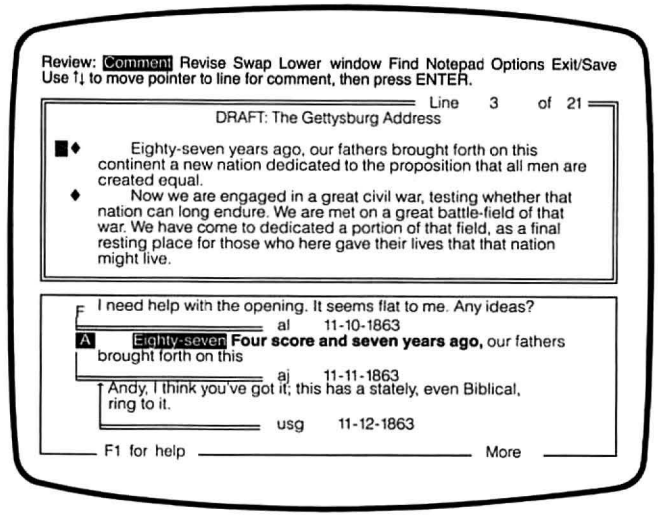


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Esther Dyson, Release 1.0

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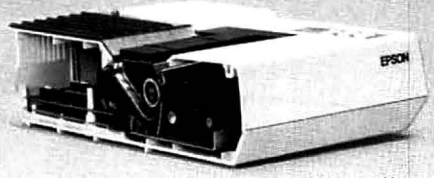

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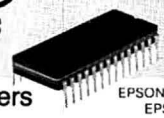

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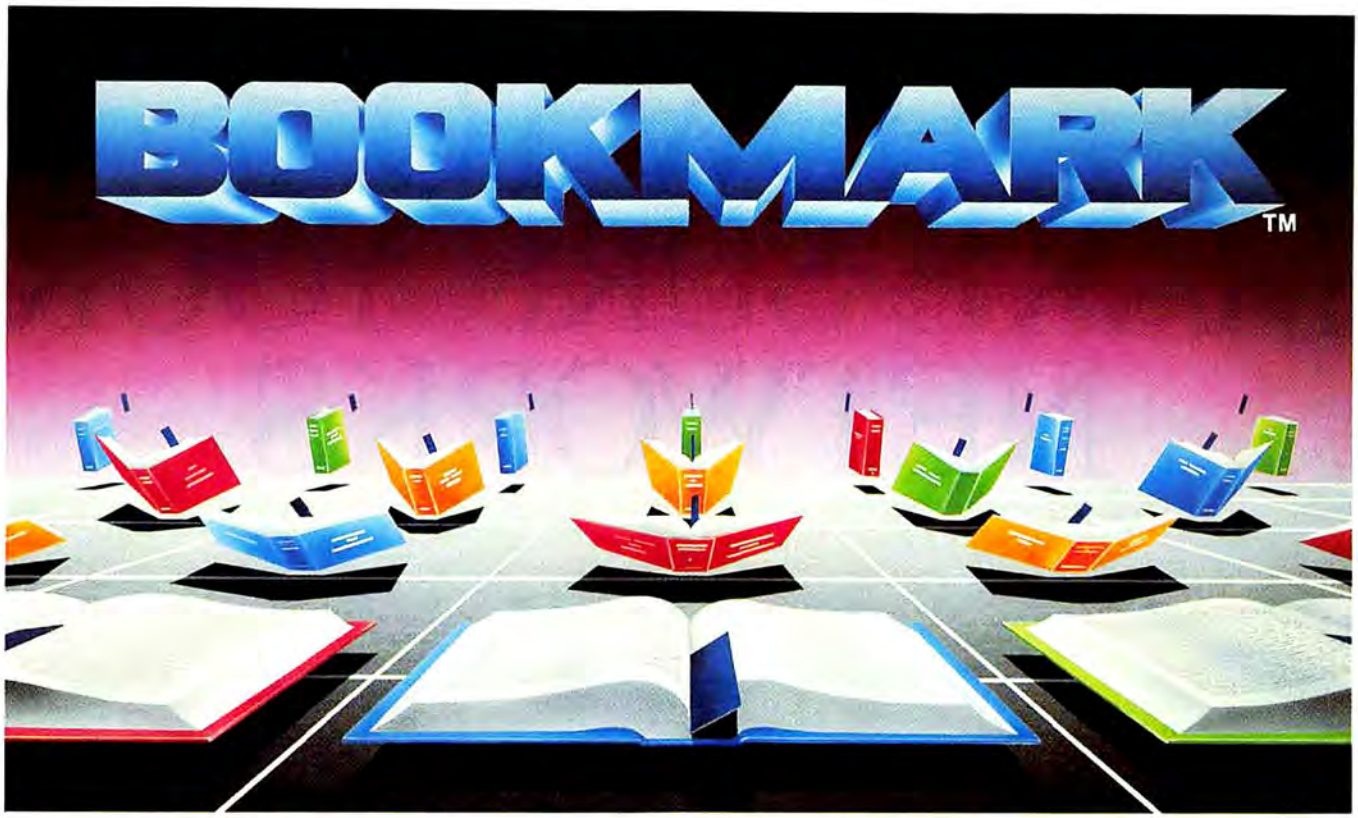


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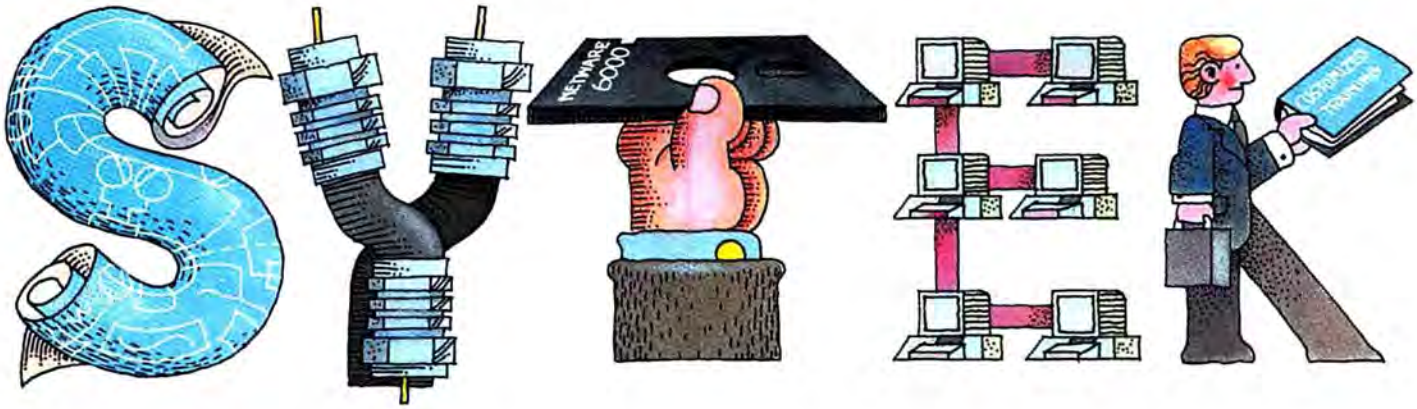


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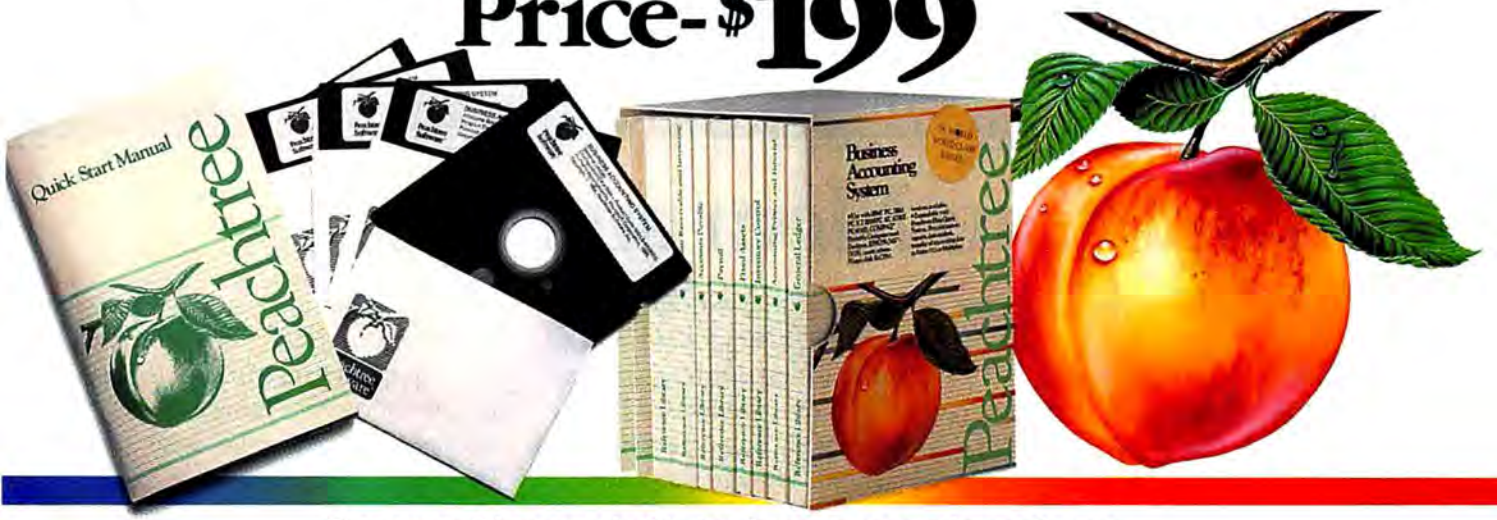


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PC WORLD

# Goodbye to Mom and Pop?

*While chains of serious-minded computer outlets now dot the landscape, there may still be a place for the old-fashioned, informal neighborhood store.*

Remember the mom-and-pop computer store?

When the personal computer industry was in its infancy, almost a decade ago, the computer hobbyists and hackers who made up most of the market bought computers and computer kits from the neighborhood dealer. The dealer then was most likely an enthusiast, eager to chat with customers about programming shortcuts or the best way to plug in an extra 4K of memory.

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

More recently, with the likes of IBM, Apple, Commodore, and Radio Shack establishing a strong retail presence, franchised business-oriented computer stores have taken hold. The Businesslands, ComputerLands, Tandy (Radio Shack) Computer Centers, and Entrés began to squeeze out the small single-owner computer shops.

Businessland, one of the fastest-growing retail stores, opened for business in 1982. "The idea from the beginning was not to sell PCs as consumer items but to sell them to business markets and, specifically, to corporate America accounts," says Enzo Torresi, cofounder and vice president of Businessland. "We were right in forecasting that what was once a tool for the individual, the early adopter, the technical hacker, would become a tool for office automation."

Torresi says that Businessland's strategy truly started to pay off in 1984 when "the consumer market went from declining to disappeared, and the walk-in traffic was at a minimum."

Now a nationwide, 106-store chain, Businessland receives 65 to 75 percent of its revenue from its outbound sales force and the rest from walk-in traffic. That represents quite a change from opening day, when the first Businessland (in San Jose, California) drew more than 3500 curiosity seekers.

Still, while big business buys most of today's PCs, Torresi feels that the neighborhood computer store may return to serve users in the market for add-ons and expansion devices. "If you consider the millions of 8088-based machines installed, there will always be a big aftermarket for upgrades—if they're sensibly priced and extend the life of existing machines," he says.

One neighborhood-style store that has changed its approach dramatically is Radio Shack. In 1978, after selling its initial TRS-80 Model 1 through its Radio Shack stores, Tandy opened its first dedicated computer center, without most of the usual consumer electronics.

"We did it because in the early days we couldn't put all the products in the store, and we wanted

# View

*News and notes for the computing community*

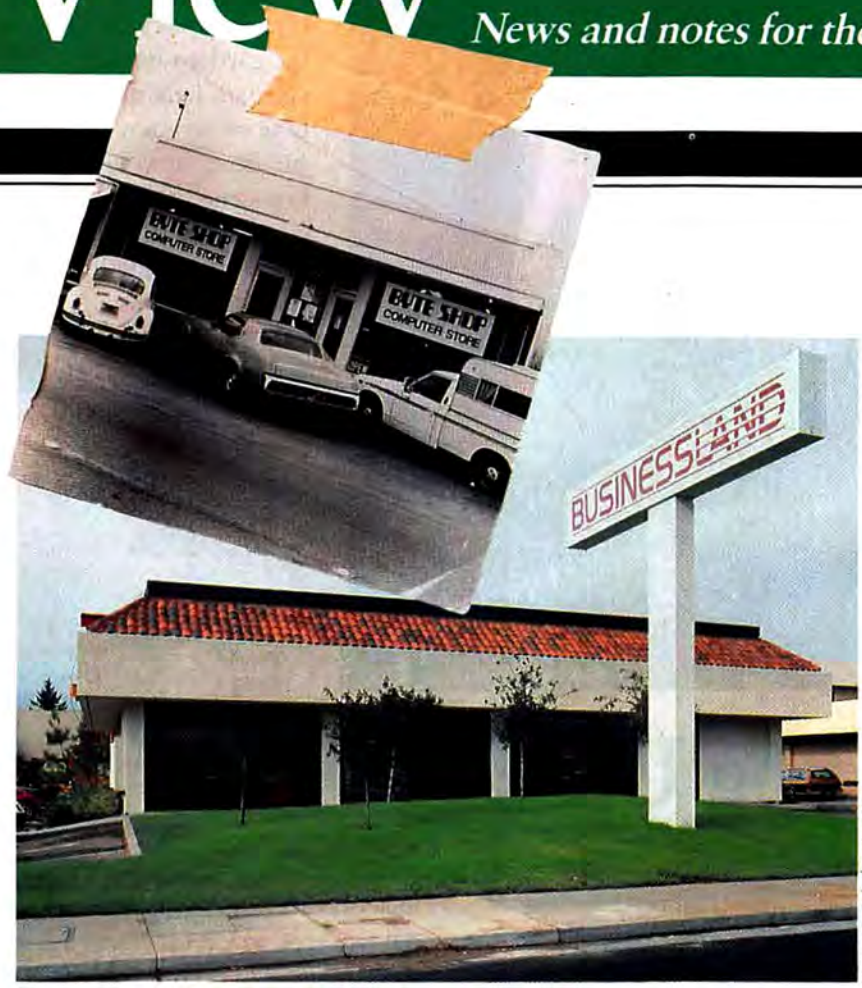



Photo courtesy of Paul Terrell

Photo courtesy of Businessland

expertise in specific locations," recalls Ed Juge, director of market planning for Radio Shack.

Today some 500 Tandy Computer Centers have sprung up nationwide. Run as a separate business-products division within Tandy, the centers maintain their own direct corporate sales staff and offer an array of training and installation services. "We discovered you couldn't just sit and wait for customers," says Juge.

With a showroom setting and a new employee dress code (dark suits, white shirts, and no mustaches or beards), Tandy Computer Centers are a far cry from the stereotypical Radio Shack packed with electronic gizmos. "It's more business-oriented," says Juge, who admits that "the hobbyists sometimes complain."

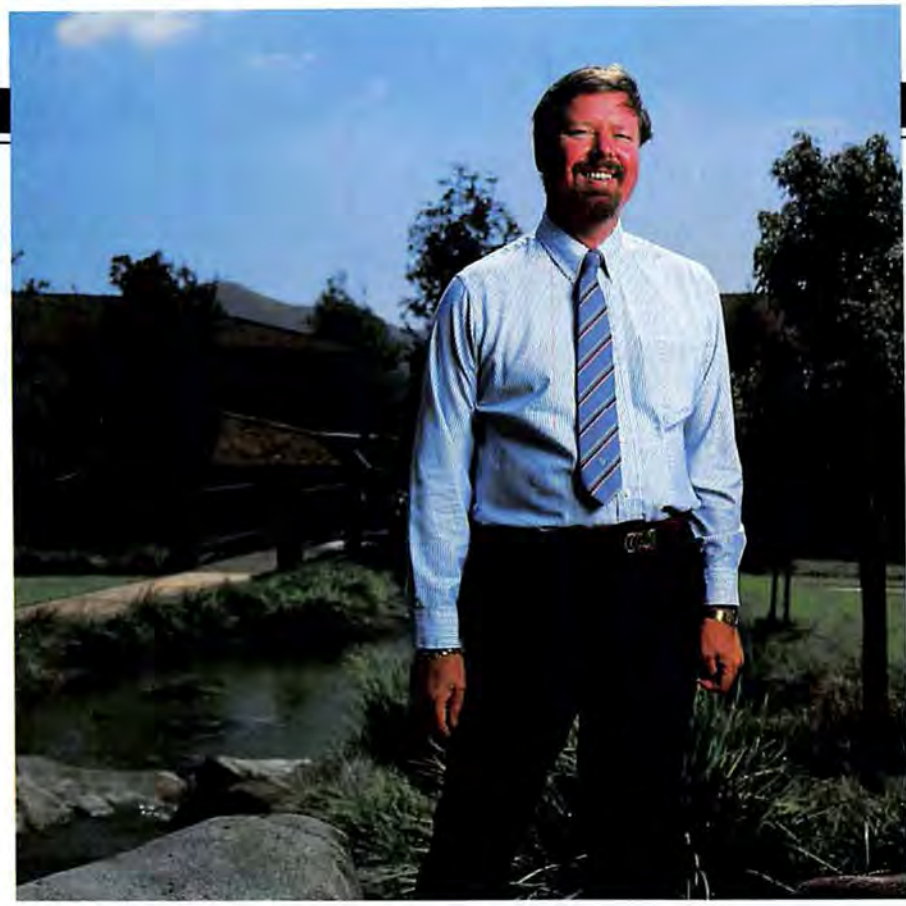
Paul Terrell remembers the transition away from hobbyists quite clearly, as well he should. Terrell opened one of the first computer stores in the country, the Byte Shop, in Mountain View, California, in 1975. He sold his interest in the Byte Shops in 1977 after he'd expanded the operation to 74 stores.

Terrell, who currently heads Software Emporium—a five-store enterprise based in Cupertino, California, that addresses the PC aftermarket—thinks the computer retail business has come almost full circle and that a resurgence of the neighborhood computer store may be in the offing.

"The Byte Shop catered to a very technical audience who understood computer kits and put up with soldering components," Terrell says. "Today I see the same thing happening with PC clones. People are buying motherboards, chassis, keyboards, and so forth."

Terrell has been toying with the idea of a "build your own" computer store to cater specifically to do-it-yourselfers: "I think there's an opportunity for a mom-and-pop [operation] if you can say, C'mon in and for $500 put together a compatible!"

*—David Needle*



Blake Little

Founder Robert Harp taking a quick break in the gardens outside Cordata headquarters. One of very few survivors among the first generation of PC-compatible suppliers, Cordata repeatedly and successfully has skipped to new products, customers, and manufacturing plants.

# The Upstanding Upstart

*Cordata's Bob Harp enjoys challenging the odds—perhaps because he beats them so routinely.*

A youthful 49, Dr. Robert Harp runs Cordata, the privately held PC-compatibles supplier he founded five years ago. Cordata has slugged it out successfully in a landscape littered with casualties—a classic case of entrepreneurial brains matching Big Blue brawn.

Harp first became interested in PCs in 1975, when, as an engineer at Hughes Research Laboratories, he dashed off an order for the 4-bit Altair. "I remember the excitement of getting BASIC to run on it," he recalls. "It was great fun. But those early computers were very poorly designed, and I thought I could do a much better job."

A year later, Harp acted on his conviction and left the company to design his own machines. He formed Vector Graphics, which developed a rudimentary business computer and grew at a steady clip.

But Harp was tantalized by the release of the IBM PC, which he fully expected to become an industry standard. When his colleagues at Vector Graphics disputed his decision to move toward IBM's architecture, Harp walked. In short order, he set up Cordata (known then as Corona Data Systems) and got in on the ground floor of the skyrocketing personal computer market.

With its 64K and cassette port, IBM's first PC wasn't much more than a toy, Harp notes. Looking to build a serious business computer, he raised the motherboard's memory capacity to 512K, added a graphics display, and offered a hard disk option in Cordata's first model, which shipped early in 1983. "When the XT came out, it was almost an exact copy of our computer," he says.

Today, Cordata sells a full line of low-cost PC compatibles. More than 200 staffers work in a few nondescript buildings nestled in "Little Silicon Valley," just north of Los Angeles. While design is domestic, manufacturing is up to Daewoo Electronics, part of a South Korean high-tech conglomerate that has infused Harp's firm with several million dollars.

Most Cordata machines offer greater speed or storage than their IBM forerunners, but Harp isn't interested in getting too far ahead of IBM. "One thing we've clearly learned is that attempts to be inventive come back to haunt you. It's absolutely vital in this industry to maintain software compatibility, and that limits the architecture of the system."

That scenario frustrates committed engineers because IBM hasn't sprung a "really new" product in five years, Harp points out. He fully expects the status quo to change—and soon.

Does Harp anticipate a proprietary PC? Not exactly. He suggests IBM's hands are tied by its own standard. The incompatibility of a new system would slow down its acceptance and give competitors a chance to reverse-engineer a better clone, he says.

Instead, Harp is banking on breakthroughs in software and hardware that would tap the 80286's potential for windowing and graphics. "The 286 is more powerful than the Macintosh's [Motorola] 68000 by quite a margin," he maintains. "It's a real screamer if it's taken advantage of."

Citing the paucity of applications designed for the 80286, Harp is viewing the introduction of 80386-based PCs cautiously. Apart from greater raw processing power, this up-and-coming class of systems initially won't offer users much benefit over earlier machines, he maintains.

If rival Compaq has staked its future on the faster chip, Cordata is gambling on surpassing IBM's AT and EGA standards to deliver a better graphics mousetrap. That innovation will help Harp lead a Cordata desktop publishing charge, ultimately upgrading the company's laser printer (which currently accounts for half of the firm's sales) and unveiling high-resolution color graphics hardware.

Harp proudly shows off Intellipress—a stunning, high-speed 80286-based publishing system. The system includes an inexpensive hard copy scanner and an ultra-high-resolution, oversize display that, as Harp says, "blows people away."

Bob Harp takes delight not only in creating hot new products but in being part of a rough-and-tumble industry. "Since I got into this business, I've gotten to know a lot of the people, and I'm interested in everything that goes on. It's like watching a big soap opera, seeing fortunes ebb and flow. You hate to miss an episode." *—Harvey Rosenfield*

## Born in Italia

"AT&T's entry into the commercial computer market means more than just another player in an already crowded field," declared James Olsen, then vice chairman and now chairman, back at the March 1984 kickoff of AT&T's computer line. "Over time, it will redefine the industry."

But AT&T's computer organization seems to spend more time redefining itself than shaking up the industry, and to date it has experienced more management shuffles than the New York Yankees. The group carved out a respectable chunk of the PC-compatibles market—selling roughly 170,000 machines last year—and carried off some big government orders for its minicomputers. But its losses were staggering—reportedly approaching $1 billion for 1986.

Last fall, Olsen bit the bullet and decreed that the giant telecommunications supplier would return to its traditional focus on data communications and networking. While AT&T will keep plugging away at information systems, that segment has been downgraded. Among the changes, all PC development and production has been turned over to Olivetti, AT&T's Italian partner, and an ex-Olivetti exec now heads the computer effort. *—E. B.*

## *Follow That Story!*

* * * \

**Scenes like this tell the story in PALS, an interactive-video learning system that reaches far outside IBM's traditional customer base.**

# Big Blue's News

Yes, it's IBM software, and yes, it looks like a cartoon, but it's designed to address a rather grim problem—adult illiteracy.

Roughly 20 million adult Americans can't read at the fifth-grade level, and more than 2 million more join those ranks each year. According to educational pioneer John Henry Martin, these people are dropouts not just from school but from society.

"It's a pretty sad world, a world of unhappy people," Martin says. They can't fill out job applications or even buy generic-label products. Many feel ashamed—dodging requests to read by pretending they've left their glasses at home, or walking around with newspapers showing from their jacket pockets, according to Martin.

A retired educator living in Stuart, Florida, Martin sparked IBM's successful PCjr-based Write to Read education system for kindergarten children. Write to Read debuted in mid-1983 and now reaches 300,000 children a year—about one-tenth of those entering school.

Martin returned to IBM in late 1984 with another project in mind. Adapting Write to Read's structured learning environment for adults produced impressive results in an inner-city classroom; Martin wanted to deliver this new system via interactive videodisk.

The result is PALS (Principle of the Alphabet Literacy System), which IBM describes as "a phonetic-based system using animated video and computer-stored voice to enable nonreaders to associate sounds with letters, letters with words, and [to] use words to create sentences." The software conveys a story of the development of the alphabet ("fictionalized," IBM notes) and offers reading and writing exercises.

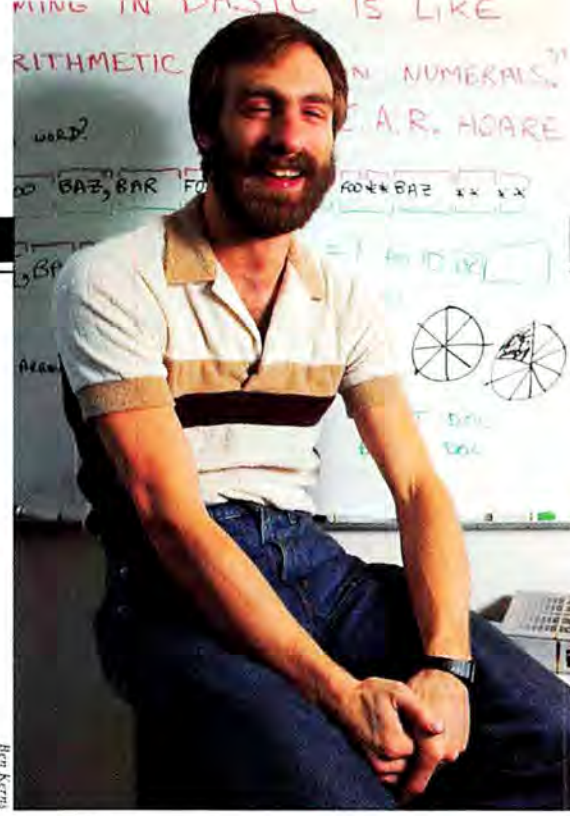
Beginning in the second quarter, IBM will sell PALS as a complete laboratory classroom for 16 students, with four Infowindow touch-screen videodisk systems (each with XT and videodisk player), four typewriters, and eight PCjrs with accompanying software. With an education discount, the cost is less than $60,000. The system has been tested successfully with high school students, prisoners, and municipal workers.

Meanwhile, Martin and coworkers continue to insist that the traditional approach, limited to teacher, chalk, and blackboard, just doesn't hack it today. Among technologies under investigation, interactive voice is next, and expert systems are in the works. *—E. B.*

# Reunion at Redmond

Tim Paterson, credited with creating the software that's been the mainstay of Microsoft's dazzling growth, has returned to the fold.

Paterson wrote the operating system that evolved into MS-DOS and PC-DOS, and left Microsoft after polishing off DOS 1.10. But in a million-dollar deal, he came back to the software giant last fall.




Ben Kerns

Tim Paterson, who dreamed up the original versions of DOS, has gone back to Basics after rejoining Microsoft.

Back in 1981, fresh out of college and working at Seattle Computer, Paterson wrote the first version of DOS. He had been working on an 8086 board, and the chip needed an operating system. In four months of half-time labor, Paterson turned out an operating system that was dubbed 86-DOS.

Microsoft approached Seattle Computer about purchasing the software for an unnamed OEM, which turned out to be IBM. Paterson went to work for Microsoft, putting the finishing touches on MS-DOS (and PC-DOS) 1.00.

He spent much of his time trimming the operating system to 12K, and DOS 1.00 did manage to fit on a 16K computer. Paterson, who calls himself "a connoisseur of fast and small," remains proud of the accomplishment.

He also describes himself as a self-starter who likes to build things, which was what he did when he briefly returned to Seattle Computer to work on a memory board. In 1984 he founded Falcon Technologies, which initially built a multifunction hard disk controller for the PC; Paterson both created the products and ran the company.

In August 1984, Microsoft cofounder Paul Allen asked Paterson to write a Z80 version of DOS for the Japanese MSX machines. Paterson needed the cash to keep Falcon Technologies alive. He also wanted a royalty-free license to distribute DOS with Falcon's products, and Microsoft agreed.

Over time, however, Microsoft became increasingly concerned that DOS might fall into the wrong hands. There was talk of Falcon selling it to Hong Kong's Microware to distribute with a $20 disk controller—essentially giving DOS away.

Microsoft approached Paterson about buying back the license. When they couldn't agree on a price for the license alone, Microsoft successfully bid on the license, Paterson's employment contract, and two of Falcon's product lines (which Microsoft subsequently sold).

At Microsoft's Redmond, Washington, headquarters, Paterson is now working on the next version of QuickBASIC. Despite the quotation displayed prominently on his wall—"Programming in BASIC is like doing arithmetic with Roman numbers"—Paterson says he's content, for now.

Asked why he's not part of the DOS group, Paterson replies that he couldn't handle such an assignment. Before, he says, "I was the big cheese and DOS was my baby." Now that the DOS group is so large, he'd just be "a cog in the DOS machine." With BASIC he works in a group of four. "That's bigger than a cog," Paterson says. "That's a gear."

Although Paterson claims he knows almost nothing about upcoming versions of DOS, he wonders if the product would be different—perhaps smaller and faster—if he still had a hand in it. He says he doesn't use the system's "fancy stuff"—and doesn't even change the C> prompt on his hard disk. *—Nancy Andrews*

## Cantabrigian Clones

Challenging Lotus Development's hammerlock on spreadsheets, cheap knockoffs of *1-2-3* began cropping up over a year ago. The noisiest attack has come from Paperback Software, whose founder, Adam Osborne, each year faithfully predicts that software like his *VP-Planner* will begin to erode Lotus's pricing–next year.

But clones keep springing up even in Lotus's hometown of Cambridge, Massachusetts. In fact, two firms have built respectable businesses selling Lotus look-alikes.

Mosaic Software currently ships between 15,000 and 20,000 copies of its *Twin* package monthly, according to president Richard Bezjian. Most copies are bundled with Leading Edge PCs.

Mosaic began deliveries in mid-1985 and now offers a $99 clone of *1-2-3* release 1A and a $145 clone of release 2. The company also intends to be the first to release a look-alike that runs under UNIX.

Bezjian doesn't buy the Lotus lectures about how its customers value service, support, and stability over cost considerations. But when he talks about Ontio Computer Products, a rival located a few blocks away, he sounds a little like Lotus brass. "We're not scared about Ontio," he says. "They don't know what it takes to get visibility in the marketplace and to support the product. Every [support] call you take costs you $30 to $40."

Ontio, which sells its *259* package for $19.95 without documentation and $29.95 with, dismisses Bezjian's contention.

The way Ontio chairman Tracy Licklider describes it, *259* began with a thought something like "what this country needs is a good 5-cent cigar." *1-2-3* was the standard, but the price was high, particularly for small businesses and home users. Software clones existed, "but my feeling was their price point was wrong–what they had done represented a good $1 cigar."

Licklider, an industry veteran whose previous stints include time with *VisiCalc* developer Software Arts, put together a look-alike in a few months, adding a few nifty graphics features in the process.

"We see this as an expansion of the market, a niche that has been ignored by the larger companies," says Ontio president Julian Lange, another Software Arts alumnus. This strategy is particularly apt for cheap hardware clones, he suggests.

Lange insists that without venture capital backing, expensive public relations firms, advertising, copy protection, technical support lines, and all the other paraphernalia that surround a big software company, pricing programs at $30 and below is perfectly reasonable. "It really gets down to your expectation of profitability–what kind of living you want to make."

The big payoff is not what Ontio is after, Lange claims. "People used to say, software entrepreneurs want to make their money and go to the beach." Naming the firm after a beach in Maine was a small joke that indicated Ontio founders had no such intention. "We *enjoy* doing this." *–E. B.*

*Nancy Andrews is a freelance writer living in Seattle; longtime computer journalist David Needle lives in Mountain View, California; and Harvey Rosenfield is executive director of the Network Project, a consumer research group based in California.*

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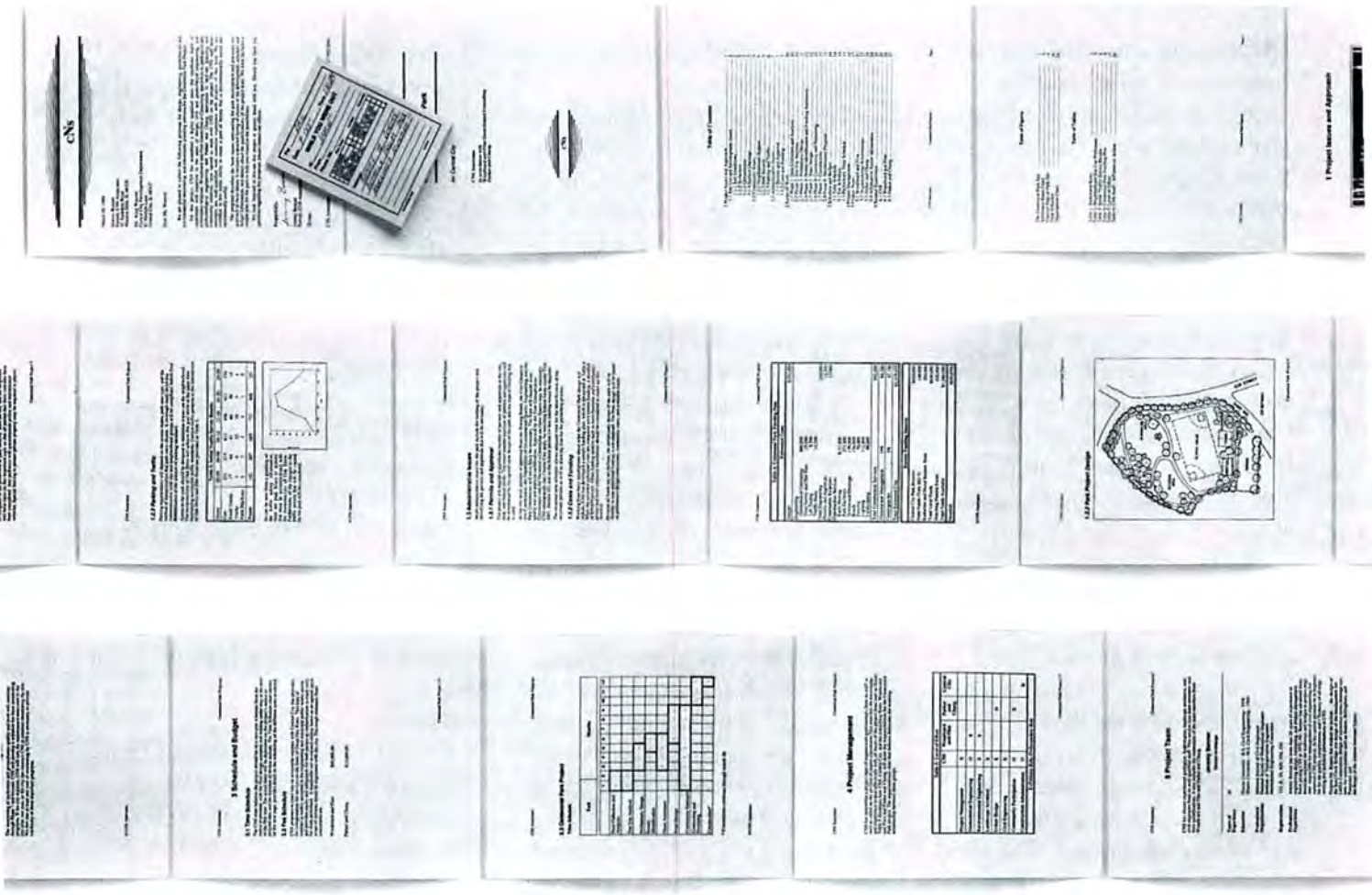

You may be content with your present word processor. And it's easy to understand why.

Even the clumsiest word processor is light years beyond the electric typewriter, the accepted standard only a decade ago. Plus, just the term word processing conjures up a rather modest expectation, ho hum, the ability to process words.

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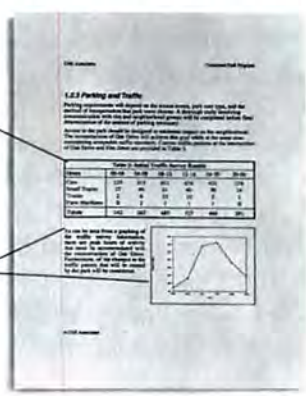

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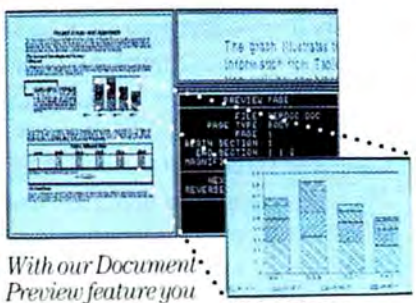

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# From the Hardware Shelf

***PC World offers first impressions of recent hardware releases***

Two new shots at display standards face uphill battles, while a familiar laptop takes to the road.

***Edited by Eric Knorr***

## The QuadEGA ProSync and NEC MultiSync

If you find yourself in the dark over the current flurry of video displays for the PC, take heart. An increasing number of manufacturers are shedding light on the subject with video hardware that consolidates diverse display modes and standards into a single, easy-to-use piece of hardware. One such device is Quadram's QuadEGA ProSync, a multimode video display board.

The design (and the name) of the ProSync is intended to capitalize on the phenomenal popularity of the MultiSync, a remarkably versatile monitor that can be driven by IBM's Enhanced Graphics Adapter (EGA), Monochrome Display Adapter (MDA), and Color/Graphics Adapter (CGA). Together these products provide a one-size-fits-all display solution destined to ease video woes—and to introduce Quadram's own snazzy new display standard. Because the ProSync emulates all three IBM boards, it becomes a one-board solution for driving the MultiSync, which automatically synchronizes with the operating frequency of the current video mode. If your graphics needs are varied, you can run just about any graphics software with the ProSync and the MultiSync without swapping boards or monitors.

In a sense, Quadram's promotion of the ProSync as a companion to the MultiSync is a bit misleading. The MultiSync can be driven by any board compatible with IBM's video adapters, just as the ProSync can drive any monitor compatible with the boards the ProSync emulates. In fact, the ProSync is actually an enhanced version of Quadram's QuadEGA+, and like its predecessor, it emulates the graphics mode of the Hercules Graphics Card (HGC), which the MultiSync can't handle (see "Seven Up on EGA," *PCW*, August 1986).

What sets the ProSync board apart from the QuadEGA+ and other EGA compatibles are two proprietary graphics modes that take advantage of the MultiSync's flexibility and high resolution. Like the EGA's enhanced graphics mode, the two ProSync modes support 16 simultaneous colors, but the resolutions are 640 by 480 pixels and 752 by 410 pixels, respectively—significantly higher than the EGA's 640-by-350-pixel format. These new high-resolution modes unquestionably enhance the performance of an already fine monitor.

Of course, you can only take advantage of the proprietary ProSync modes if the software you use has specially written drivers. And software developers are notoriously leery of writing custom drivers for a mode until it has established itself in the marketplace. Quadram has circumvented this Catch-22 somewhat by including a *Microsoft Windows* driver on disk so that any program written for *Windows* can run in the ProSync high-resolution modes. This may be a wise move indeed, because Microsoft is aggressively promoting third-party software development for the increasingly popular *Windows* environment (see "PC World Graphics Forum" in this issue).

To set up the ProSync's default mode, you need to flick a few DIP switches, which are accessible from the board's rear bracket. Once the board is running, you can switch between modes through software commands. Some vertical stretching of the image and loss of sync are common while traversing the various modes, but you can easily correct these imperfections with the MultiSync's externally mounted controls.

Like most EGA compatibles, the ProSync uses software to invoke hardware-based CGA and HGC emulation. The emulations are well implemented, and all but a handful of games run without a hitch. However, the memory-resident emulation software is a little picky about whom it shares memory with. It often takes a shuffling of the memory-resident deck before the emulator will work properly.

The ProSync software also contains a screen-blanking function that extinguishes the display after a designated period of keyboard inactivity, as well as a diagnostic program that gives a smashing demonstration of the various emulation modes.

It's Quadram's new modes, however, that make the ProSync/MultiSync combination pretty bold stuff. Burgeoning software support for *Windows* could put Quadram in the enviable position of setting a new resolution standard, one which depends on the MultiSync for its very existence. It will be interesting to follow the progress of the three separate parties involved—Quadram, NEC, and Microsoft—as their intertwined stories unfold. *—TJ Byers*

*QuadEGA ProSync*
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*404/923-6666*
*List price: $595*

*JC-1401P3A MultiSync*
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*List price: $799*

*(continues)*

**Driven by Quadram's ProSync video board, the NEC MultiSync monitor approaches its maximum possible screen resolution. In this photo, the MultiSync displays Microsoft Windows at a resolution of 640 by 480 pixels. Currently, Windows and any application written for that environment are the only programs that can run in this proprietary mode.**

*John Greenleigh*

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# Now Think Small.

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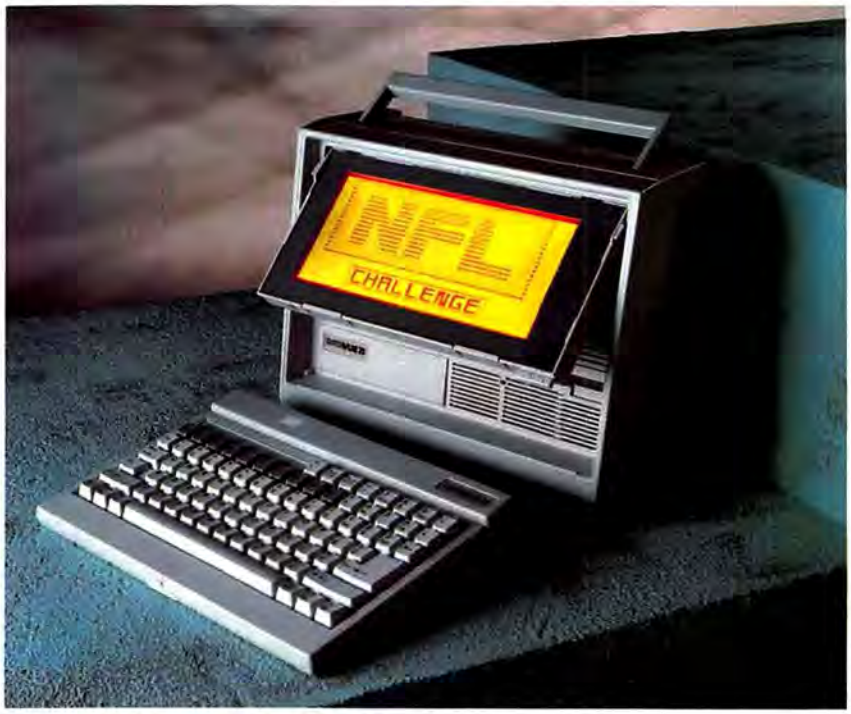
# Datavue 25




John Greenleigh

**The latest incarnation of Quadram's Datavue 25 is the only battery-powered laptop to offer both a 20MB hard disk and over 1MB of RAM.**

The last time I traveled with Quadram's Datavue 25, the plucky portable met the challenge of a rough-and-tumble journey through the tropics, and despite a few idiosyncrasies, it survived the fray (see "On the Trail of the Datavue 25," *PCW*, October 1985). For the latest, hard disk version of the Datavue 25, I posed a less strenuous obstacle course: a cross-country motor tour, and several months of intensive keyboard activity in a damp cottage in upstate New York.

The first challenge arrived early. I was driving along a pocked lumber road in Oregon's Blue Mountains, admiring the forest fires, when I smacked the side of my forehead. "Ay caramba! I forgot to park the hard disk!" I pulled off the road in a cloud of red dust, flung open the trunk, and plugged in the battery. To my relief, I discovered that the hard disk parks itself whenever you turn off the computer.

As of this writing, the Datavue 25 is the only battery-powered laptop that offers both a 20MB hard disk and more than a megabyte of RAM. But that's only part of the story. As a company best known for its PC-expansion products, Quadram has taken to expanding the Datavue 25 in a spirit of Rabelaisian excess. You can outfit the Datavue 25 with one of three screen technologies (LCD, fluorescent, and gaslit), a variety of memory and storage possibilities, and an array of options ranging from an internal modem to a desktop expansion chassis. The model that I tested for three months featured a luminescent gaslit screen, an internal modem, a 20MB internal hard disk, one 3½-inch disk drive, an external battery pack, and 1.25MB of memory—in essence, a $4600 portable powerhouse.

On the caboose end of Quadram's expansion express you can pick up a 256K LCD version with one 5¼-inch drive and a RAM disk for a scant $1695. However, because the LCD is barely legible, you'd be well advised to step up to one of the fluorescent backlit models. For example, $2395 will fetch a 768K fluorescent unit with two 3½-inch drives. This Baskin-Robbins approach to computer retailing has only a few restrictions: the 20MB hard disk is available exclusively with the gaslit model, and the two 3½-inch disk drives come only with the fluorescent and gaslit models.

The Datavue 25's lunchbox-style chassis measures 12¾ by 6¼ by 10½ inches and weighs slightly less than 14 pounds (16 pounds with the hard disk). An infrared keyboard detaches from the front of the unit, revealing a 9¾-by-4-inch display that tilts upwards in six positions to a maximum angle of 50 degrees. The 80C88 CPU runs the show at a stately 4.77

*(continues)*

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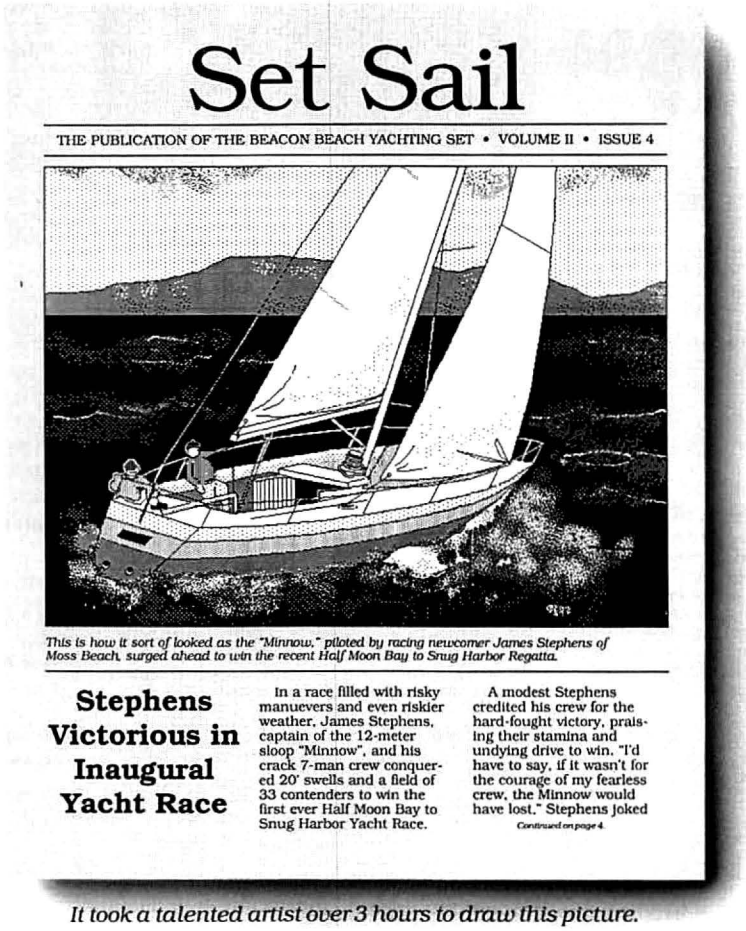

Set Sail

THE PUBLICATION OF THE BEACON BEACH YACHTING SET • VOLUME II • ISSUE 4

*This is how it sort of looked as the "Minnow," piloted by racing newcomer James Stephens of Moss Beach, surged ahead to win the recent Half Moon Bay to Snug Harbor Regatta.*

**Stephens Victorious in Inaugural Yacht Race**

In a race filled with risky manuevers and even riskier weather, James Stephens, captain of the 12-meter sloop "Minnow", and his crack 7-man crew conquered 20' swells and a field of 33 contenders to win the first ever Half Moon Bay to Snug Harbor Yacht Race.

A modest Stephens credited his crew for the hard-fought victory, praising their stamina and undying drive to win. "I'd have to say, if it wasn't for the courage of my fearless crew, the Minnow would have lost," Stephens joked

Continued on page 4.

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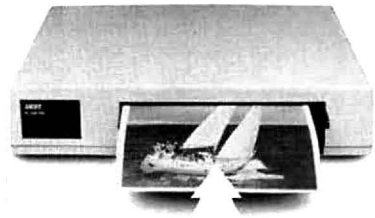

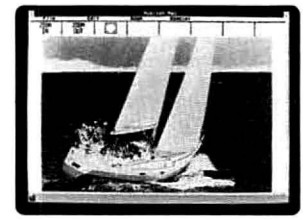

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*Pictured here is the "Minnow," piloted by racing newcomer James Stephens of Moss Beach, surging ahead to win the Half Moon Bay to Snug Harbor Regatta. (Photo by George Chadwick)*

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In a race filled with risky manuevers and even riskier weather, James Stephens, captain of the 12-meter sloop "Minnow", and his crack 7-man crew conquered 20' swells and a field of 33 contenders to win the first ever Half Moon Bay to Snug Harbor Yacht Race.

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Continued on page 4.

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MHz, and memory is expandable in 512K increments to 1.25MB. All units contain a clock calendar and a socket for an 8087 math coprocessor. Another standard feature is the built-in RAM-disk setup, which is indispensable if you have a solo drive system and advantageous when you're using the battery. Other standard equipment includes parallel, serial, and internal modem ports and RGB and composite color ports.

The Datavue 25's optional internal battery, which looks like a miniature version of the monolith in *2001,* slips into a compartment on the left side of the computer and provides a mere hour of battery life for normal disk access—twice that if you're using the RAM disk. The battery takes 4 hours to recharge, and you'll need an optional external battery pack—which has the same 2-hour maximum life—if you want to use the hard disk. A keyboard command displays the level of battery depreciation, and a red light flashes when the end is nigh. Other ROM-based system commands are available to change screen attributes and system configurations. You can also change DIP switch settings from the keyboard.

Each of the three screen options provides an 80-column-by-25-line text and graphics display with 640 by 200 pixels in high resolution and 320 by 200 in medium resolution. Monochrome color gradations are represented by four simultaneous shades (from a palette of 16) in medium resolution. With the fluorescent backlit display, you can view the crisp black-on-blue screen from a number of peripheral angles, and you can even work in the dark.

For only $200 more you can move up to Quadram's unique gaslit screen, but whether you choose to do so is a matter of taste. The screen displays orange text on a soupy, blotchy-yellow background. However, it's easier on the eyes than the Data General/One Model 2's impressive electroluminescent display, and for marathon computer sessions, it may be the most forgiving display on the market—CRTs included.

As with the original Datavue, my biggest gripe concerns the keyboard. The touch continues to be somewhat mushy and the response a little sluggish. Fast typists will discover that characters drop out or become transposed. The layout is still baffling, mostly because of the odd placement of special keys, especially in the upper-right territory of the keyboard. The keyboard "improvements" have only led to further difficulties: The enlarged <Shift> keys would be welcome if they hadn't forced the <PrtSc> key to a position directly below the left <Shift> key, making an accidental screen dump all too easy.

The Datavue scored perfectly on compatibility tests. All the old favorites, including *1-2-3, dBASE III, Microsoft Word,* and *WordStar* worked fine, and even more exotic bit-mapped programs such as *Microsoft Windows Paint* and *NFL Challenge* performed faithfully and accurately.

Aside from the display, memory, and storage choices, Datavue offers the following options: a 300/1200-bps internal half-height modem (including *Crosstalk XVI*), a second 5¼-inch disk drive (which attaches to the back of the unit), an expansion chassis that holds three full-size boards, and an expansion chassis that includes a 10MB hard disk. A padded nylon carrying case, a keyboard cable, a cigarette lighter attachment, and a foreign 220AC power supply are also available.

Once again I've come to the end of a journey with the Datavue 25, and once again it has passed the test. This time a hard disk was at stake, but its shock-mounting held up to the punishment. Mark the gaslit screen down in the computer history books as another leap forward in flat-screen technology, and at a lower price than other luminescent displays, such as those found on the Grid, the Data General/One Model 2, and the Toshiba T3100. With a revamped keyboard, the Datavue 25 might turn into a winner, competing not so much with the laptop market as with Compaq. Unless you want to wait for Datavue's 10-pound clamshell laptop, the Snap 1+1, or the 80286 version of the Datavue, you should take a look at the Datavue 25. *—Eric Brown*

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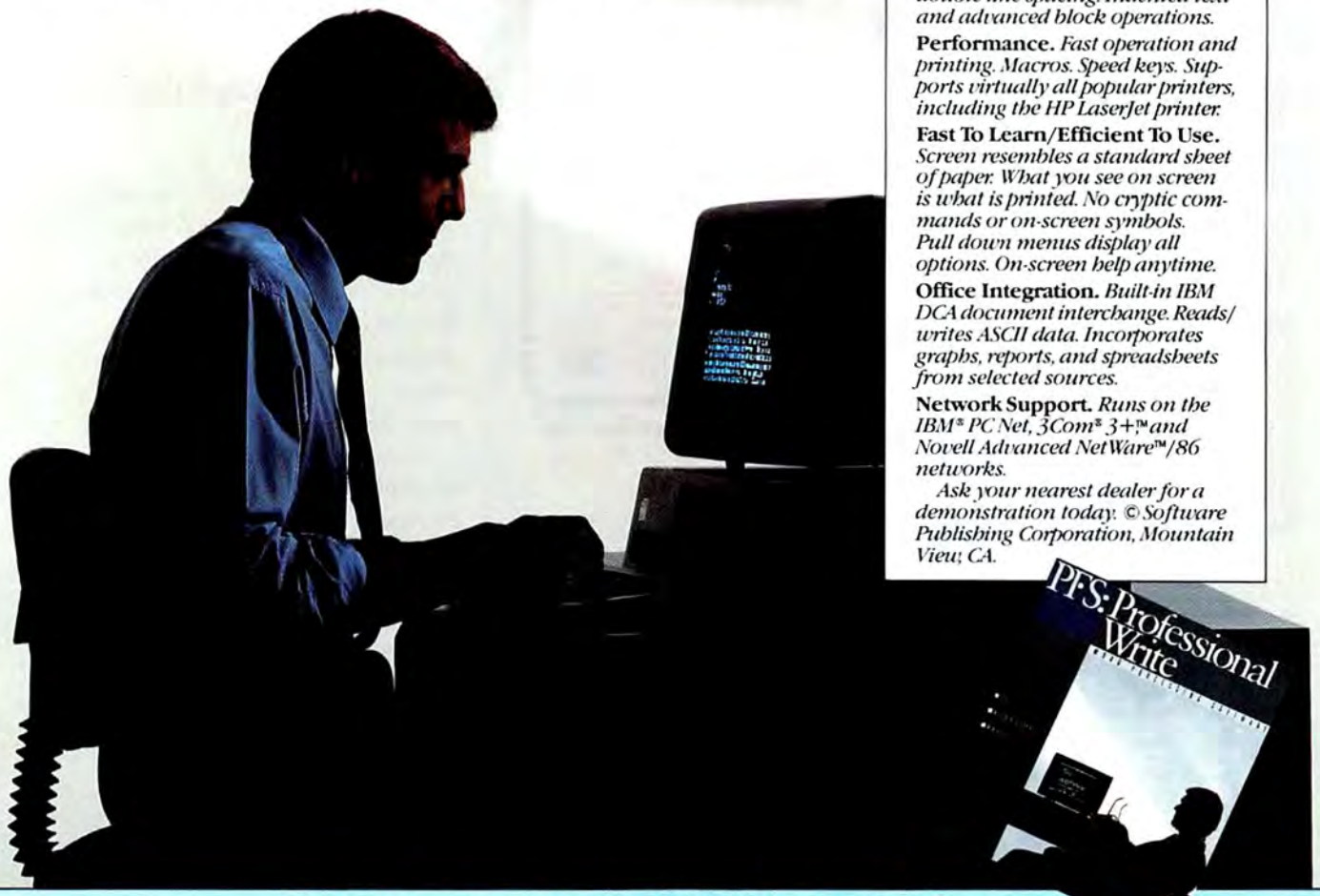


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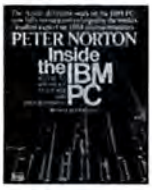


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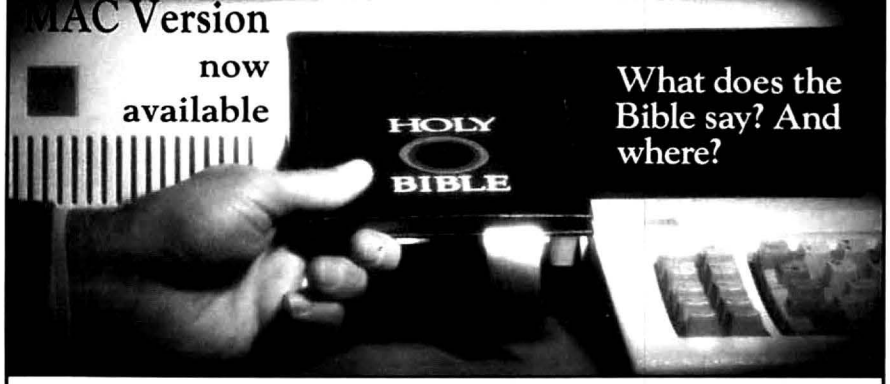


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RamFont holds character definitions in RAM, enabling the character set to be replaced with another font. Hercules offers a library of 25 disk-based fonts that range from the prosaic Courier to the Greek alphabet.

The Plus board gives you a choice of two RamFont modes. The first is similar to the text mode supplied by IBM's Monochrome Display Adapter in that each character on screen is specified by a byte in video memory (see "Display Intelligence" in this issue). However, single bytes of 8 bits each limit the number of available characters to 256. To expand the number of characters accessible at one time, the Plus board has a second RamFont mode that uses a 12-bit character-specification scheme.

With the 12-bit specification, you can choose from among 3072 characters instead of a mere 256. This vast array of choices makes it possible to display multiple fonts and a slew of character-based graphics simultaneously. The character definitions are stored in the Plus board's 48K of RAM.

Unfortunately, the 12-bit character code makes RamFont incompatible with most applications. Although the 8-bit RamFont mode works with virtually any program, the 48K RamFont mode requires that an application be modified—or written with RamFont in mind—before 12-bit characters can be displayed. To make the 48K RamFont mode more appealing, Hercules has included utilities with the Plus board that make the

*(continues)*

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**Software Digest®**
**RATINGS NEWSLETTER**
**Vol. 3, No. 11 / November 1986**

...rint and plot graphs. Quality tests ... programs. The 1987 schedule will kick off with word processi... ages in January and project management software in February.

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

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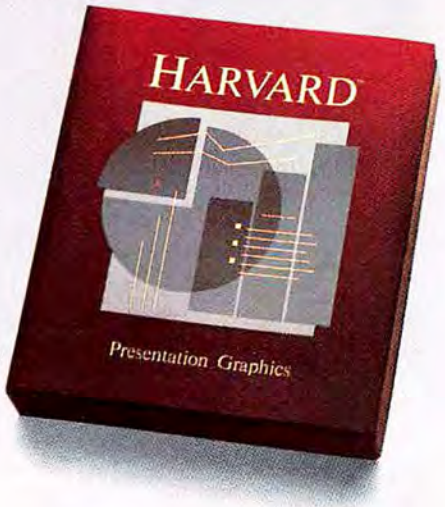


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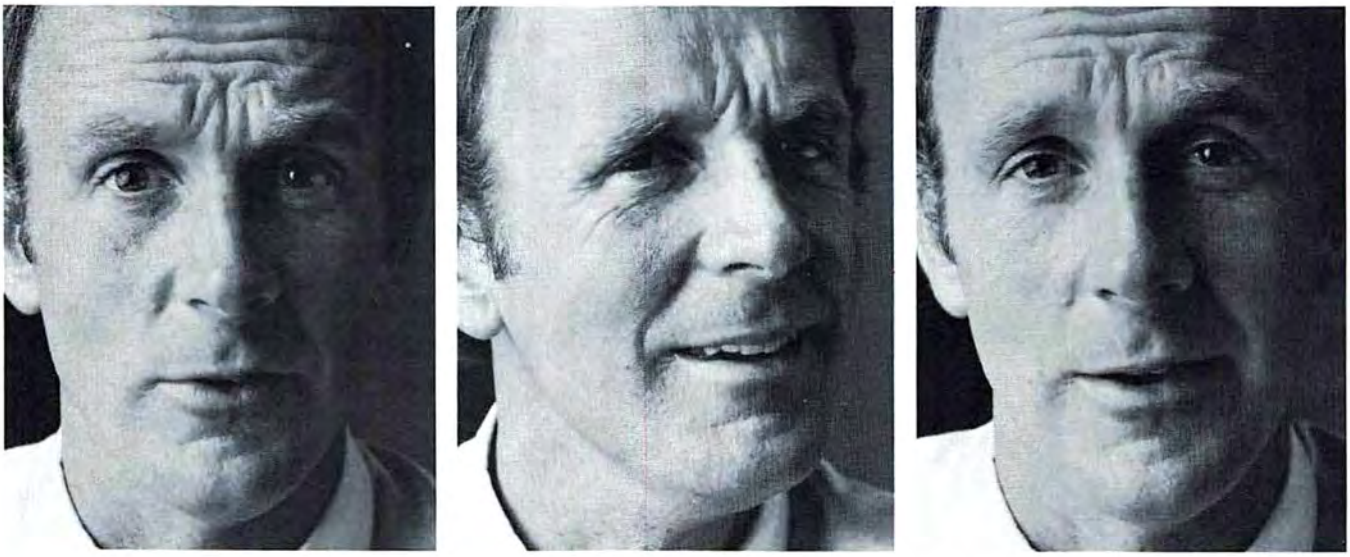

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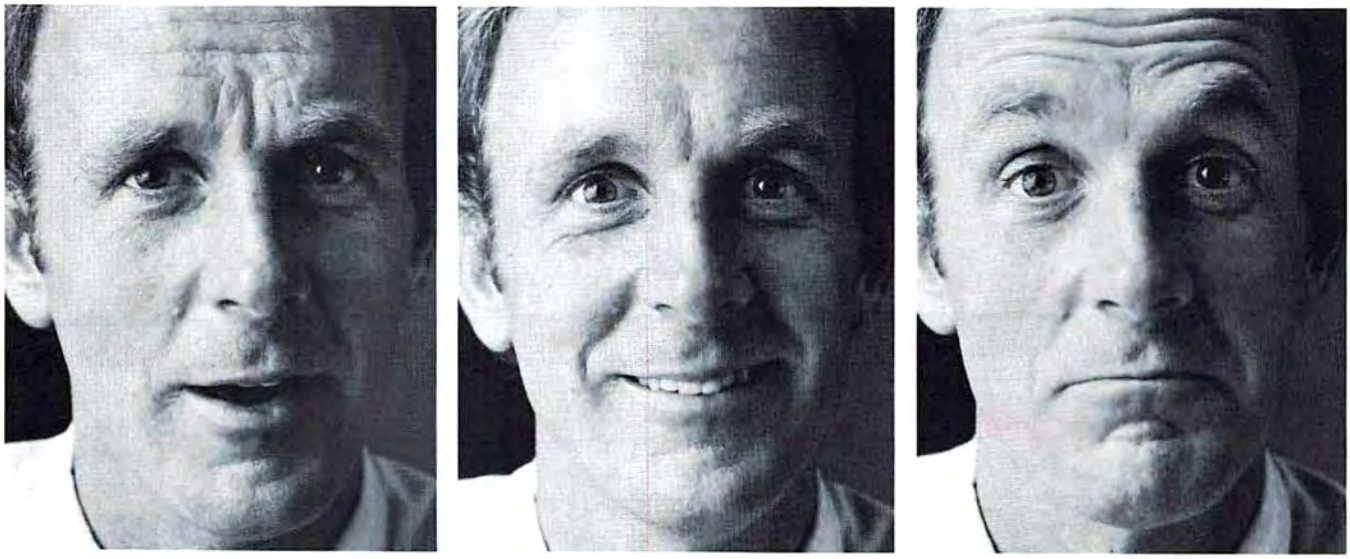
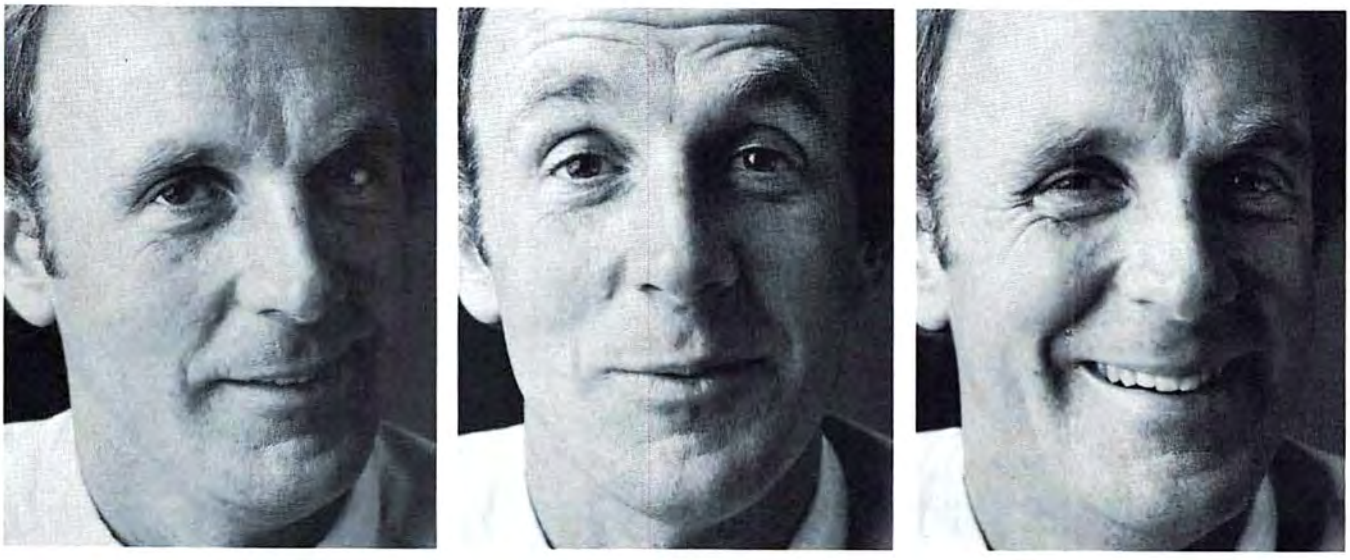


**3:29:** *"Hey, this really works. And it doesn't hurt at all."*



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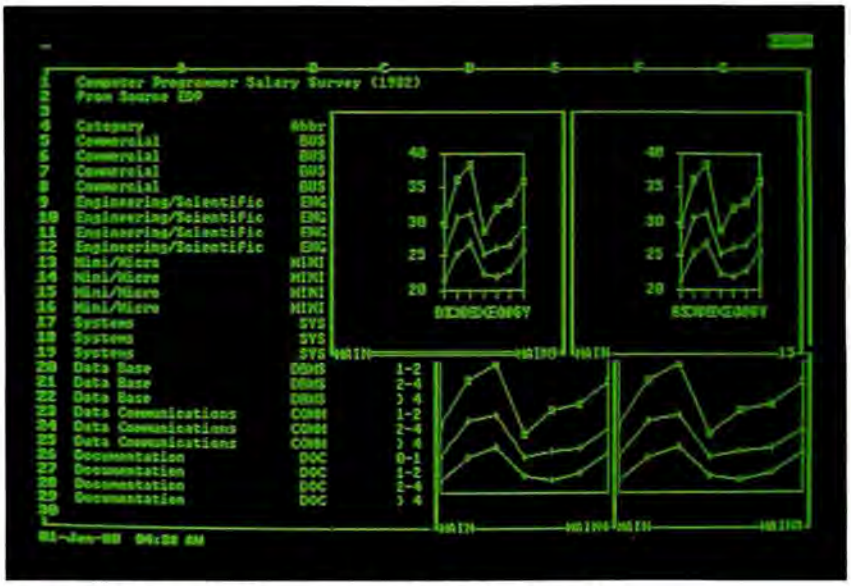


**Screen 1: Using the RamFont mode of the Hercules Graphics Card Plus with Symphony, you can place a spreadhseet and character-based graphs on the same screen.**

appropriate modifications to four popular programs: *Microsoft Word 3.0*, *1-2-3* release 2, *Symphony 1.1*, and *Framework II*.

Some of the 48K RamFont features prove quite interesting. When you use that mode with *1-2-3*, for example, you can mix text and special RamFont graphics characters on the same screen. Instead of drawing in graphics mode, *1-2-3*'s RamFont-modified routines create graphs composed of mosaics of graphics characters. The characters form a window for the graph, which appears within a spreadsheet on screen.

The RamFont board's greatest limitation is its inability to print out on-screen characters—whether they're 8 bit or 12 bit. They are screen images only and remain that way.

RamFont also permits smaller text size for *1-2-3*, *Symphony*, and *Framework* spreadsheets, enabling you to display more rows and columns (see Screen 1). When used with *Word*, the Plus board will display the program's normal italic, bold, and underlined text, but without the penalty in performance that comes with *Word*'s graphics mode.

For the adventurous, the Hercules Graphics Card Plus software includes a program called FontMan for creating RamFont characters. FontMan is well documented in the Plus's comprehensive owner manual, and it's not that hard to implement—just time-consuming.

Overshadowed by RamFont's glitter is the Plus's unique parallel port, which is controlled by a single proprietary chip. Unfortunately, the parallel port has been permanently assigned as LPT1. If one of your other expansion boards' parallel ports is also permanently designated as LPT1, you can remove the chip from the Plus board—not the most elegant solution, but effective nonetheless.

You have to hand it to Hercules—RamFont has to be one of the most innovative approaches to character-based display that the industry has seen. And sales of the Graphics Card Plus have been brisk, probably due to a price that's 40 percent lower than the original Hercules Graphics Card. It would be interesting to know, however, how many of Hercules' new customers are actually using RamFont. A captivating selection of fonts on the screen is chic, but if you can't send them to the printer, where's the beef? Software developers may find the board makes their applications look better, but end users are likely to stick with the tried-and-true Hercules Graphics Card functions. Thankfully, they're all still there in the Graphics Card Plus. *—TJ Byers*

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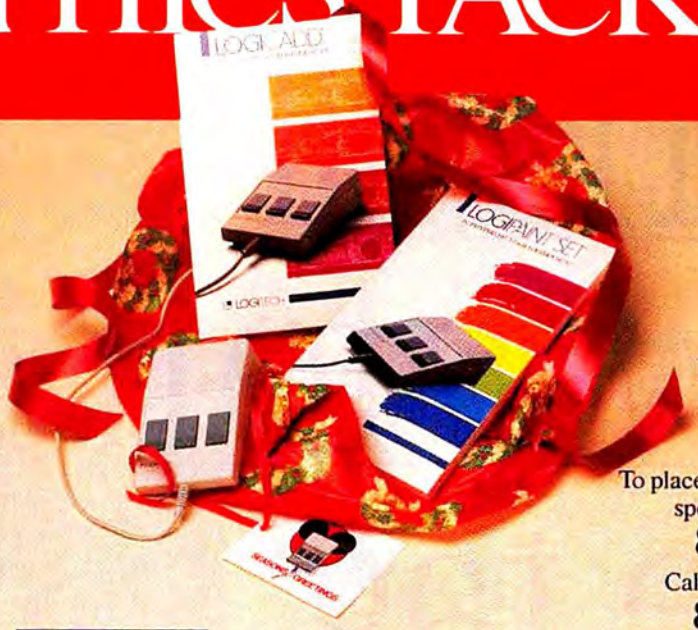

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## Brother M-1109

I hate printers. They're exasperating and noisy and tend to break down at the most inopportune times. Yet printers are a fact of life, and I needed one. In particular I needed a printer for the road to accompany my laptop—something small, lightweight, and capable of printing legibly.

Unfortunately, most printers designed for the laptop world are thermal. They're cute little things, and they're easy on the backbone, but even if you manage to find the appropriate thermal-sensitive paper, the output is less than rewarding.

Fortunately, I found a reasonable solution—the Brother M-1109. Although the M-1109 is not marketed for the road and offers no carrying case, you can wrap it in swaddling clothes and stick it in a suitcase, and it comes close to being the perfect traveling companion. Measuring only 13.1 by 2.8 by 7.6 inches and weighing a mere 7.8 pounds, the M-1109 is no thermal plaything, but the real thing—a dot matrix printer with graphics capability and near letter quality (NLQ) competence.

The M-1109's draft quality seems average for a 9-pin printer. Its NLQ output, while not as crisp as a 24-pin printer's, compares well with that from other 9-pin NLQ pretenders. The M-1109 delivers both Epson and IBM graphics compatibility, so don't worry if you can't find the M-1109 among your application's list of printer drivers.

John Greenleigh

**Brother's M-1109 printer may not be designed for travel, but its tiny footprint, light weight, and excellent output make it the perfect dot matrix printer for the road.**

The M-1109's major disappointment is its relatively slow speed. Like many printer manufacturers, Brother claims speed figures that are substantially higher than their machines produce in reality. Whereas Brother boasts 100 characters per second (cps) in draft mode, the M-1109 consistently hovered around 50 cps. Similarly, the manufacturer's advertised 25 cps in NLQ mode turned into a leisurely 13 cps. Still, this is not much slower than the real-life speeds of many dot matrix printers costing more than twice as much as the M-1109. A partial palliative for the impatient is a 2K data buffer and a 2K print buffer for limited simultaneous editing and printing.

A number of typographical effects are available, including enlarged, condensed, emphasized, double-strike, italic, underlined, double-underlined, superscript, and subscript. All these effects tested out well, as did the Pica, Elite, and Prestige NLQ Pica typestyles in both 10 and 12 pitch. If your word processor supports Prestige Pica, take advantage of it, because it yields darker type with the M-1109 than does the standard Pica NLQ mode.

Typical of printer documentation, the M-1109 manual skimps on explanations. However, all the escape sequences are documented in good order, complete with BASIC programs for conjuring up

*(continues)*

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special character modes. With the help of line drawings, installation is easy enough—as long as you don't have to change any DIP switches. Located under a plastic strip deep in the guts of the machine, the switches are difficult to see, let alone switch. Brother ballyhoos the fact that the M-1109 comes with both a parallel port and a serial port, but the manual neglects to mention that you need to toggle some DIP switches to make the serial port work.

Once you're set up, operating the M-1109 is easy. If you're intimidated by printer consoles that resemble the panels of expensive stereos, you'll be relieved by the Brother's polished simplicity. You need to press only three buttons: the on button, the on-line button, and the NLQ button, which doubles as a linefeed control when the on-line button is turned off. These last two are built into the top of the machine on a flat, touch-sensitive pad that includes a power indicator and an error light. After three months of use, the error light flickered only once—when I tried the illegal maneuver of mixing Elite and Pica on the same line.

Perhaps the feature that most endeared me to the M-1109 is its complete lack of shrieks or beeps. The print action itself, rated at 60 decibels, also isn't nerve-racking.

Unlike some printers, the M-1109 is easy to feed. The printer has a friction-feed platen for loading single sheets and comes with a detachable pin-feed unit (complete with sound cover) for fanfold paper. Occasionally the

*(continues)*

# dBase, dPen.*

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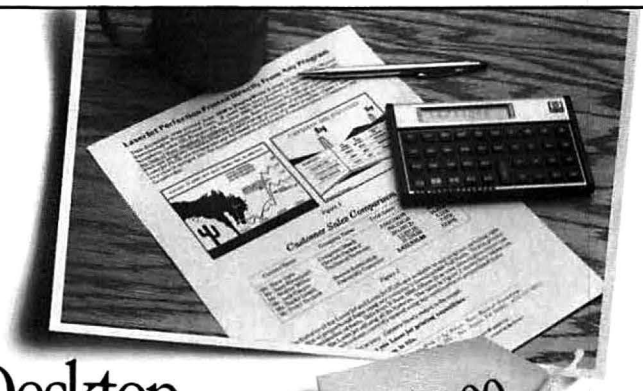

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tractors slipped a little during long print jobs, but this didn't surprise me—I've never met a tractor feed unit I could trust unattended. A roll-paper holder, not tested for this review, is available at extra cost.

Having survived three months of regular use and a cross-country car trip, the M-1109 has served me well. (And it's changed my mind about printers: I don't hate them anymore, I just dislike them.) The Brother M-1109 was clearly not designed for heavy office automation duties, but as a personal printer for the office, the home, or the road, it succeeds in unassuming style. Never before has near letter quality come in such a small package. *—Eric Brown*

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*List price: $299, roll-paper holder $18.66*

## Epson HI-80

Of all computer peripherals—digitizers, laser printers, and Bernoulli boxes notwithstanding—the plotter is by far the most fascinating. If you're not used to seeing a plotter's little robot arm zip through graphs, charts, and architectural renderings, the sight can evoke an awe of technology. The price, however, can be even more awesome.

*(continues)*

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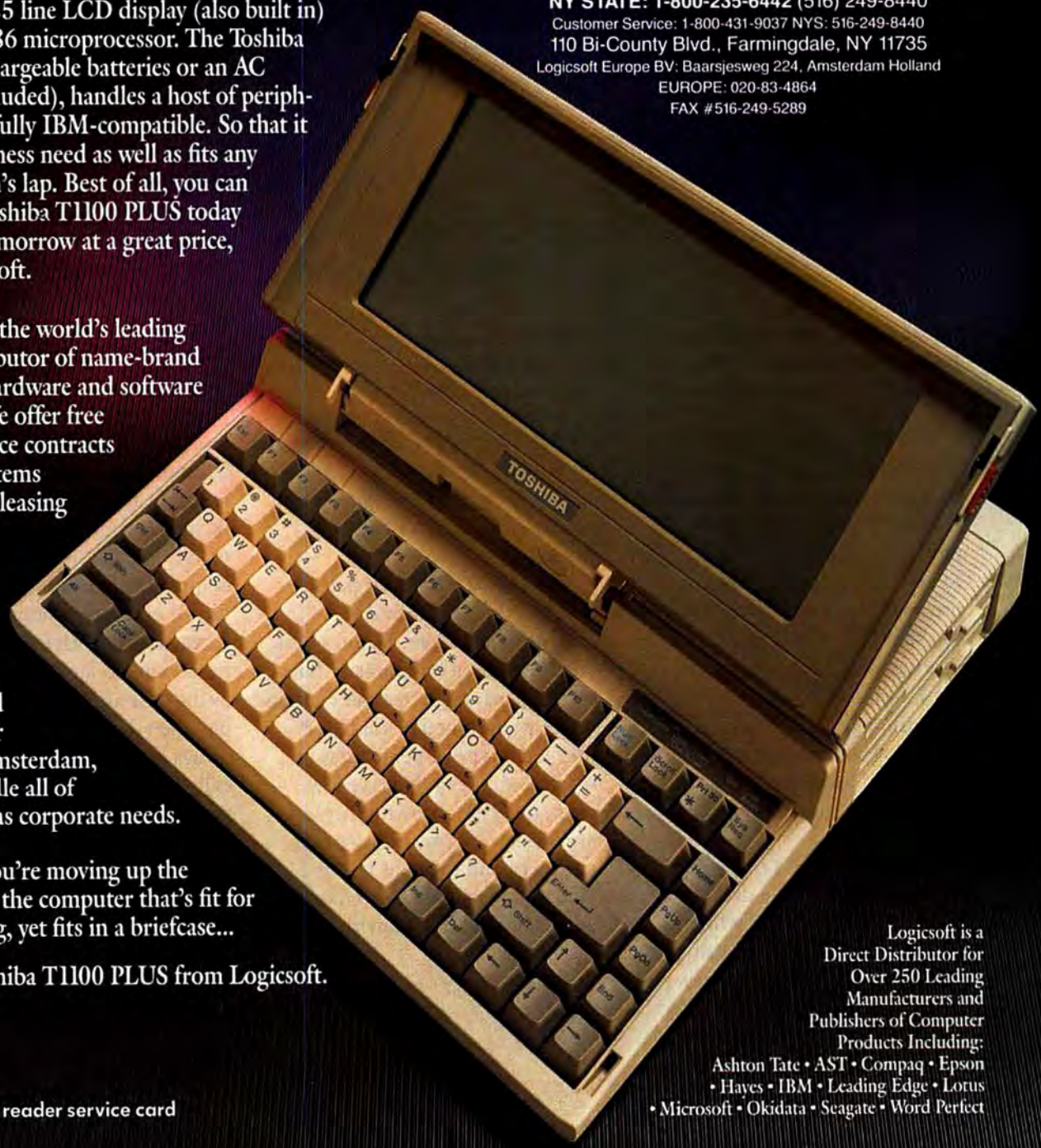


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John Greenleigh

**At $700, the Epson HI-80 offers the ideal low-cost, A-size plotter solution for project management, presentation graphics, and CAD drawing previews.**

At $599, Epson's HI-80 plotter is intended to remove some of the sticker shock from plotter purchasing. The HI-80 is an A-size plotter, designed to accommodate 8½-by-11-inch paper. Except for preview drawings, the machine is too small for architectural or engineering work, but you may find the HI-80 just right for presentation graphics and project management flowcharts. And a 17-inch-by-12-inch footprint means it's less of a desk hog than most printers.

The HI-80 uses a roller-bed design, similar to the drum plotters of old. The paper, which is gripped on the edges by grit-textured metal wheels, moves vertically while the pen moves horizontally. This technology enables the HI-80 to scratch out drawings at 9 inches (of drawn lines) per second—a respectable speed for a plotter of such small size and price.

The HI-80 holds four pens, which fit into a removable-cartridge penholder. Epson offers you a choice of ballpoint or fiber-tipped pens; the latter can contain either water-based or oil-based ink. Each type of pen comes in black, red, green, blue, yellow, cyan, magenta, brown, purple, and orange. Because a cartridge costs $10 and the pens go for $12 apiece, you can afford to have several cartridges loaded with a variety of colors. The ballpoint pens produce fair quality output, although they skip occasionally. The oil-based fiber pens yield much better results but only on expensive film. Unfortunately, the water-based fiber pens—which should produce the best results on paper—were not available for testing.

Although you'd normally connect the HI-80 to your PC via the parallel interface, Epson also offers an optional serial interface board for $150. Installing the board within the plotter's case enables the HI-80 to emulate the Hewlett-Packard 7074 and use the HP Graphics Language (HPGL). This is a nice option for anyone using *AutoCAD* or other software that lacks an Epson plotter driver.

Most PC graphics packages include a driver for the HI-80, so all you need to do is connect the device to your parallel port and begin plotting. The adventurous, however, may wish to write their own programs using plotter commands in a BASIC program, or commands in a word processing file, or even commands in a spreadsheet. With Epson's powerful command language, this isn't as difficult as it sounds. For example, the HB (hatch bar) command draws a rectangle and automatically hatches it with any of six patterns. The well-written and generously indexed manual gives several examples of how to use BASIC programs, text files, and spreadsheets to construct plots.

The HI-80 actually has three command sets of its own: Epson's own plotting command language,

*(continues)*

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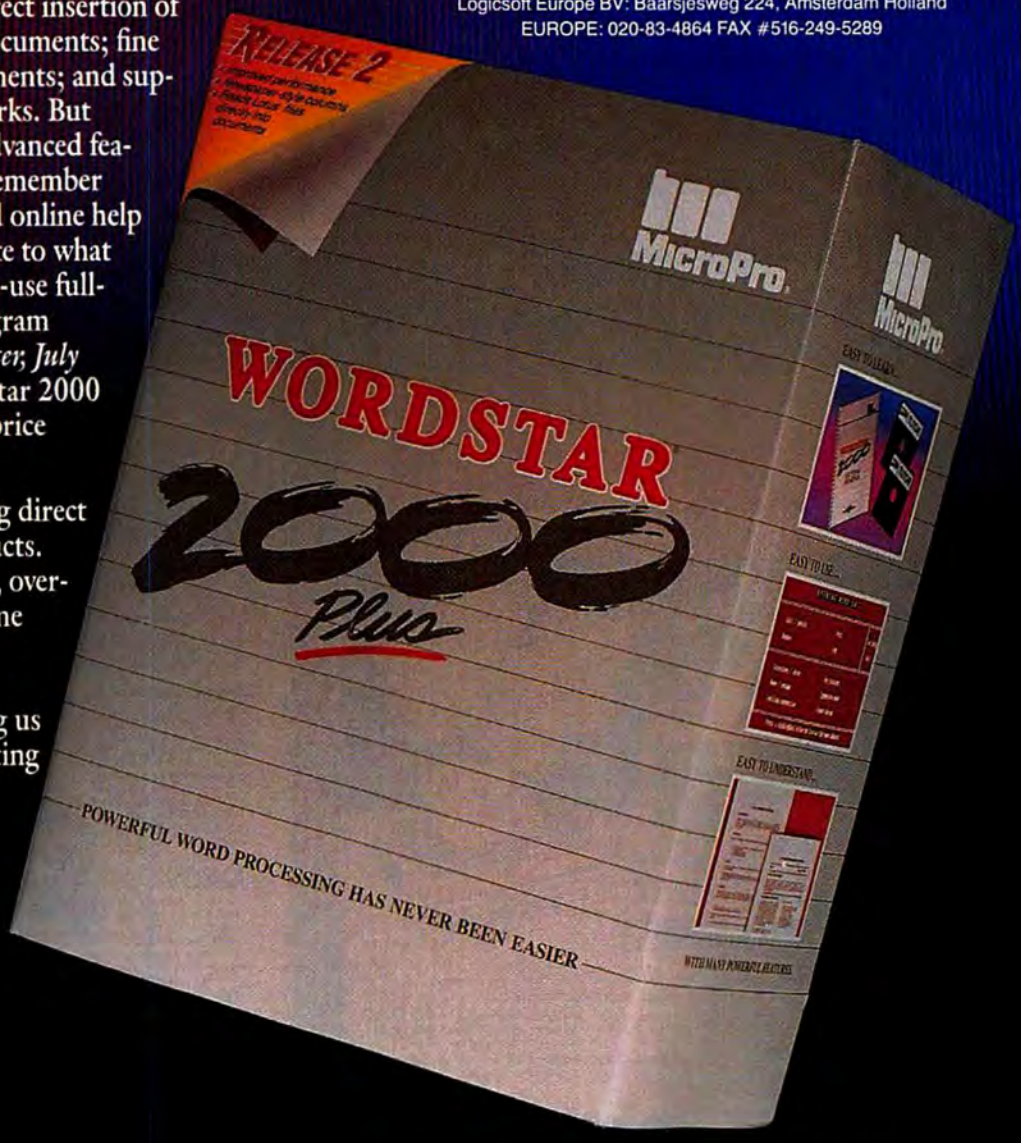


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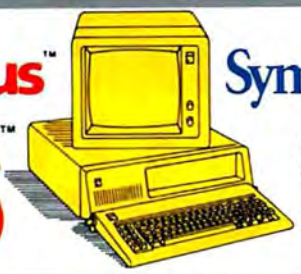

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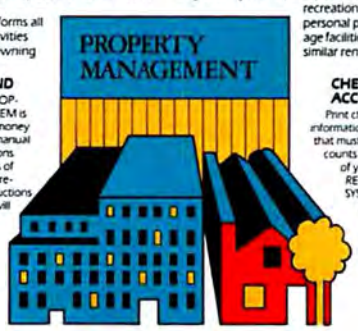


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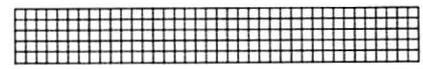

a Graphtec plotter-emulator command set, and a standard Epson printer command set. If you hold down the HI-80's cap/off button while turning the power on, the plotter will wake up thinking it's an FX-80 printer, and it will generate acceptable text output—albeit at a snail's pace.

The registration and alignment of the HI-80 are excellent and reflect the quality of plotters that cost three times as much. True, the ballpoint pens do skip occasionally, but that's a common problem. If color flowcharts and graphics inserts for reports are your bent—and you've had trouble justifying the expense of a plotter for your desk—the HI-80 may be just the ticket. *—Donald B. Trivette*

*HI-80*
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*2780 Lomita Blvd.*
*Torrance, CA 90505*
*800/421-5426, 213/539-9140*
*List price: $599, serial interface $150*

*TJ Byers is a freelance writer and the author of* Inside the IBM PC AT *(McGraw-Hill, Inc., New York, 1986). Eric Brown is a Contributing Editor for* PC World. *Donald B. Trivette is a consultant and freelance writer living in Wrightsville Beach, North Carolina.*


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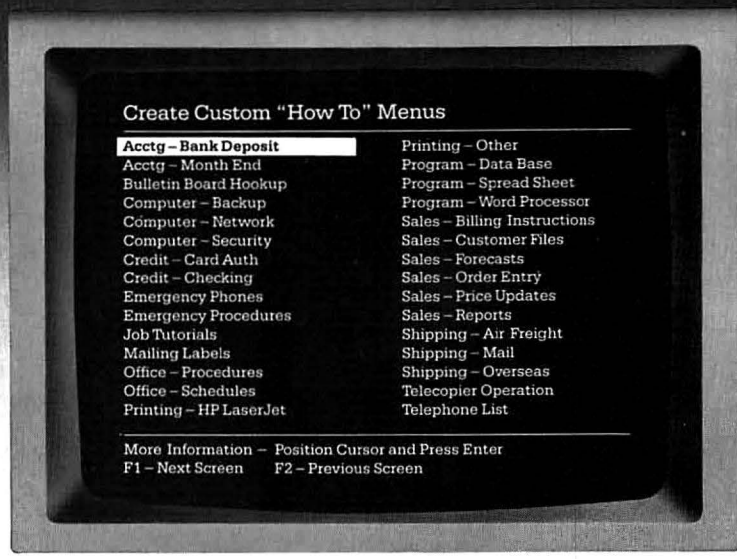


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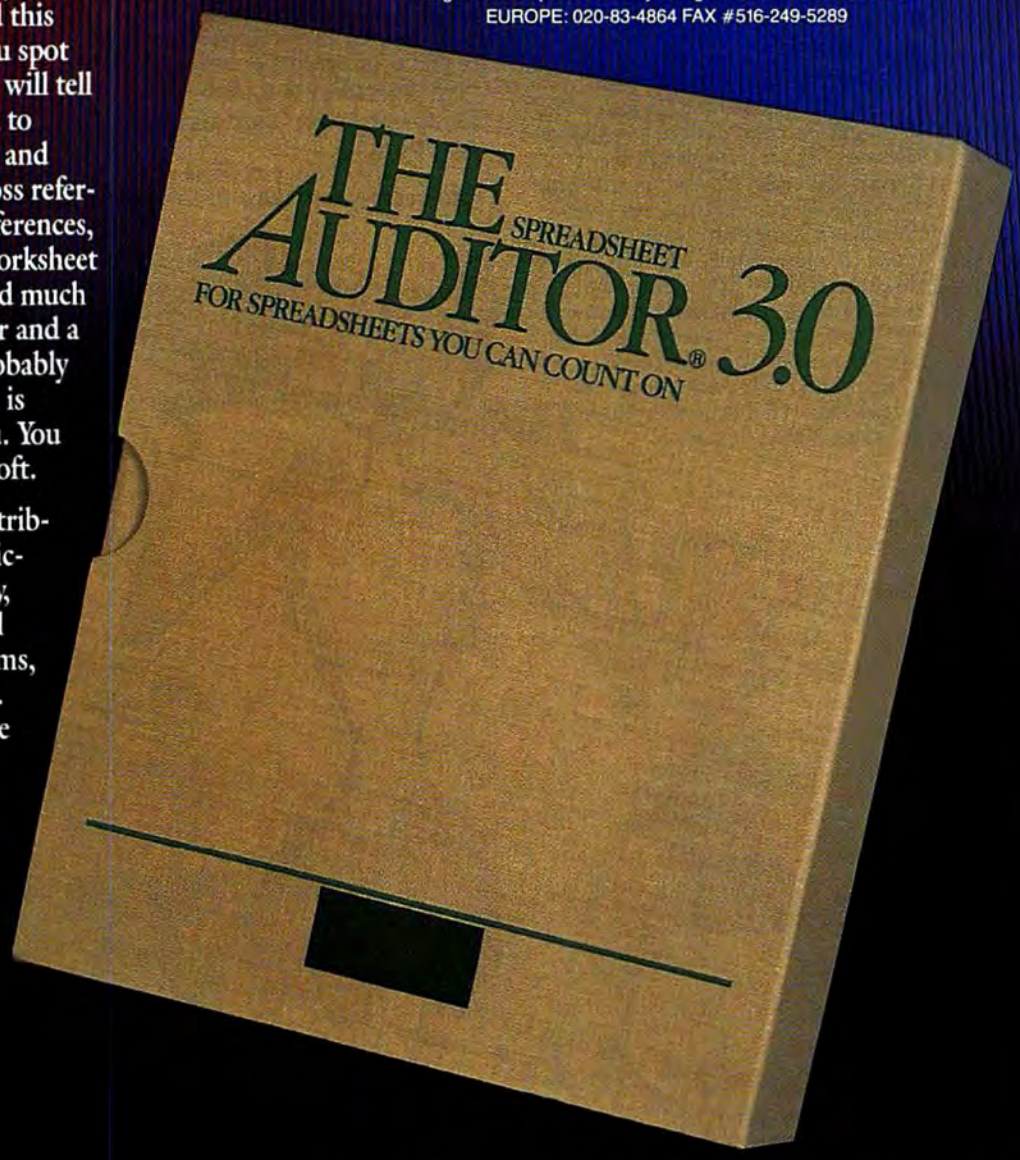


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# From the Software Shelf

***PC World offers first impressions of recent software releases***

This month: Bargain-basement financial forecasting, QuickBASIC made better, the E-mail shuffle simplified, typesetting for the PC, penny-pinching-perfect home accounting, the Master Blaster of batch languages, and saving the family tree

***Edited by Robert Luhn***

## The Forecasting Edge

*The Forecasting Edge* is a compact, concise program that for $99.95 does one thing well—Box-Jenkins time-series forecasting.

Now, there may be a few of you out there who don't know what Box-Jenkins time-series forecasting is. If you've ever used *Javelin*, you've been exposed to the discipline. In a nutshell, time-series forecasting is a statistical technique that examines past financial trends and predicts the effects of their continuing into the future. Until recently, time-series forecasting was mainly the province of economists and other academic types.

*The Forecasting Edge* brings this formidable forecasting tool to business managers. With it, for example, you will be able to analyze past sales performance and predict what the next few years will bring if those patterns persist.

That might seem easy enough, but in reality the cyclical nature of financial trends complicates the process. For example, monthly retail sales typically peak in December and drop in February. Accounting for these cycles is a major statistical challenge.

That's where George Box and Gwilym Jenkins come in. In 1976 they published a set of statistical formulas that can account for cyclical variations when making time-series predictions. *The Forecasting Edge* condenses their formulas into a well-packaged business-oriented program that zeroes in on the ever-important bottom line.

To enter the requisite historical financial data, select the Entry option from the program's command

*(continues)*

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| Built-in Pop-up Firmware | Yes | No |
| Separate Numeric Keypad | Yes | No |
| Screen Type | S-Twist LCD | LCD |
| Keybd. Compat. IBM PC/XT | Yes | No* |
| Total Keys | 85 | 78 |
| Weight | 11.2 lbs. | 12.2 lbs. |

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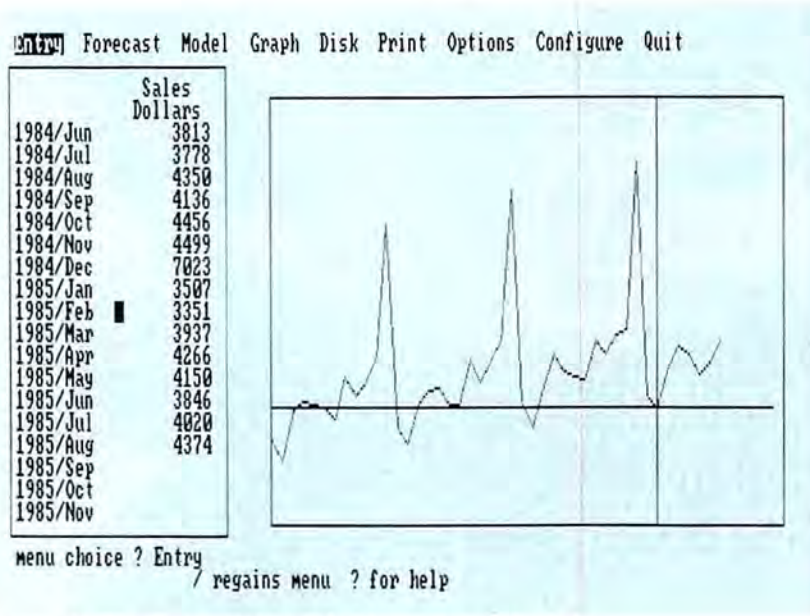


**Screen 1: The Forecasting Edge in action. The left window holds financial data being analyzed; the right window holds an interactive graph of the same data.**

line. The program pops open two windows: The left window contains a single column where you type in the historical information (or import it from *1-2-3*, *VisiCalc*, *dBASE*, or *WordStar*) and specify the time period you want to project; the right window contains a constantly updated *x*-*y* graph of the same data (see Screen 1). A few quick keystrokes instruct the program to build a statistical model of the data.

To build a model, the program evaluates several possible formulas, picks the one that best accounts for your company's past performance, and uses it to make financial projections. Once *The Forecasting Edge* has thoroughly chewed on the facts, you select Forecast from the menu, highlight the future period in the left window, and press <Enter>. The program fills in the blanks with extrapolated data and redraws the graph in the right window accordingly.

The process isn't particularly speedy. In one test using the slowest (but most accurate) of the three available model-building methods, a dual-floppy PC took 7 minutes to digest five years' worth of monthly sales figures. Speed will naturally improve on a system equipped with a hard disk or a faster microprocessor.

Of course, accuracy is even more important than speed. To test the program's implementation of Box and Jenkins's wizardry, I took the duo's original real-life test data (12 years of international airline ticket sales figures) and poured the first 5 years into the program. I then asked *The Forecasting Edge* to predict passenger loads for December, 3 years down the line. In its most accurate (but slowest) mode, the program predicted that 310,000 passengers would take wing; the actual load for that year was 306,000 passengers. For $99.95, accuracy within 1 percent is pretty good figuring.

In addition to pinpointing projections, *The Forecasting Edge* lets you track a selected leading indicator (such as the consumer price index) and chart its likely effect on your business. You can also perform limited "goal seeking." For example, if you want to increase sales by a certain percentage, *The Forecasting Edge* will consider the notion and then supply the hard sales goals you will have to reach.

Like so many programs that use complex and relatively arcane statistical techniques, *The Forecasting Edge* is essentially a black box. You drop data in, and the desired results pop onto the screen. Not surprisingly, the program's user manual is light on theory, focusing instead on program operations. *The Forecasting Edge* is not nearly as versatile as *Javelin* and other high-priced forecasting tools; imported data must be poured into the program's single-column format, and printing functions are extremely limited. Still, it does what it does exceedingly well and at a price nearly any business can afford. —*Richard Baker*

*(continues)*

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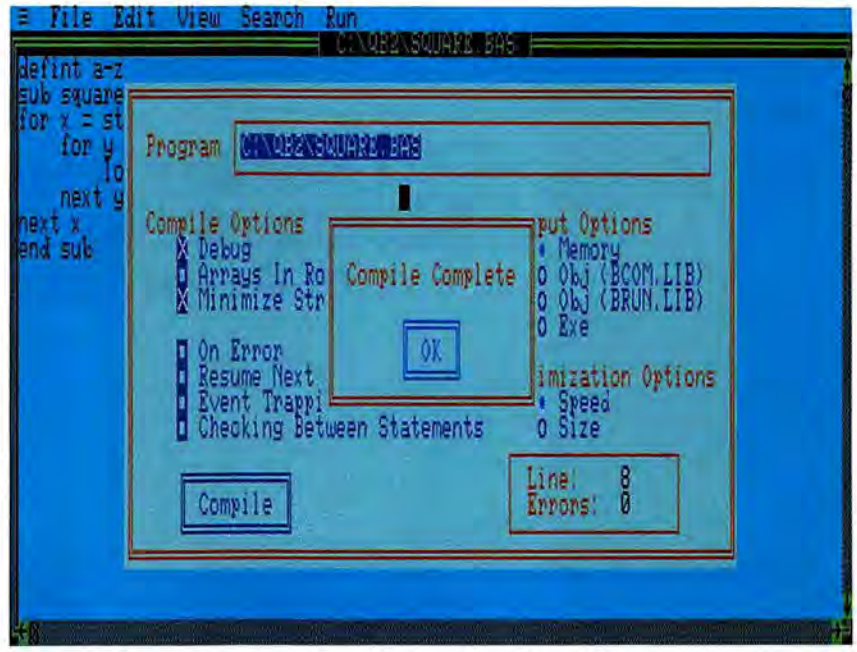


**Screen 2: Newcomers and professionals alike will take to QuickBASIC's pulldown menu. Compiling a program is as easy as loading a source code file and picking a single menu selection.**

## QuickBASIC

I've probably heard dozens of contract BASIC programmers wail enviously about Borland International's Turbo Pascal: If only BASIC featured Turbo's simple programming environment, quick compiles, and ability to repair errors on the fly and then continue compilation. In short, if BASIC combined the tools of a compiler with the versatility of an interpreter, they could quit yammering and get back to work.

Now BASIC professionals will have to find something else to fret about. Microsoft has released QuickBASIC 2.0, arguably the most significant language product of 1986. This new version of the popular compiler packs all the traditional utility of interpreted BASIC, the developer-coddling environment of Turbo Pascal, and a Borland-like $99 price.

Like Zedcor's ZBasic, QuickBASIC 2.0 essentially meshes an interpreter, compiler, and program editor into one neat package (for more information about ZBasic, see *From the Software Shelf, PCW,* August 1986). As with an interpreter, you write, test, debug, and later compile programs in one environment. The sparse but utilitarian editing functions are easily plucked from QuickBASIC's new pulldown menu with a mouse (see Screen 2). However, if you lack an electronic rodent, you can build your larger programs with a more versatile ASCII text editor (such as *PC-Write*) and import them to QuickBASIC.

Debugging is a breeze. Unlike with most interpreters and compilers, you can view a running program in one user-defined window and the actual code in another. (Keep in mind, however, that any BASIC program that tries to write to the screen in an area occupied by the debug window causes a runtime error and stops the process cold.) QuickBASIC naturally offers a TRON/TROFF function, but for greater control the STEP function executes one line at a time. With the ANIMATE function, you can vary execution speed and specify the number of lines you want to view as execution proceeds. Unlike traditional compilers, QuickBASIC doesn't produce reams of error messages when you try to compile a syntactically wobbly source code file. Instead, it immediately highlights the first error; you can then correct it and skip to other faulty entries in sequence by pressing <F6>.

*(continues)*

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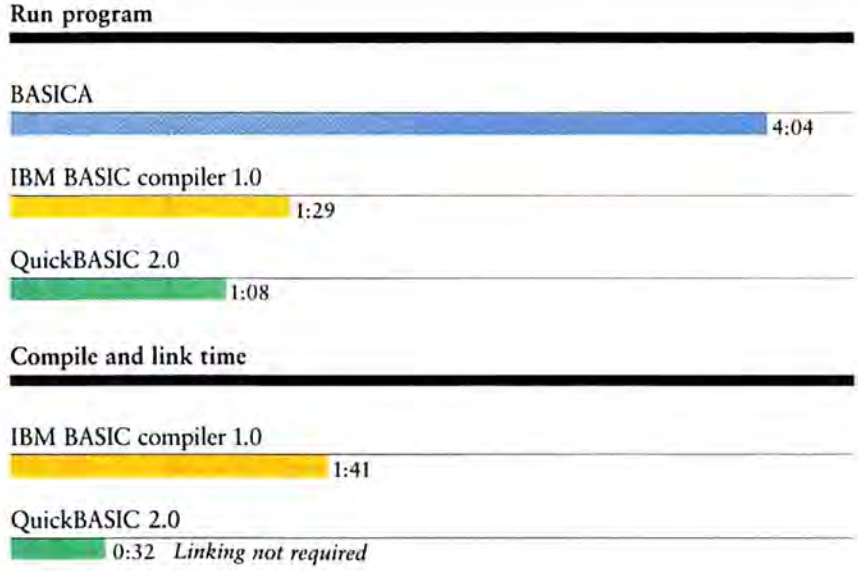
QuickBASIC makes compiling simpler, too. Most BASIC compilers force you to learn a complex command syntax. Worse still, you must run a separate LINK program to create an executable program—acceptable for professional programmers, but hardly inviting to the legion of BASIC dabblers looking to speed up their interpreted programs. QuickBASIC makes life easier for professionals and amateurs alike by relegating compile options to a menu. To select a compiler switch (for event trapping, debugging features, error trapping, and so on) you merely go down a list and pick your poison. And the list will warm many a programmer's cockles: You can compile and link a program in one step or produce an intermediate object file. The latter can be linked to one of two different libraries, enabling you to produce small modular programs that can be used over and over to build larger applications. Best of all, you can compile a program to memory—a previously unheard-of feature that speeds the entire process.

As an extra bonus, QuickBASIC will optimize code for either the quickest execution or the smallest possible program size. And though compilation speed is a relatively unimportant measure of value, QuickBASIC is markedly faster than its predecessors (see Figure 1).

If you yearn to banish the dreaded GOTO statement and impose some structure on your code, Microsoft's addition of a multiline

**Figure 1: QuickBASIC squares off against two old chums. The application is the 451 BASIC data base program that computes changing averages, selectively sorts data, accumulates the top ten performers in a given category, and prints the results to screen. This is a real-world test involving intensive calculation and input/output (times in minutes:seconds).**




IF . . . THEN . . . ELSE . . . ENDIF statement to BASIC will be particularly welcome. In the past, a control statement would probably look something like this:

```
2300 INPUT "What is your
        guess"; GUESS
2400 IF GUESS<X THEN
        PRINT "TOO LOW":
        GOSUB 10000:
        C=C+1:GOTO 2700
2500 IF GUESS>X THEN
        PRINT "TOO HIGH":
        GOSUB 12000:
        C=C+1:GOTO 2800
2600 IF GUESS=X THEN
        BEEP:GOTO 3000
```

Using QuickBASIC 2.0's multiline control statement and line labels, the result is far more readable and meaningful:

```
INPUT "What is your guess";
  GUESS
IF GUESS<X THEN
    PRINT "TOO LOW"
    GOSUB Under
    COUNT% =COUNT% +1
  ELSEIF GUESS>X THEN
    PRINT "TOO HIGH"
    GOSUB Over
    COUNT% =COUNT% +1
  ELSEIF GUESS =X THEN
    BEEP
    GOSUB YouGotIt
    VICTORY% =1: G=99
END IF
```

*(continues)*

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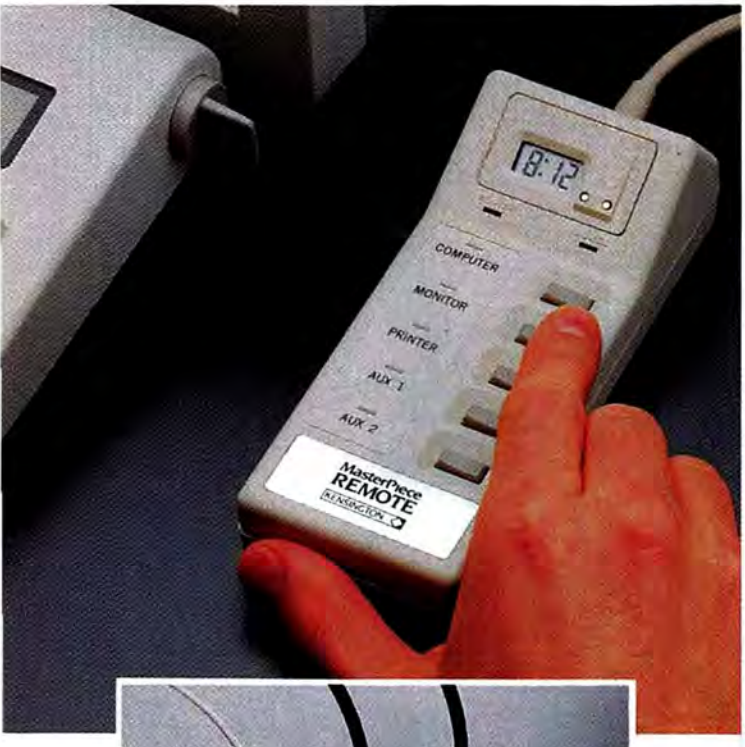

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For added structure (and fewer debugging headaches), you can also use subprograms—FORTRAN-like structures delimited by SUB and ENDSUB statements.

Microsoft has often ignored the masses in favor of power users, but QuickBASIC 2.0 is positively democratic, with copious, logically arranged information available to programmers at all levels. The product disk includes a gaggle of sample programs that demonstrate new features and proper programming style. The user manual is readable, well organized, and generally thorough. However, it lacks an index card of function key assignments and a detailed discussion on using interpreted BASIC files—the number one source of confusion among novice and intermediate BASIC programmers.

Nonetheless, QuickBASIC has quelled—at least until the next competitive cycle—the urge of professional BASIC programmers to convert their wares into a more efficient language. At the same time, QuickBASIC's delightful new interface and low price will painlessly introduce thousands of users to the advantages of a compiler. They might also be further sated (and lured away from Microsoft's offering) by Borland International's Turbo BASIC, which reportedly sports many of QuickBASIC's amenities and then some. Either way, the market will finally silence those who want their BASIC cake with Turbo Pascal icing. *—Jeff Angus*

*QuickBASIC version 2.0*
*Microsoft Corp.*
*Box 97017*
*16011 N.E. 36th Way*
*Redmond, WA 98073-9717*
*800/426-9400, 206/882-8088*
*Washington*
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*Requirements: 256K, two disk drives, DOS 2.00 or later version; mouse optional*
*Not copy protected*

## Get

In the old, pre-PC days, picking up the office mail meant rummaging through an in-box. Today, thanks to the latest in time-saving, productivity-enhancing computer hardware, you can log on to two or three on-line services—and still discover nothing's there. After many fruitless trips to the electronic mailbox, one is apt to put the job off.

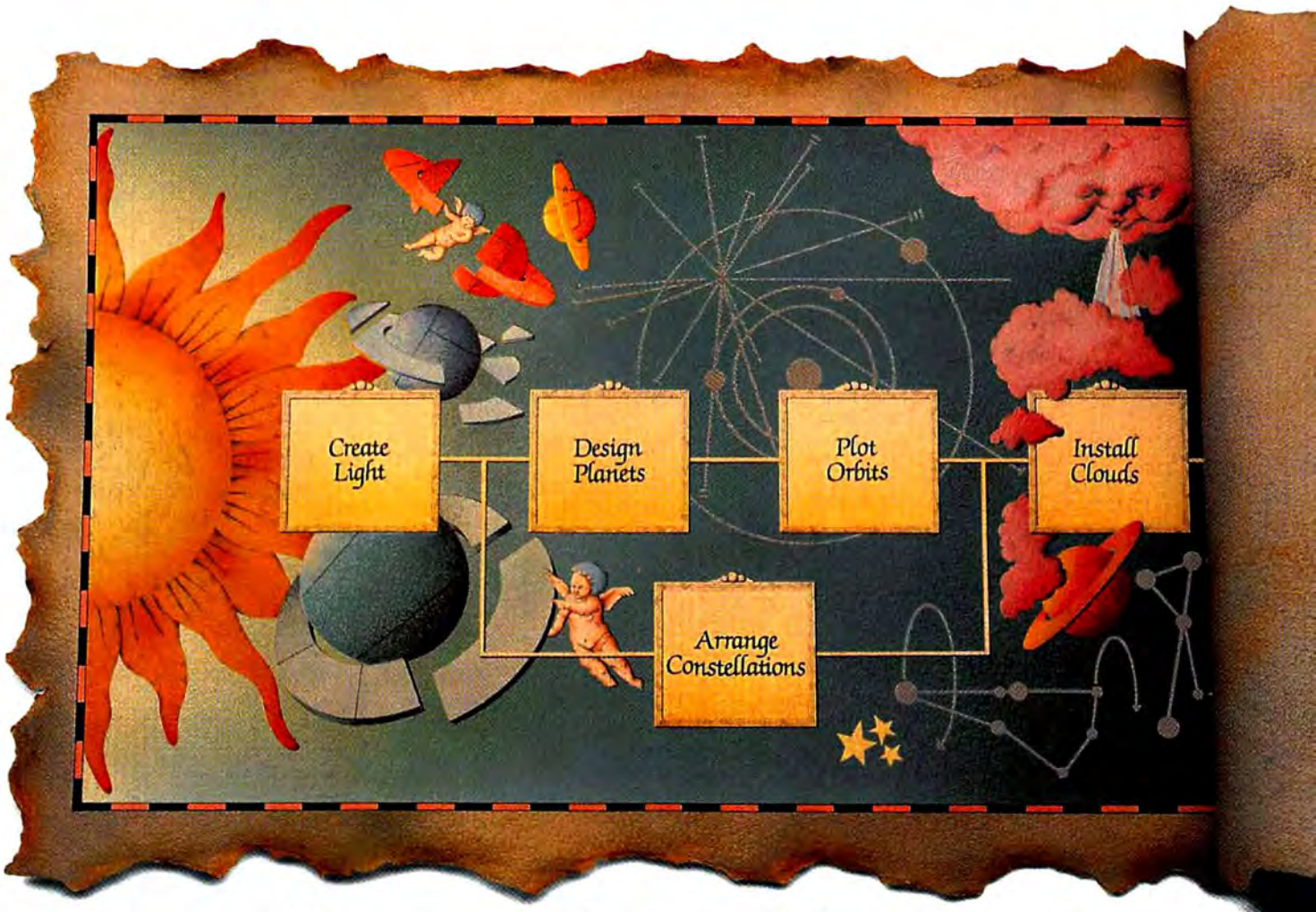
In the meantime, vital messages arrive, marry, grow old, begin to forget where they put their car keys, and eventually collapse into stray electrons. Fortunately, Cygnet Technologies has created *Get*, an unintimidating memory-resident utility that automatically checks for electronic mail on as many as 15 services, taps you on the shoulder, and helps you save your messages once you've read them.

New PC users and other procrastinators will find *Get* a welcome relief. The manual is brief and the program almost automatic once you install it. And because *Get* works in the background, you can use other applications while it probes for electronic mail at the specific times and intervals you've indicated. Configuring *Get*—specifying which services to call and when, communications parameters, and so on—is accomplished by running a prompt-driven installation program and answering a few questions.

But if terms such as parity, stop bits, and data bits make your eyes glaze over, don't fret. Cygnet provides the settings for MCI Mail, CompuServe, the Source, and most major on-line services that offer electronic mail; you merely supply *Get* with account names, passwords, and other user-specific information.

Once *Get* is properly installed, the fun begins. Flick on your modem, load *Get*, and then run your

*(continues)*

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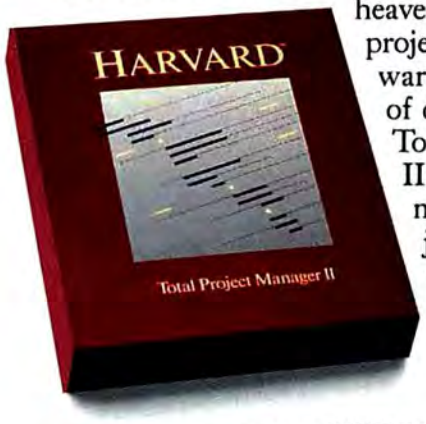


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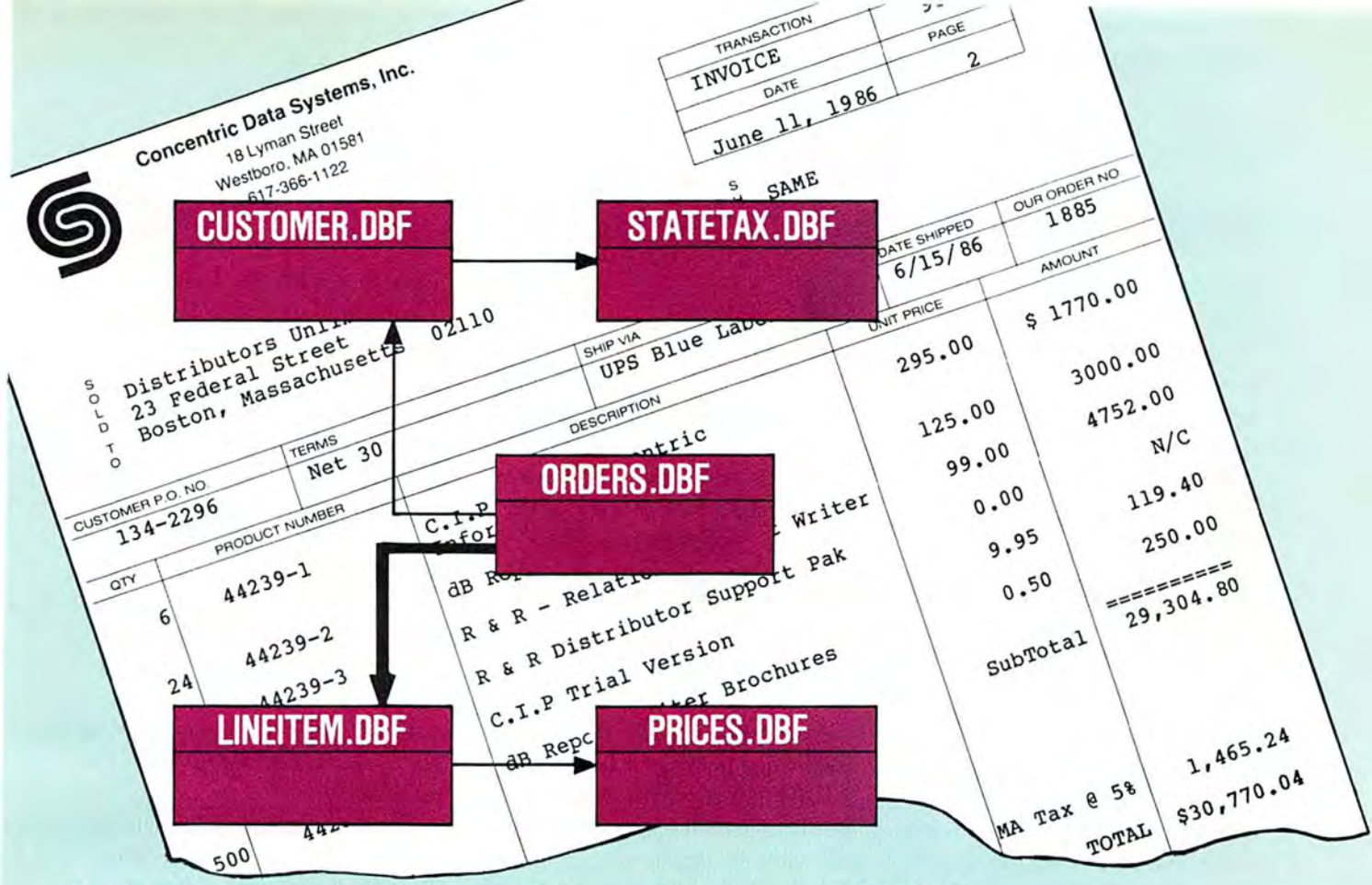


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application program. As you recalculate a worksheet or edit a document, *Get* stealthily dials each service and snoops around looking for recent arrivals. If a letter is waiting, *Get* flashes a message in the upper-right corner of the screen. To read your mail or store it to disk (or to send a message), simply type <Alt>-G to pop up *Get*'s menu, enter the password you've defined, and issue the appropriate commands. Pressing <F1> returns you to the original application.

*Of course, Get* can't do everything—yet. The program cannot automatically read and store electronic mail, but a version now in the works will add this feature and more. Even so, the current version is a blessing to the modem-phobic. If telecommunications isn't your cup of tea, or if you're tired of trudging through a passel of electronic services, *Get* is indispensable. *—Lori Bragg*

*Get version 1.04*
*Cygnet Technologies, Inc.*
*1296 Lawrence Station Rd.*
*Sunnyvale, CA 94089*
*800/621-4292, 800/331-9113*
*California, 408/734-9946*
*List price: $89.95*
*Requirements: 192K, two disk drives, DOS 2.00 or later version, 300-, 1200-, or 2400-bps Hayes-compatible modem*
*Not copy protected*

## MP-XL

The desktop publishing gold rush is on, and the mass of almost-maybe-to-be-released vaporware has created a veritable consumer fog bank. Software companies that don't know indention from indentation tout products via lavish and expensive advertising. To users with a real interest in the market, navigating this pea soup in search of a capable desktop publishing package is frustrating indeed. For the print shop that needs to generate income, finding the right PC typesetting program may be vital to keeping the doors open.

Enter *MP-XL*, a professional typesetting package for the PC and Cordata LP-300 Laser printer. Why "professional"? Because *MP-XL* offers many of the features professional type houses have come to expect from a typesetting program—basic features such as multiple typefaces and columns; intermediate features such as the ability to set type in sizes ranging from 6 to 36 points and to include graphics and rules; and advanced features such as macros, kerning, and reverse leading.

Keep in mind that *MP-XL* is a bread-and-butter typesetting package, not a what-you-see-is-what-you-get desktop publishing program à la *PageMaker*. As with a traditional typesetting program, you embed control codes within a document. *MP-XL* commands, however, control the look of a document down to the last hairline. In fact, *MP-XL*'s author was one of the founders of Autologic, which markets a line of professional phototypesetters.

*MP-XL* has only 94 commands, so learning the program is relatively easy if you're versed in typesetting concepts and practices. Commands are mnemonic—for example, <ql> indicates a quad left, <cp>*n* indicates a change in the point size of *n*, and so on. Functions for drawing rules and simple boxes are also stored in *MP-XL*'s toolbox.

Typesetting macros known as formats simplify the process further. The program can store as many as 200 formats holding either typesetting codes or boilerplate text—in short, the sum total of a document's appearance. To invoke a format, you type <uf>*n*, where *n* is the number assigned to the format. Operations are thus streamlined, since one person can learn *MP-XL* intimately and create the necessary formats, while others with less experience can do the actual formatting and printing.

Remember that *MP-XL* is a text formatter, not a text editor. You create the text to be typeset with any ASCII word processor and insert the appropriate codes. *MP-XL* then takes the document and essentially compiles it, generating an output file holding the correct

*(continues)*

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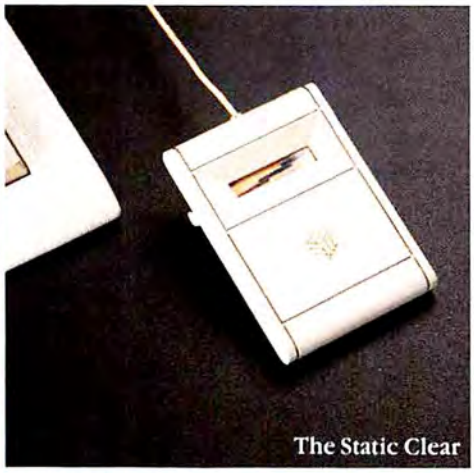

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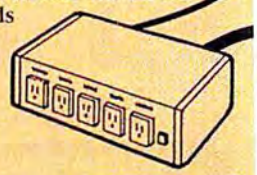

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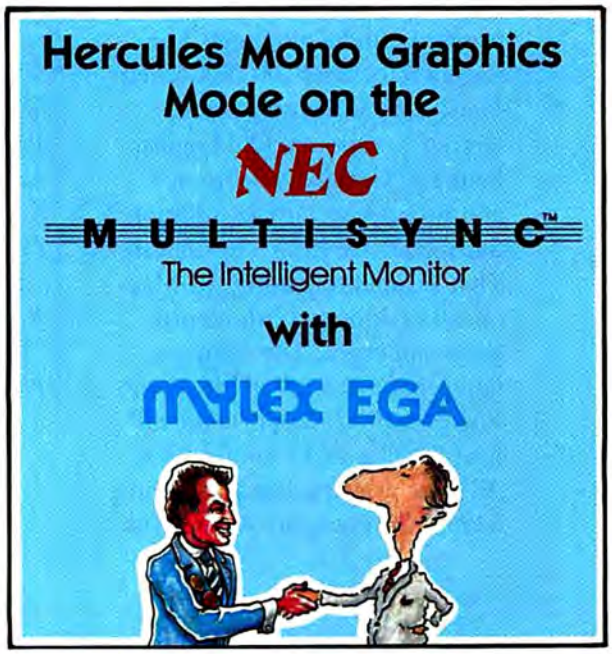


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escape codes for the Cordata Laser printer. Once created, this output file can be used over and over again.

You integrate digitized images into text in a similarly straightforward way. Pick the spot, insert the <gc> command followed by the digitized image's file name, and specify the offset from the command's position in inches. Keep in mind that *MP-XL* accommodates only images digitized by the Microtek, Canon, Ricoh, and compatible scanners. If you lack a scanner, MicroPrint-X scans images for a very reasonable fee.

Is *MP-XL* right for you? The product has been on the market for over a year, which means most of the bugs have been found and fumigated. If you've ever waited half an hour for a PostScript file to print out, you'll also appreciate *MP-XL*'s speedy print routines, which typically force a heavily formatted page out of the Cordata printer in under a minute. The program includes 100 disk-based fonts, such as Times Roman, Helvetica, Optima, Old English, Bauhaus, Gothic, Park Avenue, and Broadway, with 83 additional fonts available from VS Software. That's something no PC or Macintosh desktop publishing program can claim. The company notes that a recently released version of *MP-XL* supports the HP LaserJet Plus and Canon LBP-8 A2 laser printers. For a whopping $4995, the company will provide you with *MP-X*, a version designed solely to drive Autologic typesetters.

*MP-XL* admittedly can't match the allure of *PageMaker* or *Ventura Publisher*. The program's ability to import images is limited; but this is, after all, a text-oriented workhorse for those who produce everything from massive classified ad listings to 200-page company manuals. If your company needs to produce typeset copy by the bushel, *MP-XL* merits your consideration. *—Bill Crider*

*MP-XL*
*Micro Print-X, Inc.*
*P.O. Box 581*
*Ballinger, TX 76821*
*915/365-2343*
*List price: $495*
*Requirements: 512K, hard disk strongly recommended, DOS 2.00 or later version, Cordata LP-300 Laser printer*
*Not copy protected*

*VS Software Fonts*
*VS Software*
*P.O. Box 6158*
*Little Rock, AR 72216*
*501/376-2083*
*List price: $50 to $250 depending on font package*
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## CashTrack

I'm no bookkeeper, and balancing my checkbook often seems tantamount to reconciling the national debt. But when I heard that Sub-Logic Corporation (makers of *Flight Simulator* and *Jet*) had produced *CashTrack*—a home accounting program—I knew I had found the answer. If they could teach me how to fly an F-16, I reasoned they could show me the path to financial order.

*CashTrack* helps you organize and track every penny of your household income and expenses. It creates a comprehensive record of your personal financial activity and provides a convenient way to categorize and summarize information about your financial status.

Armed with my checkbook, a handful of receipts, and *CashTrack*, I set up my own home-accounting system. In less than 2 hours, I knew how much I was worth, the amount of liquid capital I had on hand, and where all my money was going.

The program is entirely menu-driven, so you don't have to memorize obscure command sequences. To enter transactions, write and print checks, reconcile bank and credit card statements, display and print reports, and change previously entered data, you merely pick the appropriate option from

*(continues)*

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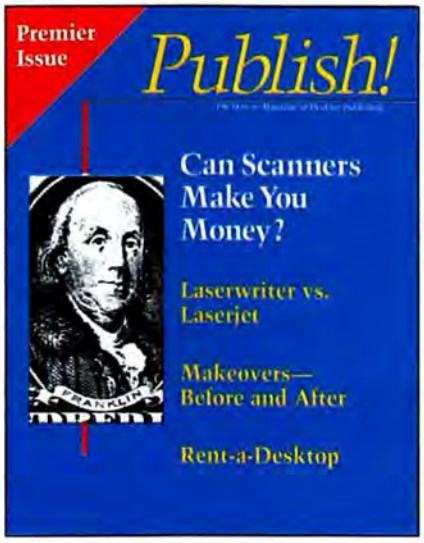


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the main menu. The program prompts you from beginning to end.

In keeping with its flexible nature, *CashTrack* can be as simple or complex as you want. Beginning home accountants won't have to fuss with setting up accounts—*CashTrack* does that job for you. You can modify these categories to fit your own financial situation or discard them and create your own. If you're the phlegmatic type, *CashTrack* can easily serve as an electronic shoe box that merely stores the financial data you toss in until tax time; for those on the cutting edge (did you pay for your house with a MasterCard?), the program can generate up-to-the-minute reports of your financial well-being. *CashTrack* can also help you manage stocks and bonds (displaying gains or losses for any period) and show your charge account balances (or just the relevant interest) in a glance. With *CashTrack*, you always know what's in your reservoir of liquid assets, right down to the change in your procket.

Working with your raw figures, the program creates a meticulous cash flow record and produces a slew of handsome, comprehensible reports (see Figure 2). Cash flow reports can indicate income and expenses in five different levels of detail for any month, range of months, or year. You can make projections and compare actual cash flow to your budgeted calculations. Net worth reports reveal what you owe versus what you own, while transaction and loan reports help you keep tabs on your progress toward a debt-free life. A few keystrokes generate any of these predesigned reports either on screen or at the printer.

John & Mary Sample
Net Worth
Feb. 28, 1985

Page 1 of 1
Printed 2-1-87

| | | | |
|---|---|---|---|
| Assets | | | |
| Cash | | | |
| Pocket Money | 1,498 | | |
| Checking Account | 3,061 | | |
| Money Market Account | 3,963 | | |
| Total Cash | | 8,522 | |
| Receivables | | | |
| Loan to Sarah | 50 | | |
| Cable TV Deposit | 20 | | |
| Mortgage Escrow Account | 1,480 | | |
| Total Receivables | | 1,550 | |
| Life Insurance Cash Value | | 800 | |
| IRA | | 4,000 | |
| Securities | | | |
| Stocks | | | |
| General Motors | 1,800 | | |
| Dovetail Software | 10,000 | | |
| Total Securities | | 11,800 | |
| Personal Property | | | |
| Chevy | 2,500 | | |
| Toyota | 10,155 | | |
| IBM Personal Computer System | 2,000 | | |
| Furniture | 5,000 | | |
| Appliances | 1,500 | | |
| Total Personal Property | | 21,155 | |
| Home | | 120,000 | |
| Total Assets | | | 167,827 |
| Liabilities | | | |
| Charge Accounts | | | |
| VISA | 285 | | |
| Mastercard | 389 | | |
| Sears | 300 | | |
| Total Charge Accounts | | 974 | |
| Installment Loans | | | |
| Auto Loan | 6,891 | | |
| Mary's Student Loans | | | |
| NDSL | 1,150 | | |
| Total Installment Loans | | 8,041 | |
| Mortgage Loan | | 58,172 | |
| Total Liabilities | | | 67,187 |
| NET WORTH | | | $100,640 |

**Figure 2: CashTrack's net worth report is detailed yet straight to the point.**

Unlike most documentation on the market, SubLogic's user manual is a succinct, thorough, and jargon-free guide to program operations. It includes a *CashTrack* tutorial and takes the time to explain a few of the bookkeeping concepts and terms used throughout.

*CashTrack* is foolproof, fastidious, and quick. It warns you when you select an inappropriate function and refuses to budge until you feed it information in the proper form. Even the little things are covered, like tracking check numbers (by specific bank if you use

*(continues)*

In the past, word processing software was either easy to learn and use, or fast and powerful.

Never both, sometimes neither.

*New OfficeWriter 5.0.*
*The simplicity you want with the power you need.*

OfficeWriter 5.0 was designed for people who work with computers but don't think like them.

In short, it's wonderfully simple to operate (like the things of your childhood).

It quickly creates confidence rather than anxiety (which makes you look smart for buying it).

And it has the speed, features and power to keep you ahead of the game (which makes you glad it's around).

And while the ideas behind OfficeWriter are new, the principles on which it was built are well established.

In fact, *PC World* described us as ... "Approaching perfection. Office Solutions has done a fine job of integrating power and ease of use into a product ... for a full range of office jobs ..."

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OfficeWriter 5.0

# Until now, all word processing software fell into one of these two categories.

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

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

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## FEBRUARY CASE HISTORY

Elroy Bond, Vice President and Director of Data Processing at Golden State Mutual Life Insurance had a problem with data transmission. The difficulty was his telecommunications equipment. No matter how reliable and easy-to-use his PC based system was, if the phone lines were down or his PC operator was ill, he would end up sending disks through the mail from their branch offices in Winston-Salem, N.C. and Compton, Westwood, and Los Angeles, CA. Besides the hassle of copying a disk and using a disk mailer, there was always the possibility of having to resend the disk because of damaged data.

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more than one) and ATM transactions. The program will even print continuous-form checks. One special note: Like all SubLogic products, *CashTrack* does not work with memory-resident utilities.

*CashTrack* can't tackle a complicated set of company books—it's just a straightforward home accounting program that delivers on its promises. *—Charles Gulick*

*CashTrack*
*SubLogic Corp.*
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*List price: $149*
*Requirements: 128K, one disk drive, DOS 2.00 or later version*
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## Extended Batch Language

If you've ever introduced a computer neophyte to DOS, you've probably discovered the effectiveness of the A> prompt as a tool of intimidation. When a newcomer turns on a PC, it whirs and whistles as it performs a lot of seemingly important internal gyrations, displays A>, and then stops dead in its tracks. Except, of course, for that insistent cursor that seems to shout, Don't just sit there, *do* something.

Every semester I introduce DOS to a new crop of college students, many of whom have never sat in front of anything more interactive than a television screen. And every semester I wonder if there's some way of masking the vagaries of DOS so my students can concentrate on the application at hand.

Every semester until now, that is. Thanks to Seaware Corporation's *Extended Batch Language (EBL),* my students can run a number of programs without ever confronting the dreaded A> prompt or issuing a single DOS command. Using *EBL*'s sophisticated batch processing talents, I created a menu-driven DOS shell that painlessly guides students through the selection and execution of a particular application. *EBL* is even powerful enough to run a program demonstration from start to finish, loading the application, answering program prompts, and entering the data required for the demonstration.

What we have here is no simple extension of DOS's batch language, but rather, something akin to an intuitively easy high-level language. DOS's batch processor, by comparison, is dim-witted, capable only of automating simple tasks (such as logging on to a subdirectory) and accepting limited information from the DOS command line. *EBL* corrects these oversights with READ statements that pass data to another program directly from the keyboard, from a file, or from a special section of memory reserved for *EBL*. An *EBL* application can even capture data from the screen and act on it. Thus *EBL* could easily automate the compiling and linking of a program, evaluate the linker's output, and determine whether to

*(continues)*

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continue the process or to stop so that the programmer can correct compiler errors. *EBL*'s talents could just as easily be used to create an automated hard disk backup system.

Not surprisingly, *EBL* packs 25 user variables (compared to the 10 available with the DOS batch processor), as well as several dedicated variables such as %V, which can pass the default disk drive name to another program. *EBL* can search subdirectories for a file; determine the file's full path; control screen colors (at the DOS level); print the time and date in a number of formats; chain batch files together; call batch file subroutines; perform integer or floating-point math calculations (using an 8087 coprocessor, if installed); execute complex IF . . . THEN . . . ELSE constructs; pass parameters to other batch programs; beep the PC's speaker; and send control codes to a printer that can trigger microjustification or select a LaserJet cartridge font.

The package includes a thorough 350-page manual and a generous selection of sample programs. Even PC-shy users (like my students) can become proficient at writing *EBL* programs. Whether you chafe at the limitations of DOS's batch language or simply want to create a friendly, customized user interface, *EBL* is well worth investigating. At $49, it's an unbelievable bargain. —*Dennis Dykstra*

*(continues)*

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*Personal Ancestral File* was developed by the Mormon church to assist its members in genealogical research. The Church believes that a family will continue throughout eternity if members are properly "sealed"; since Mormons may seal ancestors by proxy, recording and preserving family ties is important. This may explain why *Per-*

*(continues)*

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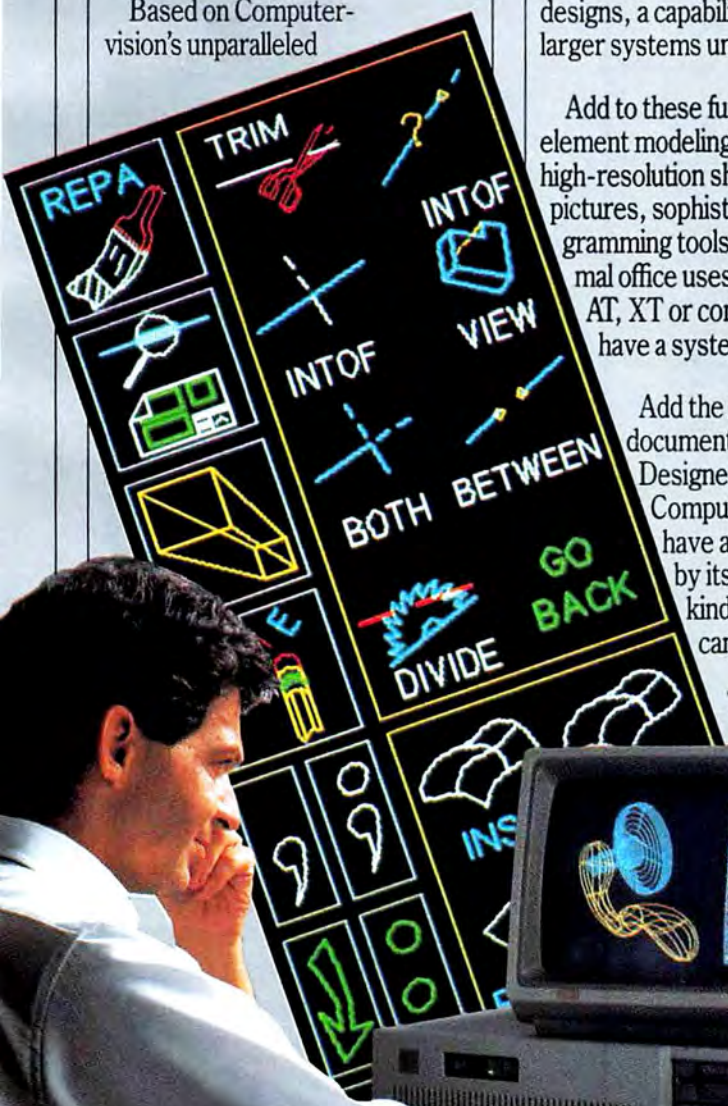

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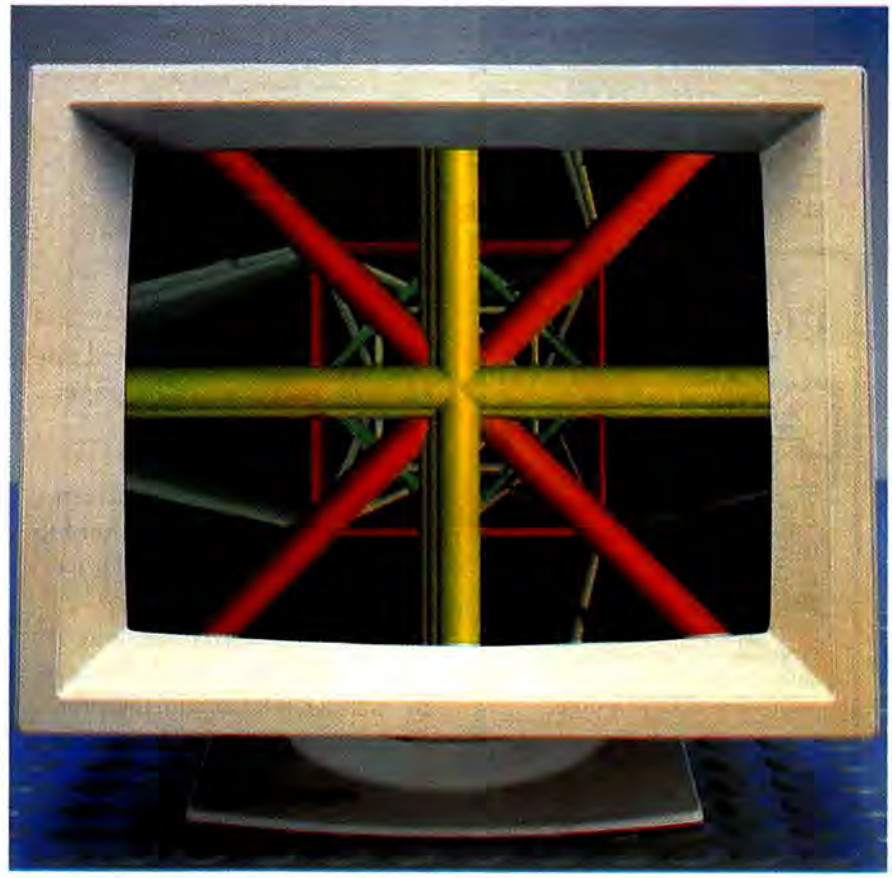

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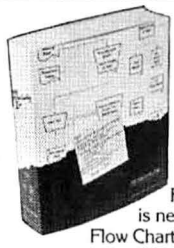
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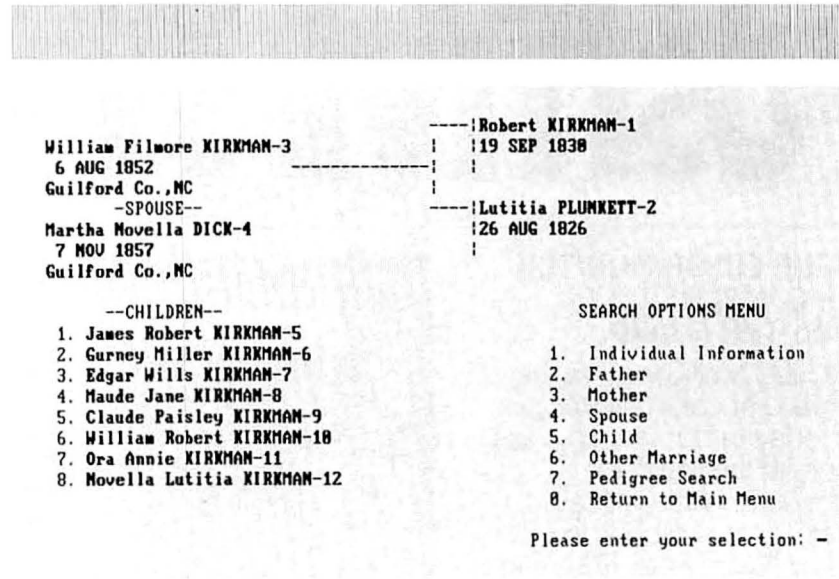


Screen 3: Personal Ancestral File can generate a pedigree on screen or on paper.

display a pedigree line on screen, and even compute the relationship of any two people in the file (see Screen 3).

*Personal Ancestral File* does what it does in a logical, thoughtful manner. The documentation discusses genealogical procedures and program operations throughly and is well indexed. There's even a user hot line. *Personal Ancestral File* would be a bargain at three times the price. *—Donald B. Trivette*

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*Richard Baker is a freelance writer and the author of* dBASE III Plus: Advanced Applications Without Advanced Programming *(TAB Books, Blue Ridge Summit, Pennsylvania, 1986). Jeff Angus manages publications production for the Software and Educational Products Group at Boeing Computer Services. Lori Bragg is the Editorial Administrative Assistant for* PC World. *Bill Crider is a microcomputer training consultant in Tucson, Arizona, and a Contributing Editor to* PC World. *Charles Gulick is author of* 40 Great Flight Simulator Adventures *and* 40 More Great Flight Simulator Adventures *(Compute Books, Greensboro, North Carolina, 1986). Dennis Dykstra, a professor of forestry at Northern Arizona University in Flagstaff, is also a freelance writer and software developer. Donald B. Trivette is a consultant and freelance writer living in Wrightsville Beach, North Carolina.*

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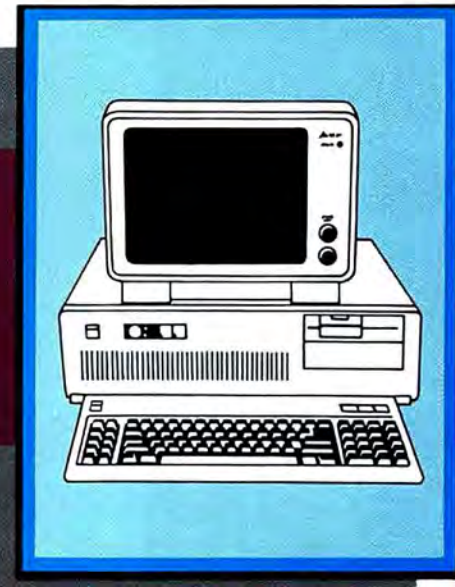
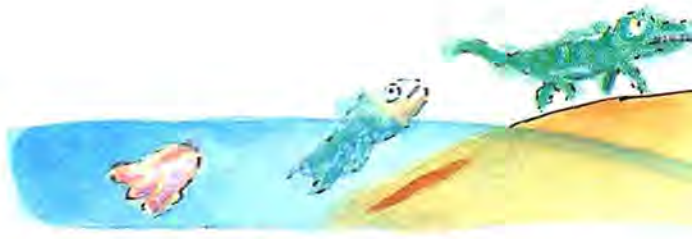


Circle 525 on reader service card

# Display Intelligence

If you're familiar with the technology and the marketplace, you can select the right combination of display board and monitor without suffering hardware anxiety.

*Eric Knorr*



There comes a time in every PC user's life when choosing or changing a video display is unavoidable. For those with little love of hardware, fixing a flat on a freeway ramp may seem preferable. Dodging incompatibilities between software, display board, and monitor can be a dicey proposition with today's glut of display standards and modes.

But a little information can go a long way. Even if you work in a company with a large technical support staff, you'll be ahead of the game just knowing what the options are. If nothing else, you'll end up with a monitor and display board that you can use—instead of an expensive paperweight.

Three types of monitors and four kinds of graphics boards virtually monopolize the PC display marketplace (see Table 1). IBM's Monochrome Dis-

play, Color Display, and Enhanced Color Display make up the invincible trio of monitors, although much of their installed base is actually composed of less expensive, third-party clones. Work-alikes have also devoured a healthy share of the market dominated by the IBM Monochrome Display Adapter (MDA), the Hercules Graphics Card, the IBM Color/Graphics Adapter (CGA), and IBM's Enhanced Graphics Adapter (EGA).

The best way to begin your search for an appropriate display and board is—you guessed it—to assess your software needs. Ask yourself whether you'll be using graphics software and if your graphics must be in color or if monochrome will do. If color graphics are necessary, visit a dealer (or nearby workstations that are suitably equipped) to determine the resolution and the number of colors you'll need. Next, take into account how much you or your company is willing to invest in a display system. Once you've considered these factors, the solution to your hardware needs should be evident.

### Text Without Graphics

The most popular display system for the PC is IBM's Monochrome Display coupled with the MDA. The crisp, eminently readable characters produced by this pair have set a high standard against which other PC display systems are measured.

The MDA is a refreshingly simple piece of hardware. Its sole job is to display the 254 characters held in its read-only memory (ROM) chip. Because the MDA displays only characters, the board is "locked" into *character mode* (also referred to as *text mode*).

Besides the character ROM, three other components play a key role in the MDA's machinations: the video controller chip, the basic input/output system (BIOS) chip, and 4K (4000 bytes) of video random access memory (RAM). The video controller is the MDA's engine, driving the monitor's electron gun.

Patrick McDonnell

## Table 1: A comparison of the most popular video adapter and display combinations

| | Monochrome Display | Color Display | Enhanced Color Display |
|---|---|---|---|
| **Monochrome Display Adapter (MDA)** | Text mode:<br>•80 columns by 25 lines of text<br>•9-by-14-dot character cell<br>•normal, underlined, high-intensity, blinking, and inverse | N/A | N/A |
| **Hercules Graphics Card (HGC)** | Text mode:<br>•same as for MDA<br>Graphics mode:<br>•720-by-348-pixel resolution<br>•on or off | N/A | N/A |
| **Color/ Graphics Adapter (CGA)** | N/A | Text mode:<br>•either 40 or 80 columns by 25 lines of text<br>•8-by-8-dot character cell<br>•16 foreground (text) colors plus blinking, 8 background (character cell) colors, 1 of 16 border colors<br>Medium-resolution graphics mode:<br>•320-by-200-pixel resolution<br>•4 on-screen colors—choose 1 background (full screen) from 16 colors, choose 1 of 2 palettes of 3 preset colors<br>•40 columns by 25 lines of text<br>•8-by-8-dot character cell<br>•text only in 3rd color (white or brown) of palette<br>High-resolution graphics mode:<br>•640-by-200-pixel resolution<br>•white foreground, black background<br>•80 columns by 25 lines of text<br>•8-by-8-dot character cell | All modes:<br>•same as for Color Display |
| **Enhanced Graphics Adapter (EGA)** | Text mode:<br>•same as for MDA<br>Graphics mode:<br>•640-by-350-pixel resolution<br>•4 on-screen pseudocolors (choose from 9 using on, off, high-intensity, and blinking combinations)<br>•80 columns by 25 lines of text<br>•8-by-14-dot character cell | Text mode:<br>•same as for CGA<br>Medium-resolution graphics mode:<br>•same as for CGA<br>High-resolution graphics mode:<br>•same as for CGA<br>Extended medium-resolution graphics mode:<br>•same as for CGA in medium-resolution graphics mode except 16 on-screen colors<br>Extended high-resolution mode:<br>•same as for CGA in high-resolution graphics mode except 16 on-screen colors | Text mode:<br>•same as for CGA in text mode except 8-by-14-dot character cell and no border color<br>Medium-resolution graphics mode:<br>•same as for CGA in medium-resolution graphics mode<br>High-resolution mode:<br>•same as for CGA in high-resolution graphics mode<br>Extended medium-resolution graphics mode:<br>•same as for CGA in medium-resolution graphics mode except 16 on-screen colors<br>Extended high-resolution mode:<br>•same as for CGA in high-resolution graphics mode except 16 on-screen colors<br>Enhanced resolution graphics:<br>•640-by-350-pixel graphics<br>•64K EGA supports 4 on-screen colors (choose from 16); 128K or 256K EGA supports 16 on-screen colors (choose from 64)<br>•80 columns by 25 lines of text<br>•8-by-14-dot character cell |

The BIOS chip holds the instructions that set up the video controller to produce a screen segmented into 25 lines by 80 columns, for a total of 2000 *character boxes* of equal size.

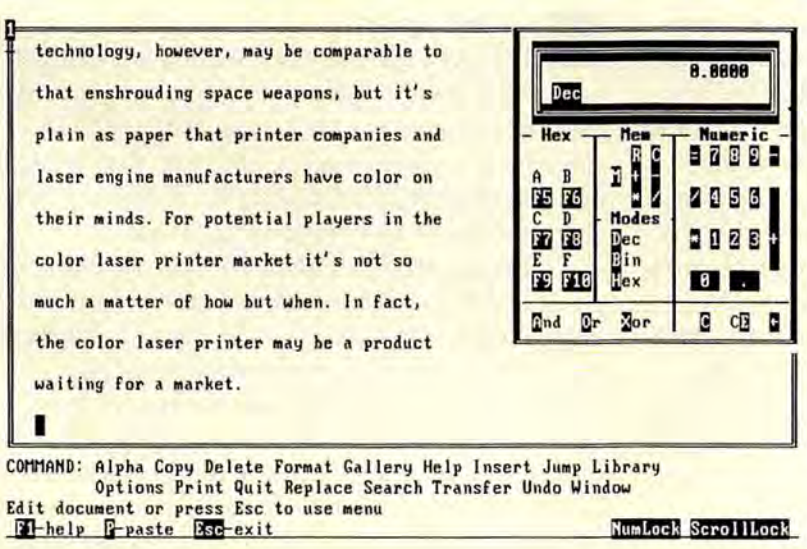
In a character box, the density of *dots*—the points where the CRT's electron beam lands on the phosphor screen—directly affects the readability of on-screen characters. The character box defined by the MDA is 9 dots wide by 14 dots tall, resulting in a sharp character image unsurpassed by the CGA, the Hercules Graphics Card, or the EGA.

Each character box is allocated two bytes in the 4K of video memory: One describes the character and one specifies the *character attribute*. With the MDA, the character attribute can be defined as normal, high-intensity (bold), underlined, blinking, or inverse video. When a PC with an MDA runs a software application, the PC's microprocessor sends the characters' code numbers and attributes to specific addresses in the area of the system's RAM that's reserved for video information. The video controller then scans video memory, reads the characters' code numbers, looks up the corresponding ASCII characters in ROM, and displays the characters on screen in the same order as they appeared in video memory.

Although the MDA cannot produce graphics per se, it can produce *character graphics*. If you've ever seen a table of the ASCII character set, you know that in addition to letters, numbers, punctuation, control characters, and various symbols, the table holds about 50 graphics characters—double lines, fill patterns, and so on. Although the possibilities are limited, many programs can manipulate graphics characters held in the MDA's ROM to produce borders, boxes, and attractive pseudographics displays (see Screen 1).

If you've inherited a PC and all you want to do is word processing, an MDA and a monochrome display will do handily. Other than graphics packages and games, there are few programs that won't run with an MDA.

But if you're buying a system for yourself or procuring PCs en masse for your company, go the graphics route. All signs point to virtually every type of PC application—from desktop publishing to operating environments—exploiting graphics. And if you opt for a monochrome graphics board (instead of the MDA or a compatible board), the additional cost is negligible.




**Screen 1: Although IBM's Monochrome Display Adapter is forever locked into character mode; it can simulate graphics using ASCII graphics characters, as this SideKick calculator illustrates.**

## Monochrome Madness

When the PC was first released, users who wanted charts, graphs, or games could only opt for IBM's CGA and Color Display as options. However, 95 percent of PC users flocked to IBM's inexpensive monochrome display system, even though that meant waiving graphics capabilities.

*Although lackluster by today's standards, the CGA is still a more complex piece of hardware than either the MDA or the Hercules Graphics Card, offering two character modes and two graphics modes.*

It took another company, Hercules Computer Technology, to take advantage of the immense installed base of Monochrome Displays and bring monochrome graphics to the PC. The product that performed this feat was the Hercules Graphics Card, a video display board that had all the capabilities of the MDA, but added a high-resolution *monochrome graphics mode.*

Graphics mode and character mode are mutually exclusive concepts. Basically, graphics mode deals with display information in bits rather than the bytes used by character-based applications. This means that applications can control individual points on the screen (and thus draw lines, circles, and other shapes) rather than simply displaying characters. Within the Hercules board, each picture element, or *pixel,* corresponds to a single bit in the board's 32K of video memory. The 1, or "on," bits of video memory determine which pixels are lit, and the 0, or "off," bits specify the pixels that are dark. The Hercules board arranges 720 pixels in 348 rows, yielding a clearly defined graphic image (see Screen 2).

As with the MDA, data is sent to the Hercules board's video memory and read by a video controller. In text mode, the controller behaves like the MDA. To display graphics, however, the application must have a Hercules *video driver.* Video drivers are special subprograms written to control specific display adapters.

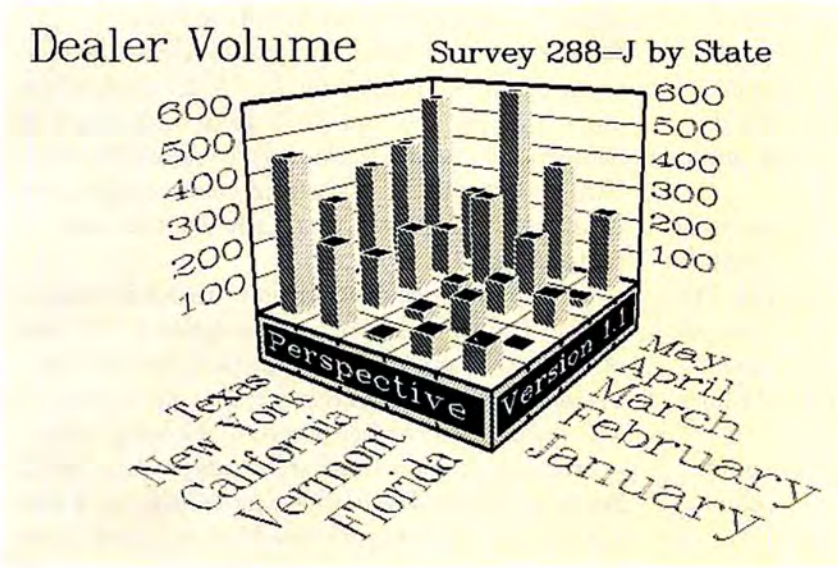
The Hercules Graphics Card enjoys a broad range of software support and considerable popularity among users. Most graphics software developers have written Hercules drivers simply because the board represents one of the only ways to display their products on a monochrome monitor; but it was Lotus's decision to write a Hercules driver to display *1-2-3* graphs in monochrome that probably gave the board its biggest boost. And because the Hercules board emulates the MDA, you can still run software in character mode if it lacks a Hercules driver.

The Hercules Graphics Card has recently been upgraded to the Hercules Graphics Card Plus (see the review of the Hercules Graphics Card Plus in this month's *From the Hardware Shelf*) and the price cut to $299, only $50 more than IBM's MDA. If you only occasionally need graphics and you prefer sharp monochrome characters, a Hercules Graphics Card and a Monochrome Display—or more likely, low-cost clones of both—is the route to follow.

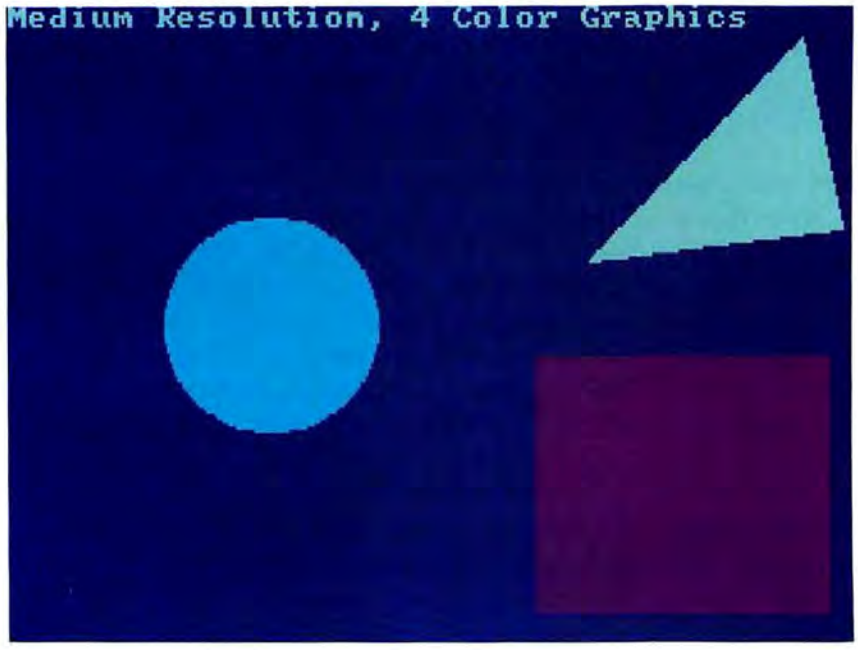
## Color Leaps In

The CGA and the Color Display were IBM's first, rather primitive, forays into color graphics. Although lackluster by today's standards, the CGA is still a more complex piece of hardware than either the MDA or the Hercules Graphics Card, offering two character modes and two graphics modes.

The normal CGA graphics mode arranges 320 pixels in 200 rows and offers as many as 4 simultaneous colors from a palette of 16. Instead of dedicating 1 bit for each pixel, the board assigns 2 bits apiece, yielding 4 possible combinations, each assigned to a different color. This color description of the screen is held in the board's 16K of video memory. Nearly every graphics application has a driver that runs the CGA according to these parameters, which together are known as the medium-resolution color graphics standard (see Screen 3).




Screen 2: Hercules introduced graphics-to-monochrome monitors with the Graphics Card Plus, shown here displaying a snazzy graph created with 3d Graphics' Perspective.




Screen 3: Originally, coarse 4-color graphics was the only alternative to text-mode displays.

The CGA's lesser-known graphics mode displays 640 pixels in 200 rows, but in black and white (see Screen 4). *Framework* and a handful of computer-aided design programs include drivers for this so-called high-resolution mode, but few other programs support it.

Although many might find the graphics coarse, by far the most irksome aspect of the CGA and Color Display is their fuzzy text display (see Screen 5). The CGA relies on an 8-by-8-dot character box, a consequence of the 200-pixel vertical resolution of the Color Display. Because the monitor displays 25 lines of text, each line can be only 8 pixels high.

The CGA also offers a 40-column text mode, a boon to no one but optometrists. The 40-column mode is designed to display text on a television, which connects to the CGA's composite video output jack. If you have a CGA and you're inclined to experiment, type **MODE CO40** at the DOS prompt and stand back; enter **MODE CO80** to return to the 80-column format. These MODE commands (including MODE BW80, which disables color) work with the EGA as well.

The CGA will also drive composite video monitors. The monitors discussed so far have been digital red-green-blue devices, which accept discrete digital pulses for each color value. Composite monitors—which can be either black and white or color—receive their data encoded in analog waveform, just like a television set. Black-and-white composite monitors are the cheapest available for the PC and are sometimes offered with cut-rate PC clones. However, if you settle for one of these, you get the worst of both worlds: no color, and text guaranteed to warp your retina.

The IBM CGA and Color Display have a large installed base and plenty of software support, but that's still no reason to put up with mediocre quality. Even if you've inherited a PC with this display system, demand a monochrome or an enhanced color display and save your eyes—unless you never plan to work with text.

### Color Graphics You Can Live With

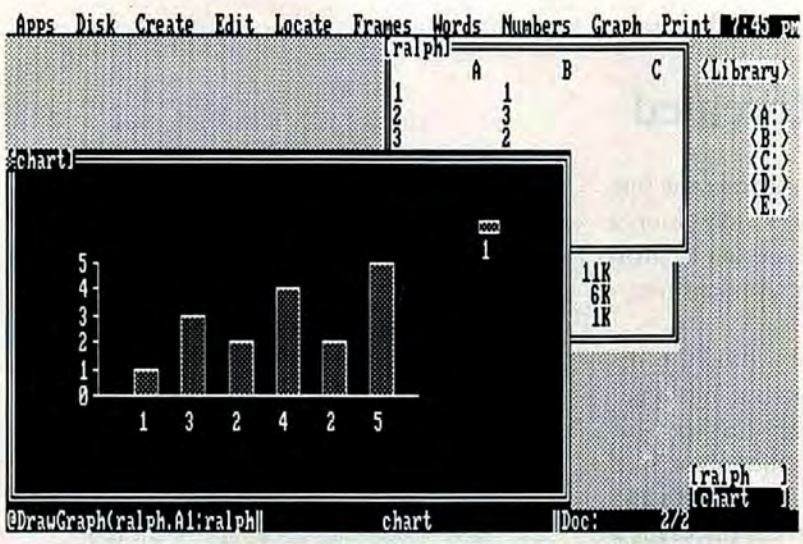
It took IBM until late 1984 to release the EGA and the Enhanced Color Display. And it took at least a year after this dynamic duo's debut for a significant number of software developers to write EGA drivers. Now, at last, there's an accepted color graphics standard that provides both a variegated palette and pleasing text.

The EGA can produce up to 16 colors simultaneously from a palette of 64. Resolution is 350 rows of 640 pixels, and characters are accorded an 8-by-14-dot box, producing crisp text that almost matches MDA-produced text (see Screen 6). Color graphics boards that promote other standards (such as the Sigma Color 400-H) may have more impressive specs, but industry acceptance of the EGA standard has ensured this display system's dominance for some time to come.

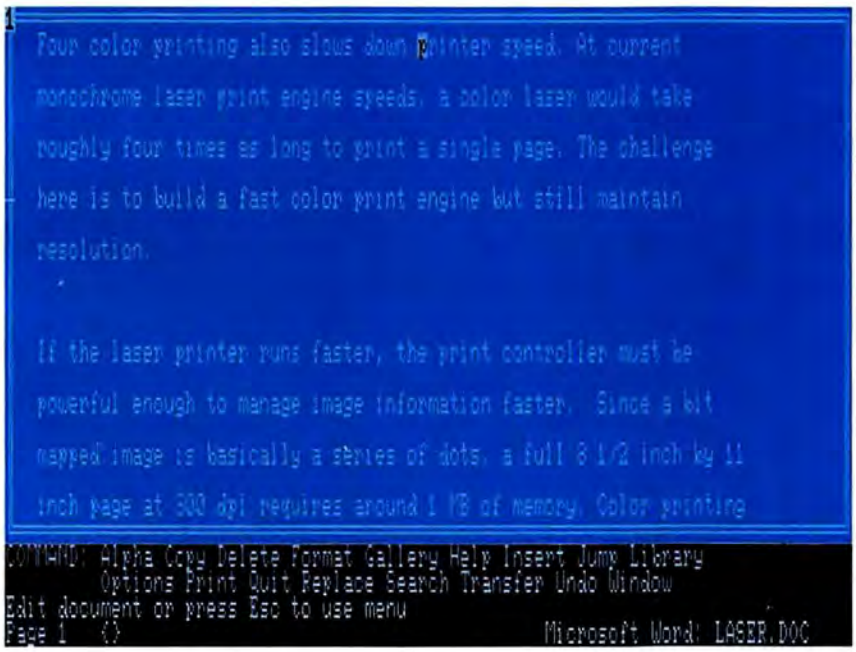
Just as the CGA creates colors by designating 2 bits for each pixel, the EGA assigns 4 bits, increasing the number of simultaneous colors to 16. Combine this with the EGA's enhanced 640-by-350-pixel resolution, and it takes approximately 112K to hold a single enhanced-graphics image. IBM's EGA packs only 64K of RAM, which means you must buy an optional 64K RAM module to get all 16 colors in enhanced graphics mode, adding $199 to the EGA's already hefty $524 price tag. An additional 128K ensures smooth scrolling and panning, although it rockets the cost of the EGA to just under $1000.

The IBM EGA is an extremely complex and versatile board. It can drive the Color Display—with up to 16 simultaneous colors—in either medium- or high-resolution CGA mode, and it contains an extra 8-by-8-dot character set in ROM for Color Display text. That same character set can be used when the EGA is set up to drive an Enhanced Color (or monochrome) Display in a special 43-line text mode. Few off-the-shelf applications are compatible with the 43-line mode, although you can adapt some programs with relative ease (see "EGA at Length," *.*, *PCW*, July 1986).

Unlike other display adapters, the EGA in text mode reads a character set from ROM into RAM. If you're willing to do some programming, the EGA's




Screen 4: Framework is one of the few programs to exploit the IBM Color/Graphics Adapter's 640-by-200-pixel, black-and-white, high-resolution mode.




Screen 5: As this Microsoft Word display illustrates, the Color/Graphics Adapter's hard-to-read text makes it an adapter to avoid.

# The Page Revealed

Though color displays attract the biggest crowds on the showroom floor, a number of companies are out to prove that there's still life in monochrome graphics.

The driving force behind this renewed interest is desktop publishing. For most users, full-page preview still means a rough representation of text and graphic elements. Now, with unprecedented monochrome display resolutions available for the PC, users can view page detail right down to the serifs on 8-point type. Although few common productivity packages are likely to support these new displays, desktop publishing software developers are writing drivers for advanced hardware to increase the functionality of their products.

Wyse Technology, a prominent manufacturer of ASCII terminals and PC compatibles, was one of the first companies to recognize the continuing importance of monochrome displays. Its top-of-the-line graphics subsystem, the $999 WY-700, is currently one of the most cost-effective high-resolution display systems available for the PC. The WY-700 board and monitor deliver a maximum 1280-by-800-pixel resolution and backward compatibility with the MDA and CGA. Like its competitors, the monitor in this pairing is—at 15 inches—larger than the average PC CRT and offers "paper-white" phosphor rather than the usual green or amber.

Amdek Corporation and Princeton Graphic Systems, two manufacturers best known for their reliable, inexpensive monitors, are approaching the monochrome melee from different angles. Amdek is promoting its new Amdek 1280, a graphics subsystem identical in price and specifications to Wyse's WY-700. Princeton has taken a higher-end route with the LM-300, a $750 monitor with the same aspect ratio as an 8½-by-11-inch printed page. The video board necessary to drive the monitor—the LM-300A—is also priced at $750 and can display four shades. In a disingenuous marketing ploy, Princeton claims that the 15-inch LM-300 "emulates" the 300 dots-per-inch output of most laser printers; with 1200 by 1664 pixels, however, the actual number of pixels per inch is less than 150. Hype notwithstanding, full-page displays like the LM-300 are helping to promote more accurate previews of a single page.

The LaserView Display System offers a conventional aspect ratio and a resolution that matches the LM-300 pixel for pixel. A product of Sigma Designs, the prominent expansion board manufacturer, the LaserView Display System consists of the LaserView Display Adapter (LDA) and either a 15- or a 19-inch paper-white monitor; the latter provides ample room for laying out a two-page spread. Together with the LDA, the 15-inch monitor retails for $1895, while the 19-inch model goes for $2395.

As this is being written, the current leader in PC graphics resolution is plainly Conographics' ConoVision 2800. A multimode adapter that works with four monitors, the ConoVision 2800 can draw 2880 by 1024 pixels on the screen. The board costs $1325 and the 15- and 19-inch monitors are priced at $895 and $1525, respectively.

Finally, at the low end of the monochrome realm, STB Systems' Chauffeur HT provides one of the cleverest high-resolution solutions. This display board runs all Hercules-compatible software at 1056 by 352 pixels instead of at the Hercules Graphics Card's 720 by 348 pixels. Like the Hercules board, STB's entry is compatible with the MDA, but the $239 price is less than that of the Hercules Graphics Card Plus. The Chauffeur HT, combined with a paper-white monitor (compatible with IBM's Monochrome Display) could provide a low-end answer to page-preview needs.

Clearly, a lot of engineering chutzpah is going into monochrome displays. And with a market as hot as desktop publishing, there'll be room enough for a busload of contenders for some time to come. *–E. K.*

*Amdek 1280*
*Amdek Corp.*
*2201 Lively Blvd.*
*Elk Grove Village, IL 60007*
*312/364-1180*
*List price: board and monitor (not sold separately) $999*

*Chauffeur HT*
*STB Systems, Inc.*
*601 Glenville #125*
*Richardson, TX 75081*
*214/234-8750*
*List price: $239*

*ConoVision 2800*
*Conographics Corp.*
*17841 Fitch*
*Irvine, CA 92714*
*714/474-1188*
*List price: $1325, 15-inch monitor $895, 20-inch monitor $1525*

*LaserView Display System*
*Sigma Designs, Inc.*
*2023 O'Toole Ave.*
*San Jose, CA 95131*
*408/435-1480*
*List price: LaserView Display Adapter with 15-inch monitor $1895, with 19-inch monitor $2395*

*LM-300*
*LM-300A*
*Princeton Graphic Systems*
*601 Ewing St., Bldg. A*
*Princeton, NJ 08540*
*800/221-1490*
*List price: LM-300 monitor $750, LM-300A video board $750*

*WY-700*
*Wyse Technology*
*3571 N. 1st St.*
*San Jose, CA 95134*
*408/433-1000*
*List price: board and monitor (not sold separately) $999*

full complement of RAM even lets you download additional fonts.

Proving its adaptability even further, the EGA can also drive a Monochrome Display with the board's full-graphics resolution or an MDA-like 9-by-14-dot character box for text. In 43-line mode, monochrome characters are formed in an 8-by-8-dot character box.

Nonetheless, pairing the EGA with anything but an Enhanced Color Display is like watching *The Wizard of Oz* on a 9-inch black-and-white television set. The only rationale for running the EGA with a monochrome monitor is financial. At least you'll get enhanced-resolution graphics on your monochrome monitor until an Enhanced Color Display is within your financial grasp.

Of course, if having the IBM logo isn't vital, you can get snazzy and affordable graphics with any number of EGA and Enhanced Color Display workalikes (see "Seven Up on EGA," *PCW*, August 1986). Not only will you save as much as $600, but you'll also reap additional features. Many EGA-compatible boards emulate the CGA and the MDA; some even mimic the Hercules Graphics Card or the Plantronics ColorPlus. Most come with parallel or serial port options. IBM's EGA and Enhanced Color Display may have established the hardware standard, but aggressive competitors have set the pricing standard in the marketplace. Not surprisingly, far more of these third-party products have sold than IBM's overpriced wares.

## Configuration Caveats

The EGA is the exception among the top four video boards in that it works with all three monitors. Remember that the MDA, the Hercules Graphics Card, and compatible boards should only be hooked up to a monochrome monitor. Likewise, the CGA and its clones should drive only a Color Display. The reason? If scan frequencies between board and monitor don't match, you won't get an image, and damage to the monitor might occur. What happens if you connect a CGA to a monochrome monitor? You'll hear the monitor's transformer begin to whine, soon followed by wisps of acrid smoke.

To keep from frying your monitor, when you install a display board you must make sure the computer's DIP switches (two in the PC, one in the AT) are set properly. If you replace an MDA with a CGA and forget to reset the switches, your machine beeps—one long and two short tones—and refuses to

**Screen 6: With IBM's Enhanced Graphics Adapter, you can have 16 simultaneous colors and readable text on the same screen.**

start until you correct the settings or install the appropriate board.

Because the EGA has so many modes, you may find it especially tricky to configure. If you're using an EGA with a monochrome monitor or a Color Display, you must set a jumper on the board or risk frying your monitor. Switches on some compatible EGA boards are accessible from the PC's backplane, so you can easily double-check settings to avoid mishaps. Other EGA work-alikes let you select modes (but not monitor configurations) with software commands, while still others change modes automatically, depending on what application you run.

### Mode Elevators

The overall trend in the marketplace is toward less expensive, more versatile boards and monitors, many of which offer competent emulations of all four standards. In addition, a number of these board manufacturers are promoting their own proprietary standards, which outstrip the resolution and color selection of the EGA (see "The QuadEGA ProSync and NEC MultiSync" in this month's *From the Hardware Shelf*). Desktop publishing is also pushing the development of super-high-resolution monochrome display systems for true what-you-see applications (see the sidebar "The Page Revealed"). While none of these non-IBM modes have culled widespread support from software developers, many board engineers are banking on the success of *Microsoft Windows*, a graphics-oriented operating environment, and are writing the necessary drivers. In doing so, they ensure that any application running under *Windows* will take advantage of their boards' proprietary talents.

Whatever the future holds for displays, the best current choices are display systems with graphics capabilities that don't sacrifice legibility. And if you find an attractively priced board and monitor that competently emulate existing standards—or use *Windows* to take a stab at creating their own—so much the better. The imperative in selecting graphics hardware is to maintain compatibility with your existing software while retaining—as much as possible—the ability to accommodate future graphics needs.

*Eric Knorr is an Associate Editor for* PC World.

*IBM Monochrome Display Adapter*
*IBM*
*P.O. Box 1328*
*Boca Raton, FL 33432*
*800/447-4700*
*List price: $250*

*IBM Color/Graphics Adapter*
*List price: $244*

*IBM Enhanced Graphics Adapter*
*List price: $524, Graphics Memory Expansion Card $199, Graphics Memory Module Kit $259*

*IBM Personal Computer Display*
*List price: $275*

*IBM Color Display*
*List price: $680*

*IBM Enhanced Color Display*
*List price: $849*

*Hercules Graphics Card Plus*
*Hercules Computer Technology*
*2550 9th St.*
*Berkeley, CA 94710*
*415/540-6000*
*List price: $299*

# PC World Graphics Forum

*Edited by Eric Knorr*

Shannon Luo

If you're looking for the fastest-paced, most imaginative corner of the PC market, you've come to the right place. The PC graphics industry is charged by a battery of controversial motives and methods, and few are better qualified to sort out the fray than the participants. To that end, *PC World* recently assembled seven graphics industry leaders for the first *PC World* Graphics Forum. This all-day roundtable discussion produced

a spirited, informative exchange about the vital issues facing PC graphics users.

Representing the software side of the graphics equation were Eric Lyons, Autodesk's product manager for *AutoCAD;* Paul Brainerd, president of Aldus Corporation; John Butler, Microsoft's *Windows* guru and senior engineer for the company's Systems Software Marketing Group; and David Wilcox, graphics national sales manager for Lotus Development Corporation. Participating hardware luminaries were Roger Archibald, product marketing manager for Hewlett-Packard; Richard Bader, co-manager of Intel Corporation's Personal Computer Enhancement Operation; and Kevin Jenkins, president of Hercules Computer Technology. Moderating the panel were *PC World*'s Editor-in-Chief, David Bunnell; Harry Miller, Editor; and Eric Knorr, Associate Editor.

The discussion ranged from the role of graphics in the workplace to the pros and cons of a graphic user interface to the prospects for more sophisticated PC graphics display systems. Throughout the day, the conversation returned to the toughest issue faced by graphics users: compatibility between software and hardware. Ultimately, *Windows*' touted position as the standard for both user and device interfaces produced the most heated exchanges.

Given the diverse backgrounds of the participants, it's not surprising that there was a lack of agreement on most subjects. Butler and Brainerd backed *Windows* all the way, while Wilcox and Jenkins argued that a sovereign interface was tantamount to market fascism. Bader extolled powerful new displays based on graphics coprocessors; Jenkins, on the other hand, appeared to view such technology as a luxury.

The panel could reach a consensus on only two issues. In principle, the participants agreed on the need for a standard graphic user interface that would ease compatibility problems between software and hardware. The predominant message, however, was one you might expect, considering the source: Whether two years or five years from now, graphics will be part and parcel of every PC application.

## Investing Money and Faith in Graphics

*Miller:* Keeping in mind the end user's perspective, how do you view the role of PC graphics in the workplace?

*Archibald:* I think one of the biggest challenges is getting people to understand why they should use graphics, period. Novice users need to be educated. Now they ask: Why should I want proportionally spaced fonts? Why should I intermix text and graphics? Why should I take a CAD drawing and pull it into a text document?

*Brainerd:* I had a sobering experience when I was getting my master's degree in journalism. In the course of one year, I taught 1500 students Introduction to Visual Communications, a required course. I was alarmed at how few students had any sense of graphics literacy. I can honestly say that 20 to 22 out of each section of 25 students were unaware of basic visual concepts such as color, depth, and contrast. The people in our society have little or no understanding of basic visual vocabulary. We've got a lot of work to do.

*Lyons:* Part of the education problem is that graphics is not a product. A lot of applications use it. Users are having trouble differentiating between what one application will do for them and what the next one does. There's a huge difference between a CAD program and a paint program, but how do you explain it?

*Wilcox:* I would argue that the biggest hindrance to PC users' learning graphics software is that most of them don't have a graphics package on their PC. The reason graphics is still a shared workstation application is that graphics software companies often have two, three, or four products to meet users' needs: one for charts, one for diagrams, one for drawing, and so on. No company will ever put multiple business graphics packages on a high percentage of its PCs. What will change the marketplace is single packages that contain seven or eight fully integrated functions, so everyone can have one.

*Archibald:* Don't discount the fact that someone has to be educated to make the decision to buy that package.

*Knorr:* If you have a graphics program with all the features you could want, what sort of aids can you build into that package to ensure that someone with little or no graphics sense can use those features effectively?

*Brainerd:* That's an important point. We provide the tools, but what are users going to do with them? We can't constrain users from what they want to do. The user is ultimately going to control the tool and has the right to produce terrible-looking results. There are some things we can build into a program–

*Knorr:* The way it defaults?

*Brainerd:* Yes, for desktop publishing, logical defaults for word spacing, letter-spacing values, things of that sort. We can build into the product things like style sheets, templates, and macros that help yield high-quality results. But we still have to provide an override for people like graphic artists. Many people are taking the tools we provide and stretching them to the very limits–well beyond the parameters of what we thought they'd be used for. An example we're seeing right now is that people are using *PageMaker* to produce full broadsheet newspaper pages, even though we don't support that paper size. If we'd put a bunch of restrictions in the product that didn't allow them to do that, we'd have lost that customer.

*Knorr:* Given that there's so little graphics literacy, do you think the average user is going to be trying to push the limits?

*Brainerd:* Everyone wants quality. An interesting example is when laser printers came into our office. The day our first laser printer arrived was the last day we used our daisy wheel printers; we literally never turned them on again. I saw this happening with our customers as well. They may not have understood why Times Roman was important, but it looked better than daisy wheel output.

*Archibald:* At Microsoft, when we delivered the first prototype of the LaserJet and watched its migration through the organization, printing your memo on it became almost a status symbol.

*Jenkins:* But is that progress? It's progress for Hewlett-Packard because they're selling more LaserJets.

*Archibald:* It's more effective communication.

*Jenkins:* I don't think so. When I used to write a memo, I'd pick up a piece of paper and write it out in longhand. Then I went to the typewriter, and it took me a little longer, but people could read it better. Then I went to a word processor. Now, it seems I have to design each memo individually. Right-justified, left-justified . . . uh-oh, I'm not kerning. It's going to take me all day to write a memo.

*Miller:* But they'll get the point quicker.

John Greenleigh

*Roger Archibald, father of the LaserJet: 'One of the biggest challenges is getting people to understand why they should use graphics, period.'*

*Archibald:* I look at the amount of information that comes across my desk. I can look at a graph and capture information in a fraction of the time it would take me to search through tables. That makes me a more productive person. There are even studies that show I can read one font faster than another.

*Wilcox:* The point with respect to users is that, until they have the capability to do something, they won't experiment with it; and, if they don't experiment with it, they won't learn it. You made a comment, Paul, about the appalling lack of knowledge of

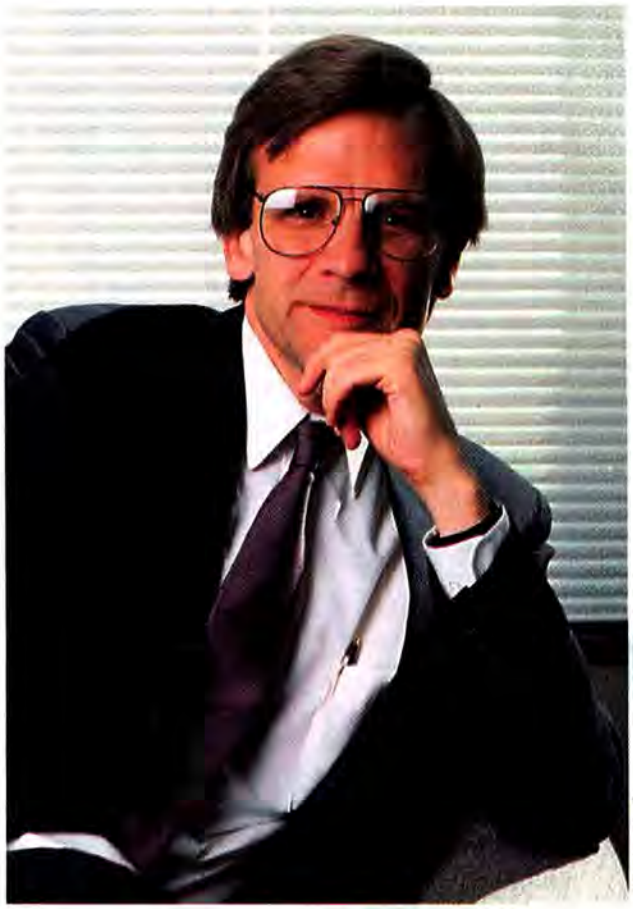
visual principles. Five years ago Lotus Development and VisiCorp would have sat at this same table and said, There's an appalling lack of knowledge about modeling and spreadsheets and tying numbers together in formulas. Within those five years, however, those companies spent a lot of money doing books, writing articles, and holding training classes. The impact of that pales in comparison to company X saying, We're going to give everyone out there one of these graphics packages and see what they do with it.

*Jenkins:* You know, someone at work gave me a memo they'd done with a Macintosh, and it had curlicues and doodads all over it. I walked in one morning and saw my secretary sitting at the Macintosh and I thought, I'm going to let her do whatever it is she's doing. I don't know what it is, but I hope it's something good. Just before noon she gave me this memo. I asked, "Have you been writing this memo all morning?" She said yes. I asked, "Did you just finish it?" She said yeah. "For the last 3 hours you've been writing this memo?" She blushed and said yes. I said, "If you ever do this again, I'll fire you on the spot." [Laughter]

*Brainerd:* I think Kevin makes a point. The memo that took 3 hours to create was not an appropriate use of that employee's time. By the same token, I think management has to be tolerant of the fact that people need time to experiment and learn these new tools. The next time around, when you make a customer presentation where some design capability is really needed, the employee may already have learned how to do it.

*Bader:* I think your example of the memo is taking things to a ludicrous extreme. People drive cars a couple of blocks when it's just as convenient to walk; that doesn't mean cars are bad. A simple memo probably isn't the place to use a tremendous amount of this desktop publishing stuff. What these tools do provide is the ability to communicate more information. That's what the graphic arts are supposed to be about.

*Jenkins:* We basically agree. I just say there's a limit. I don't want my secretary being a graphic artist when I have a department to do graphics. I don't think that kind of design is necessary for most office communications.



John Greenleigh

*Paul Brainerd, president of Aldus Corporation: 'Management has to be tolerant of the fact that people need time to experiment and learn new tools.'*

*Wilcox:* What happens when you ask your secretary to draw an organizational chart? Should she continue to do it with a ruler and pencil?

*Bunnell:* What if she has to send out invitations? Support people at PCW Communications often use Macintoshes to create invitations and forms. A forms-generation program for the Macintosh called *Print Room* has sold 250,000 copies.

*Jenkins:* What you could say is that from now on I don't want anyone I hire as a secretary to do it. I want the graphics department to do it. A graphic art-

ist will design a form faster than someone who doesn't know how to do it. Designing is a skill that has to be learned.

*Wilcox:* There's a way to have the best of both worlds. If you put an appropriate piece of software on everyone's computer, each person will be able to take symbols created by your graphic artist and implement them in very simple graphic images so that you have the benefit of artistic skills without being an artist. This is a very powerful concept.

*Brainerd:* Then the people who have the design skills can design the templates, and the people who don't necessarily have those skills can apply those concepts.

*Wilcox:* Suppose that I walk into a meeting with a bulleted list, with one line at the top, one line at the bottom, and the company's logo. You compare the look, the impact, and the professionalism of that with the case of a fellow who walks in with nothing but word charts—without the company logo and the two lines. The difference is significant. And how much skill does it take?

*Bader:* History has shown that products emphasizing power and flexibility have a steeper learning curve. Templates are a good bridge to that complexity but in a form that's easier to use. I wholeheartedly agree with that approach.

## The Face of the Machine

*Knorr:* What about the user interface itself? A lot of PC users who've seen the Macintosh complain that PC graphics applications are hard to use by comparison. When can PC users expect a user interface as graphic as the application?

*Brainerd:* Coming from the Macintosh-based *PageMaker* and now moving to the PC side of the equation under *Windows,* we're particularly well-suited to answer that question. We think that the Macintosh—and before that the people at Xerox PARC—has really developed a new standard with the graphics-based user interface. One of the things we note in our organization is that people who use the Macintosh use many different applications. I'm not afraid to pick up a brand-new application, and I know that I can use it productively within a half hour. Clearly, we need more of that type of feasibility if we're going to bring more users into computing.

*Jenkins:* Can I disagree? I think that's a popular myth, a bubble that should be burst. I don't really believe that icons or a graphic user interface per se promotes ease of use—or ease of learning for that matter.

*David Bunnell, Editor-in-Chief of* PC World: *'It seems like you can pop in a Macintosh application and not look at the manual. That's a big advantage.'*

I don't think that any of the text-based applications—like *1-2-3* or others that have been successful—are any more easy or difficult to learn than something that has a little picture of a garbage can or a file folder. Once users have invested half an hour of their time, they've jumped the hurdle—if there is any—in learning how to get a directory listing or how to put a file on disk and retrieve it. I don't think that's a big deal.

*Brainerd:* But the fact is that a Macintosh-like user interface does have some standardization. Since desktop publishing integrates all kinds of things—words and graphics from a variety of applications—it really has helped to have consistency.

*Bunnell:* It's a standard interface so people can learn new programs quickly. It seems like you can pop in a Macintosh application and not look at the manual. That's a big advantage.

*Knorr:* So it's not the Mac interface itself but the fact that Apple standardized on it?

*Butler:* Yes, and let me ratify that in slightly different words. For the applications developer, the Macintosh brings with it a complete set of applications program instructions at the system-software level so that you can build menus and forms and extract data in a consistent fashion.

*Wilcox:* If you want ease of learning, there are two directions you can take: One is the Macintosh direction, and the other is the *1-2-3*-style menu. Both

are familiar to people, easy to pick up, and offer a structure that you can model from within your own environment—which we did very successfully with *Freelance* by modeling it after the *1-2-3* menu structure. The bottom line is that if you're building software in today's marketplace, which of these two user interfaces do you select? I would argue that, for the next year anyway, you've got many more users familiar with the *1-2-3* interface.

*Jenkins:* Well, *1-2-3* certainly doesn't have a graphic interface.

*Wilcox:* Just because your objective is to do graphics doesn't mean a text-based interface won't work just fine. The other issue is: Is point and click the best way to do things? For some applications, point and click is great; for other applications, it's just not the best way to approach things. The *1-2-3* environment allows you to mix those. The moment you move into a Macintosh-style environment, you have to point and click with a mouse.

*Butler:* That's a failure of Alan Kay's paradigm in the design of the Macintosh's user interface; it's something we had to clean up in *Windows*. You want to be able to access functions in an expert fashion, and you want to be able to roam around in applications you don't often use. The choice is not character versus graphic, but visual versus multiplex. Can I pull down a menu if I'm naively roaming around an application, and alternatively, can I accelerate by typing a bunch of keys?

*Brainerd:* I think John is pointing out that *Windows* combines the two styles of interfaces: You have the *1-2-3*-style interface to get to the specific command, which I use for the functions I'm more familiar with. In other cases I like the pull-down menus. A lot of desktop publishing is point and click because we're pointing at objects on the page, moving and grabbing things; but the keyboard interface still exists. I think the two user interfaces are coming together.

*Wilcox:* I think it's safe to say that if you are developing a new software package today, you should use one or the other of those and not try to develop your own. There are a lot of developers out there today who are creating their own interfaces.

*Lyons:* And as one of those developers, I've just introduced a product that embodies one of those other interfaces—a pull-down menu interface—as opposed to adopting *Windows* or *GEM* or another PC product. Our big question is: What is the benefit to uniformity among our applications? Can I really learn a program a lot faster because the file menu is in exactly the same place every time, because the menus across the top are similar to a lot of other applications, or because the dialogue boxes look the same?

*Brainerd:* Definitely yes. There were a lot of nonbelievers among Macintosh developers a year and a half ago. Today that's no longer the case. Market research shows that the average Macintosh user buys twice as much applications software as the average PC user. There's got to be a reason for that.

*Wilcox:* Maybe because it costs half as much.

*Butler:* There are other examples you could use. I mean, cars didn't take off until there was a standard for the location of the throttle and for whether or not you had to advance the spark by hand. Is it wood in your Stanley Steamer, or coal, or gasoline?

*Jenkins:* Those people aren't getting into one car and driving a half hour and getting into another car and driving another half hour and getting into a third car—

*Butler:* Power users do. But you're right, most users have a fear of learning a whole new set of commands to use a new application. My claim is that people won't get into the first one unless they have portability of skills.

*Wilcox:* For every benefit there's a trade-off. Are the benefits that I gain from a graphic operating environment worth the cost? The cost in hardware, the cost of discarding my existing software, and the biggest cost of all—the waste of time spent *learning* my existing software.

*Jenkins:* I think there's a very practical issue that has slowed the acceptance of a graphic user interface, which is that the hardware is not powerful enough to run a graphic-based operating system fast enough. Most users are running spreadsheets, data bases, and word processors in text mode instead of graphics mode because they need the speed. Certainly Microsoft knows how fast *Word* scrolls in graphics mode.

*Lyons:* It's not just performance compromises either. Obviously, running operations on the bit level is going to take a lot longer than on the character

John Greenleigh

*Kevin Jenkins, president of Hercules Computer Technology: 'I don't think that text-based applications are any more easy or difficult to learn than something that has a little picture of a garbage can or a file folder.'*

level. But to get around the performance problem, graphic operating environments also typically take a lot more memory.

*Brainerd:* We're at a turning point in technology. There's no question that there's a trade-off today that will not necessarily exist in the near future. Obviously, for all the people that have 8088-based machines, it's going to be a problem.

*Wilcox:* But they'll be the majority through 1989.

*Butler:* How about the mid-life kicker—the accelerator boards? Those boards are going to fill up all the PCs and XTs already out there. The 4.7-MHz 8088s are going to disappear if they can be replaced by 10-MHz 8086s on the same architecture.

*Jenkins:* Microsoft may look into its crystal ball and know what's coming three, four, or five years down the road, but we're concerned about what we're selling customers today.

*Wilcox:* Most users don't have the right hardware to run graphic operating systems. Take this whole set of users and say graphic operating environments aren't relevant for them. Then take the users that do have the right hardware; within that set there are those for whom a graphic interface makes sense and those for whom it doesn't. Take the ones for whom it doesn't make sense, who have the hardware, and add them to the ones who don't have the hardware, and you've got the absolute majority of PC users for the next three or four years.

*Butler:* Pardon me, but that's insane.

*Brainerd:* That's nonsense, that's absolute nonsense!

*Wilcox:* It's nonsense that people don't have the hardware to run the application?

*Butler:* The industry has gone through 6 million PCs in five years and it's damn well going to go from 6 million to 18 or 24 million in the next five years. Of the additional 12 to 18 million machines installed, 95 percent are going to have the kind of performance and hardware for supporting a graphic interface. Your notion is bizarre! Pardon me. It's a bit like whether we should speak Turkish—which is inadequate for discussing things like science since the language has only 60,000 words in it—or whether we should use English. The graphic user interface has a broader bandwidth of communication and therefore it wins! How can you argue with that?

*Jenkins:* I've used *Windows* on a PC, and for some things, I don't care whether it's fast or not. But when you sit down and start typing fast, it'll buffer your keystrokes by the end of a line, and I don't think that's acceptable. When everyone else was holding

conferences about graphics coprocessor chips and so on, we came out with a programmable text mode, the RamFont mode. It's a radically different approach from Microsoft's, which wants to see 80286s, 80386s, accelerator boards, and graphics coprocessors doing a lot of the grunt work to process bits of data rather than bytes of data.

### Searching for Standards

*Brainerd:* Clearly it's evolving toward a graphics-based world because it's a richer interface—standard or not, it's moving toward graphics. More powerful hardware is making that possible, and there is no reversing that trend.

*Miller:* If people are learning to think visually and express themselves graphically, then they're not going to be limited to text-based applications.

*Brainerd:* As application developers, we would like to focus on solutions. Within the *Windows* environment, there's a tremendous amount of work going on to ensure data compatibility between applications. In desktop publishing we face that because we deal with almost every data format imaginable—scanned images, graphics, and very complex text. Another key area is device independence—being able to use a wide range of graphics adapters and hard-copy output devices. We're trying to find areas where we can endorse standards that will make compatibility possible.

*Wilcox:* There's not a software developer in this country that wouldn't love to see the device independence problem solved. There is a cost, however, and the cost is borne by the user.

*Butler:* How?

*Wilcox:* Standardization is by definition a lowest common denominator. We've looked at every driver standard—and I'm not talking about the screen, I'm talking about plotters, printers, and so on—and we've found that there are trade-offs when we compare a standard device interface with writing our own custom driver. Trade-offs in terms of taking advantage of the hardware, trade-offs in terms of the quality of output we can produce. Our customers have told us that they care much more about quality than they do about supporting a broad range of devices, so that's the direction we've gone.

John Greenleigh

*Eric Lyons, product manager for* AutoCAD: *'Autodesk has always had one problem with purported graphics standards: We support far more peripherals than any standard interface.'*

*Butler:* The notion that standards are inevitably the lowest common denominators is clearly not the case. What happens in language standardization efforts is that the very highest level of current functionality is incorporated. I think of it more as a critical mass problem. If 5 bright people have thought about an issue, they're not going to have a complete

solution and you end up with FORTRAN. But if 500 people have thought about a problem, they'll have a broader approach, and you can build a better standard.

*Jenkins:* John, don't you go back with this graphics ANSI stuff for years?

*Butler:* Three years.

*Jenkins:* The reason I ask is because I know this debate has been going on for ten years or more, and in the course of that time, there's never been an accepted standard in the graphics world. I think the reason is that by the time the ANSI committee decides what rich functionality is, the functionality has doubled and the standard isn't as rich as it ought to be.

*Wilcox:* So, John, you and I agree that not enough smart people have thought about standards, and that's why they don't enable you to–

*Butler:* That's nonsense! You don't look at the CGI [Computer Graphics Interface]. You don't know it. You may know the CGM [Computer Graphics Metafile], conceivably. I'm not talking about some product out there in the marketplace, I'm talking about a standard being evolved.

*Jenkins:* But you know that when *1-2-3* draws a graph, the driver uses a very small percentage of functions. Why should they use a device interface? The overhead is astronomical.

*Lyons:* As a company that's in exactly that situation, Autodesk has always had one problem with purported graphics standards: We support far more peripherals than any standard interface. There's nothing we'd like better than to get out of the driver business, but we've come up with a temporary fix–publishing our own standard. That's not very nice, but we could no longer write drivers for everyone.

*Wilcox:* We're also absolutely crazed to get out of the driver business. But I'd like to suggest that we're not at the point–with respect to standards for output-device drivers, at least–where we can just say that the operating environment has solved the problem.

*Brainerd:* You should look at *Windows*, because it does provide that capability.

*Wilcox:* I'm just talking about the ability to take whatever is in *Windows* and get output as good as what I could get if I wrote directly–

*Brainerd:* Absolutely. And we're doing that. Desktop publishing is an application that, like CAD, demands absolute precision on the printed page.

*Harry Miller, Editor of* PC World: *'If people are learning to think visually and express themselves graphically, then they're not going to be limited to text-based applications.'*

*Wilcox:* Our experience is that we can do better.

*Brainerd:* You can't do any better than one one-thousandth of an inch. It's beyond user perception what we can do.

*Wilcox:* Precision isn't the only issue. There are the issues of polygon fill, performance, fonts, justification ... not to mention the hardware being built with new capabilities not envisioned when the "standard" code was written.

*Brainerd:* I took *PageMaker* under *Windows* to Europe and displayed it on a device that doesn't exist in the United States–but which has a *Windows* driver–and it ran on a full-page, high-resolution screen with no changes whatsoever to the application. That's a near miracle in this industry.

*Butler:* There are some things we did with *Windows* that no one else ever did, such as merging raster and vector functions in our graphics instruction set. It's one of those marvelous situations where we're the existing software designer and we're not willing to elevate one person's local religion to the level of natural law. We offer more than one way of drawing polygons, for example, because we shouldn't be telling you what's the right way to do things. Our applications program interface–what you write to–is stable, and that's what's going to cause people to write really

John Greenleigh

*John Butler, senior engineer for Microsoft's Systems Software Marketing Group: 'Microsoft is in one of those marvelous situations where we're the existing software designer and we're not willing to elevate one person's local religion to the level of natural law.'*

good applications that people will want to use. That will drive the market, so obviously, five years from now, you're richer. The humans out there will be happier. And democratic institutionality will be served.

*Jenkins:* I wonder if we'll really be richer. What happens if somebody comes out with a great new piece of hardware and *Windows* doesn't support it? I'm not saying it's a matter of work; I assume Microsoft would be responsive. There are levels, as far as devices go, where your code is just not adaptable to the hardware. What happens to the user who says: "Gee, this RamFont mode that you've got in the new Hercules Graphics Card Plus sounds great. Does *Windows* take it?" Microsoft will have to say: "We can't. We don't operate on byte boundaries."

*Lyons:* If users really think RamFont is the hottest thing around, Microsoft or somebody will support it.

*Butler:* I think it's perfectly possible to build a middle common denominator. You can build a hole for people to punch their way through the interface and add value.

*Knorr:* Would it be up to the hardware people to add those capabilities?

*Butler:* They come to us, and we publish the interface to those functions.

*Jenkins:* That's ridiculous. This is a creative industry, thank God. Otherwise we'd be out there making ball bearings and stuff. All you're saying is, Build your hardware around our interface standard and we'll be fine. We can party together. But we don't look at it that way at all. We want to do the best, most creative, most imaginative thing for our end users that's cheap and that we can make money selling. That's what we're in the business of doing—not making hardware around Microsoft's or anyone else's standards.

*Brainerd:* Well, the software is what sells the hardware. It's the applications that people buy in order to solve their problems.

*Wilcox:* When one of our consulting firms surveyed some corporate sites, a high percentage of those companies were making the decision to go from limited installation of several graphics packages to broad installation of a single package. This means they're first standardizing on a software package that meets their needs and worrying about boards and output devices later. If you take that approach, then a lot of incompatibility problems between hardware and software disappear.

*Jenkins:* But that's assuming they'll never buy another graphics package that might be incompatible with whatever hardware ran with the first one.

*Wilcox:* The point is to pick a package that won't require you to buy additional packages. The crucial thing they're saying is, I want to buy graphics software that will grow with my user base so I won't have to go back next month and buy another package.

*Archibald:* I think because of the lack of standardization, people are still forced into making hard decisions about what graphics package will run with which CPU or which output device.

*Wilcox:* I agree with that, but I just think compatibility with their existing investment is more important than compatibility with software that doesn't exist yet.

*Archibald:* I think hardware configuration is just as much an issue as standardization. Right now there appear to be multiple output devices required to satisfy graphics needs, from simple devices to plotters and sophisticated laser printers. It may be naive, but I think the key thing driving desktop publishing is desktop laser printing. If that technology had not come along, desktop publishing would have been called something else.

*Brainerd:* I think there are over 300,000 LaserJets at this point. Sales of page description language printers in just the last 12 months would be in the 30,000-to-40,000 range.

*Lyons:* Three hundred thousand! That's a lot.

*Brainerd:* Thanks to page description languages, we can take a laser printing device and create very high quality results. Page description languages like PostScript are having a dramatic impact on the graphic arts market. They've made it possible to take technology that once cost literally $30,000 to $60,000 and bring it down to the office environment, using a laser printer that sells for less than $5000. In the more distant future, screen displays themselves may be driven by languages of that sort.

*Butler:* PostScript may be an acceptable language for describing the output within a particular client area. But as a display language, it is totally and woefully hacked.

## Amazing Output

*Knorr:* In terms of hardware, what do you think the next mass market display standard will be after the EGA? What drove the EGA was pretty clear: You wanted color graphics and readable text. What will drive the next generation?

*Wilcox:* Whatever IBM comes out with.

*Jenkins:* I totally disagree with you. If IBM gets there with the best product at the right time, they will set the standard. If someone else gets there first and does a decent job of manufacturing and marketing the product, then that will be the standard.

*Eric Knorr, Associate Editor for* PC World: *'What drove the EGA was pretty clear: You wanted color graphics and readable text. What will drive the next generation?'*

*Wilcox:* Others have tried to do that for a long time, and no one has succeeded.

*Jenkins:* If Hercules or Intel comes out with a product that satisfies a real need for developers and end users, they have a standard.

*Brainerd:* For those of us in desktop publishing, the EGA or the Hercules Graphics Card represents the bottom end. We see 640 by 480 pixels becoming the standard. It will probably replace the EGA; it depends what happens during the next 12 months. Then there will be a higher-end resolution for larger screen displays, the exact figure for which I'm not sure of. Something like 1024 by 760.

*Lyons:* It will take IBM to produce those boards at a low enough cost for it to become a standard.

*Jenkins:* I think the companies that cloned the EGA are the ones that drove the EGA market, not IBM.

*Brainerd:* We look at resolution from a very application-specific point of view. Can I read 10-point, 8-point type? And the fact that I can see an entire

page on the screen is very important to me if I'm doing a lot of publication work.

*Bader:* I think that's critical. The more time you spend with a package like that, the more helpful it is to have a full-page display up there.

*Brainerd:* It changes your entire perception of the PC. Your feeling about the machine changes.

*Jenkins:* Those 19-inch monitors are instruments. They're not $150 monochrome displays. There will be people who will want to run *PageMaker* on one of those displays, but they're not for a mass market. They're a niche within a niche.

*Brainerd:* The display for desktop publishing is the most important enhancement customers can make to their environments.

*Bader:* I agree with Paul. There's a class of things people are doing now with a new generation of software that will require more sophisticated displays. That stuff will come down in price over time. Products that cost $100,000 yesterday and cost $10,000 today will cost $1000 tomorrow.

*Archibald:* The high-resolution monitors are going to start out in a very specific application area—be it desktop publishing or CAD. As the hardware gains momentum, the costs will come down.

*Jenkins:* But color monitors have been selling for a long time, and I haven't seen any suggested list price below $400. Rich, how much are you selling those graphics coprocessors for today?

*Bader:* I don't know. Hundreds of dollars.

*Jenkins:* Microsoft has been waiting for the advent of graphics coprocessors for some time. Their engineers probably thought about it in passing when building *Windows* and writing the core code. A lot of applications don't have that advantage. Companies can't cash in on the benefits unless they totally rewrite their applications.

*Lyons:* Graphics coprocessors help CAD applications very little. Ninety-nine percent of CAD is vector graphics.

*Knorr:* Rich, what applications will drive coprocessors? What software will benefit the most?

*Bader:* One application that should see a great deal of improvement is desktop publishing. What's happening—again desktop publishing is probably the primary example of this—is that you want more pixels on the screen in order to get better resolution. Clearly, the more pixels you add, the more CPU cycles it ordinarily takes to keep the screen refreshed. Desktop publishing is the breaking point, where conventional display boards—which rely on the CPU to write into video memory—don't work so well anymore. The next step is a coprocessing architecture. We recognize that there will be significant investments in converting a whole lot of existing software. Fortunately, graphics standards are reaching critical mass and should provide a significant amount of leverage to move applications onto the Intel 82786 coprocessor.

*Knorr:* The NNIOS shell on the Number Nine board is an example of that, although probably not a good one.

*Bader:* To each his own. One standard interface we feel is going to have a significant impact on the marketplace is the GDI [Graphics Device Interface] layer built into *Windows*. Getting *Windows* up and running on the 82786 will mean that any application that runs under *Windows* will also run on the 82786.

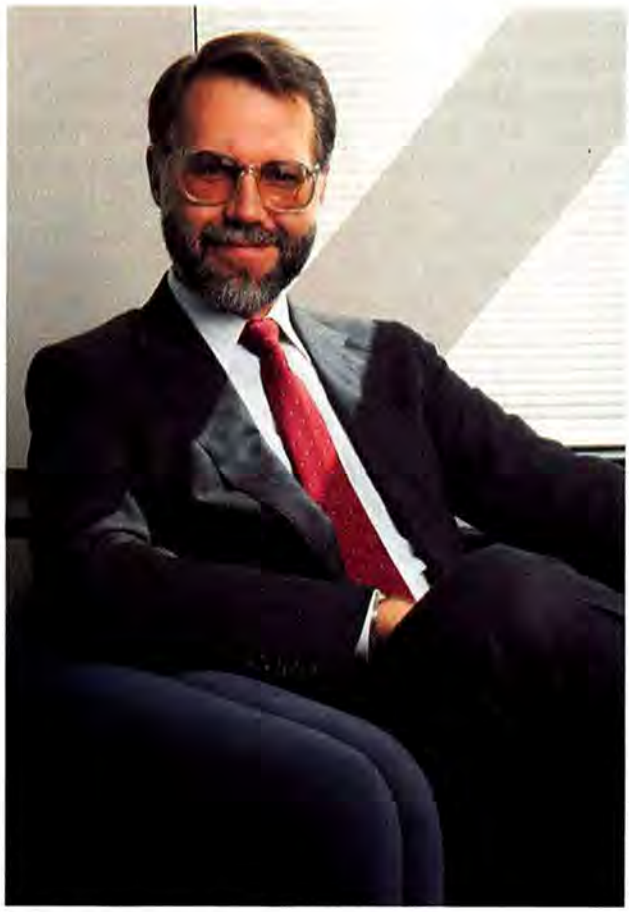
*Brainerd:* In our case, when we propose a line of type, we can use the CPU to calculate the character width, determine the leading, and so forth, and then have the coprocessor paint that line on the screen while the CPU is calculating the next line. The performance gain is a doubling of speed.

*Bader:* I expect even non-*Windows* applications will be able to take advantage of the 82786—applications that need to move a lot of bits on the screen because of either high resolution or a large number of colors. *Freelance* is an example of that, although I don't know about the specific implementations.

*Wilcox:* We're excited about the new chips, and I think there's a lot of potential there for the power user. I kind of see us oscillating between discussions of exciting new technology and discussions of how users are working with what they currently have available to them. We need to bring the users along. I'm more concerned about bringing them along than about the new technology.

*Knorr:* In terms of graphics coprocessors, that means users can have a graphic user interface and a coprocessor to take care of the overhead.

*Wilcox:* One thing we've found over the years is that if users can get decent-looking output, they're



John Greenleigh

*David Wilcox, graphics national sales manager for Lotus: 'Our recommendation to people who are under cost constraints is: Spend money on the output device rather than on the screen.'*

generally pretty happy. They'll accept certain incongruities with what they see on the screen as long as the output looks good. Based on that willingness, our recommendation to people who are under cost constraints is: Spend money on the output device rather than on the screen. As much as I would like everybody to have these coprocessors so my products can look their very best, I believe there's an enormous group of people out there who really just want to make sure that, when they pick another sans serif instead of Helvetica, the line of type won't run into their chart.

*Butler:* WYSIWYG is not the question; the issue is what-you-see-is-what-you-want-to-avoid.

## The Last Word

*Miller:* We have some very individual perspectives here. I think it would be of great benefit if each one of you could make a closing statement to our readers about what they can look forward to in the future.

*Brainerd:* In the case of desktop publishing, I think we're pushing graphics technology to its next level in every respect. Our goal is to make computers a useful tool for communication, and graphics is an essential part of what we're doing. People like Intel and Texas Instruments will provide us with the hardware, just as Microsoft will provide us with the operating environment. We'll be pushing for standards to make data interchange easier for our customers. While we're not ignoring the base of existing applications, we're trying to take leadership roles and help promulgate standards in areas that we're particularly concerned about.

*Wilcox:* We see graphics as the next broad market. The new technology is exciting, but what may be more exciting is the impact of a single package of integrated graphics tools on users who are still developing graphics awareness and abilities, who then won't have to use several different packages to do the job. This will encourage companies to put graphics on a much higher percentage of PCs than they're currently on. Then users can begin to experiment and apply graphics in their own personal applications, so that they develop the ability and knowledge to know what's good, what works, and what's productive for them. As new technologies come along, they'll have the graphics knowledge, awareness, and capability to take advantage of those technologies as they become relevant for the masses.

John Greenleigh

*Richard Bader, co-manager of Intel's Personal Computer Enhancement Operation: 'I believe that the 82786 graphics coprocessor is going to allow a human/machine interface to take the next step.'*

*Jenkins:* I don't mean to sound backward or old-fashioned in my analysis, but we sell a mass-market product. We look at a broad sprectrum of users and we're primarily text based. I think that over the next few years—and I don't mean 24 months, but maybe five years—standard PCs will come down in price, sell in large volume, and will continue to be primarily text-based machines. Obviously, we're a huge believer in graphics—monochrome graphics for certain applications and color graphics for others. I think desktop publishing is driving graphic user interfaces much more than *Windows* is. *Windows* is just a vehicle for it; it won't drive acceptance at all. Desktop publishing will be the vehicle for a program like *PageMaker* to succeed. I don't see a time in the next few years when every PC sold will have *Windows*. But if people want to spend a lot of money on a super workstation, they can have that, or anything else in between. That's what makes the market so exciting. It's so diverse.

*Bader:* It's nice to hear that the graphics market continues to be healthy and exciting. Desktop publishing, business presentation graphics, CAD/CAM, graphic human interfaces, rich text... all of these are tools that allow users to communicate more effectively. As these applications become more popular, I think users will focus more attention on what the interface with their machine is all about. Just as users are coming to expect more capabilities from their software, I think they will expect more from their display. It will take a new-generation technology to provide the platform needed to make these new applications take off. I believe that the 82786 graphics coprocessor is going to allow a human/machine interface to take the next step.

*Butler:* Unlike Kevin, I think it's going to take a lot less than five years before 100 percent of the machines out there are being used in graphics mode. Humans are inherently visual. More of your cortex is devoted to your visual system than to your auditory system. We've bet a lot on that fact. Given my role in the developmental momentum, I'm here to tell you that the rock is warm and the rock is moving. For two years I heated it up and there was a lot of hand waving and hand action, but there are folks deeply, deeply committed to our taking the steps to make their applications usable. Again, it is the functionality of applications that causes people to buy systems in the first place. With the wide range of systems available, you can now mix and match your application with the underlying hardware. We look forward to a lot of activity over the next number of years.

*Lyons:* I can agree with John in a lot of respects. One conclusion drawn by this forum is that graphics is not an application. People don't buy graphics, just like people don't buy artificial intel-

ligence. Graphics is a way of presenting information that, I believe, will become fundamental. And although my company is as yet unable to take advantage of those wonderful standards, I think the user community in general will benefit greatly from standardization. Graphics will at last prevail in the marketplace when hardware compatibility is no longer an issue, when the issue is not, Does this work with that? but rather, What is the price/performance for the quality of output? I think that applications like desktop publishing are just other forms of applications that users wanted for a long time but couldn't get without graphics. The personal computer is not personal because of its power, speed, and capabilities, but because it presents information in a personal form. That's graphics.

*Roger Archibald, product marketing manager for Hewlett-Packard, was project manager of the research and development team that gave birth to the LaserJet. Archibald, who holds an M.B.A as well as B.S. and M.S. degrees in mechanical engineering, has been with Hewlett-Packard for ten years.*

*Rich Bader is co-manager and cofounder of Intel Corporation's Personal Computer Enhancement Operation. Bader was instrumental in developing both the AboveBoard memory expansion product and the Lotus/Intel/Microsoft Expanded Memory Specification. He is an alumnus of Digital Equipment Corporation as well as of Northeastern University, from which he received a B.S. in electrical engineering.*

*Paul Brainerd is president of Aldus Corporation, producers of* PageMaker, *the renowned Macintosh desktop publishing program now available for PCs. Brainerd began his career as a newspaper reporter and holds an M.S. in journalism.*

*Dr. John Butler is the senior software engineer for Microsoft's Systems Software Marketing Group. He is also Microsoft's representative on the ANSI Graphics Language Committee.*

*Kevin Jenkins is president of Hercules Computer Technology, maker of the seminal Hercules Graphics Card. Before entering the board business, Jenkins was publisher of* Boulevards, *a controversial San Francisco tabloid. He holds a B.S. in accounting from the University of California at Berkeley.*

*Eric Lyons, product manager for* AutoCAD, *was a product manager for Amdek before joining Autodesk. He graduated from Michigan State University with a B.A. in music.*

*David Wilcox is graphics national sales manager for Lotus Development Corporation. Formerly, he was vice president of sales for Graphic Communications, creators of the popular* Graphwriter *and* Freelance *graphics programs now being marketed by Lotus. Wilcox received his M.B.A. from Harvard University.*

# Peruse our pro

**✓ denotes IBM-AT compatibility.**
**★ denotes IBM-PCjr compatibility.**
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## SOFTWARE

We only carry the latest versions of products. Version numbers in our ads are current at press time.

**Alpha Software ... NCP**
★✓Keyworks 2.0 ... $49.
★✓Alpha/three 1.0 ... 223.
**Application Techniques**
✓Pizazz 1.0 *(NCP)* ... 35.
**Ashton-Tate ... NCP**
✓dBase III Plus 1.1 ... call
✓Framework II 1.1 ... call
★✓Sign-Master 5.1 *(CP)* ... 157.
✓Diagram-Master 5.01 *(CP)* ... 207.
★✓Chart-Master 6.2 *(CP)* ... 237.
✓Map-Master 1.0 *(CP)* ... 245.
★✓MultiMate 3.31 ... call
✓MultiMate Advantage 3.6 ... call
**Best Programs ... NCP**
✓PC/Tax Cut *(1987 version for 1986 taxes)* ... 49.
**Bible Research ... NCP**
★✓THE WORD 3.1 *(KJV Bible)* ... 159.
★✓THE WORD 3.1 *(NIV Bible)* ... 159.
**Borland International ... NCP**
★✓Turbo Tutor 2.0 ... 24.
★✓Turbo Database Toolbox 2.0 ... 41.
★✓Turbo Graphix Toolbox 1.0 ... 41.
★✓Turbo Editor Toolbox 1.0 ... 41.
★✓Turbo Lightning 1.0 ... 59.
★✓Word Wizard 1.0 ... 41.
★✓Turbo Pascal 3.0 w/BCD & 8087 support ... 59.
★✓Turbo Pascal w/Turbo Tutor ... 75.
★✓Turbo Prolog 1.1 ... 59.
★✓Turbo Family Jumbo Pack ... 187.
★✓Sidekick 1.5 ... 51.
★✓Traveling Sidekick 1.0 ... 43.
★✓Traveling Sidekick w/Sidekick ... 73.
★✓Reflex 1.1 ... 87.
★✓Reflex Workshop 1.0 ... 41.
★✓Superkey 1.1 ... 41.
**BPI Accounting ... NCP**
★✓General Accounting C.13 ... 299.
**Breakthrough ... NCP**
✓Timeline 2.0 ... 239.
**Broderbund ... CP**
★✓Print Shop ... 35.
★✓Print Shop Companion ... 33.
★✓Graphics Library 1 ... 22.
★✓Graphics Library 2 ... 22.
**Chipsoft ... NCP**
★✓Turbo Tax 4.0 *(1987 version for 1986 taxes)* ... 45.
**Computer Associates ... NCP**
★✓SuperCalc 4 1.0 ... 279.
**Consumers Software ... NCP**
✓Spreadsheet Auditor 3.0 *(check your work)* ... 89.
**Dac Software ... NCP**
✓Dac Easy Port ... 19.
✓Dac Easy Mate ... 26.
✓Dac Easy Payroll ... 32.
★✓Dac Easy Accounting ... 45.
**Executive Systems ... NCP**
✓XTREE 2.0 ... 37.
✓Hot 3.0 *(DOS utility)* ... 41.
**5th Generation ... NCP**
✓Fastback 5.13 ... 97.
**Funk Software ... NCP**
★✓Sideways 3.11 ... 39.
**Generic Software ... NCP**
✓Generic CADD 2.0 ... 69.
**Harvard Associates ... NCP**
★✓PC LOGO 2.0 ... 89.
**Infocom ... NCP**
✓Cornerstone 5.2 ... 59.
**Lifetree ... NCP**
★✓Volkswriter Deluxe Plus 1.0 ... 69.
★✓Volkswriter 3 1.0 ... 147.
**Micro Education (MECA) ... CP**
★✓Managing Your Money 3.0 ... 115.
★✓Managing the Market 1.0 ... 85.
**Micropro ... NCP**
★✓WordStar 3.31 ... 179.
✓WordStar Propak 3.31 ... 259.
✓WordStar 2000 Plus Release 2 ... 285.
**Microrim ... NCP**
✓R:base 5000 1.01 ... call
✓R:base System V 1.0 ... 359.
**Microsoft ... NCP**
✓Windows 1.03 ... 65.
★✓Multiplan 2.01 ... 119.
★✓Microsoft Chart 2.02 ... $197.
★✓Microsoft Word 3.1 ... 279.
★✓Microsoft Project 3.0 ... 239.
*LANGUAGES*
✓Quick Basic 2.0 ... 59.
★✓Macro Assembler 4.0 ... 97.
★✓Pascal Compiler 3.3 ... 175.
★✓Fortran Compiler 3.31 ... 229.
★✓C Compiler 4.0 ... 279.
**Microstuf ... NCP**
★✓Crosstalk XVI 3.61 ... 95.
✓Remote 1.3 ... 95.
**Migent Software ... NCP**
✓Ability 1.0A ... 65.
**Monogram ... NCP**
✓Dollars & Sense 2.0 ... 105.
**Nantucket Software ... NCP**
✓Clipper *(Autumn '86)* ... 349.
**Nolo Press ... NCP**
★✓WillWriter 1.0 ... 35.
**Paperback Software ... CP**
★✓VP-Planner 1.3 ... 57.
★✓VP-Info 1.0 ... 57.
**Personics ... NCP**
✓SmartNotes 1.4 ... 49.
**Peter Norton ... NCP**
★✓Norton Commander 1.0 ... 36.
★✓Norton Utilities 3.1 ... 59.
**Quarterdeck ... NCP**
✓DESQView 1.3 ... 65.
**Simon & Schuster ... NCP**
★✓Webster's New World Speller 1.3 ... 39.
★✓Webster's New World Thesaurus 1.0 ... 43.
★✓Webster's New World Writer 1.01 *(includes Thesaurus & Speller)* ... 109.
**Softlogic Solutions ... CP**
✓Double DOS 4.0 *(PC concurrency)* ... 33.
✓Software Carousel 2.0 ... 33.
✓Disk Optimizer 2.0 ... 35.
**Software Publishing ... NCP**
✓PFS First Choice 1.0 ... 97.
✓Personal Publisher 1.0 ... 109.
✓Professional Write 1.0 ... 119.
✓Professional File 1.0 ... 149.
✓Harvard Presentation Graphics A:01 ... 245.
✓Harvard Total Project Manager 1.12 ... 289.
**Springboard ... CP**
★✓Certificate Maker ... 34.
★✓Newsroom ... 35.
★✓Clip Art Volume 1 *(for Newsroom)* ... 19.
★✓Clip Art Volume 2 *(for Newsroom)* ... 25.
✓Newsroom•Pro *(not copy-protected)* ... 79.
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✓Q & A 2.0 ... call
**True BASIC, Inc. ... NCP**
★✓True BASIC 2.0 ... 109.
✓True BASIC Libraries ... *each* 32.
**Turner Hall ... NCP**
✓SQZ! 1.5 *(for Lotus compactness)* ... 49.
✓Note-It 2.0 *(notes on spreadsheets)* ... 49.
**WordPerfect Corp. ... NCP**
✓WordPerfect Library ... 59.
★✓WordPerfect 4.2 ... 239.

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Do you have a problem communicating with 1-2-3? Don't feel bad, now HAL is here to lend a hand. HAL understands English, so you are both now speaking the same language. Tell him to "/enter Jan to Dec across in C3," and voila! The months appear across the top like magic. HAL is the greatest thing to happen to 1-2-3 since the personal computer.

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- Includes the ability to link spreadsheets (finally!)
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For the IBM PC, XT, or AT
(requires 1-2-3 Rel. 1A or 2) ... $109.

For the IBM-PC (XT & AT) *Exclusively.*

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**The play's the thing.**

For years, industry fuddie duddies have been trying to figure out the extraordinary attraction of our industrious fuzzy wuzzies. How, they ask themselves, did a bunch of small tree-climbing carnivorous mammals manage to metamorphose the miniature maildrop of Marlow, NH (pop. 545) into a micro mail-order monolith?

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**Get on the (joy) stick!**

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**Give your PC the bird—with *Hopper*. Together at last with *PC Man*, on one disk. Offer not available to net accounts. Limit one per customer.**

**For the IBM-PC (XT & AT) exclusively.**

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- Smartmodem 1200B *(w/Smartcom II)*. . . . . 349.
- Smartmodem 1200B *(no software)*. . . . . 319.
- Smartmodem 2400 . . . . . 589.
- Smartmodem 2400B *(w/Smartcom II)* . . . . 529.
- Smartcom II 2.1 *(software)*. . . . . 89.

**Hercules ... 2 years**
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- Hercules Graphics Card . . . . . 189.
- Hercules Graphics Card Plus . . . . . special

**Intel ... 5 years**
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- Above Board PS-PC 64k C/S/P. . . . . call
- Above Board PS-AT 128k S/P . . . . . call
- Inboard 386/AT . . . . . call
- 8087 *(for IBM-PC & XT)* . . . . . 119.
- 8087-2 *(for 8 Mhz PC compatibles)*. . . . . 169.
- 80287 *(for IBM-PC AT & XT 286)* . . . . . 195.
- 80287-8 *(for 8 MHz AT compatibles)* . . . . . 269.

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**key tronic ... 90 days**
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- * HX-12 RGB monitor *(690 x 240)* . . . . . 449.

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  0k *(upgrades to 384k)* . . . . . 129.
  384k *(fully populated)*. . . . . 179.
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- Microfazer II Printer buffer 64k . . . . . 249.
- QuadEGA+ *(half-card)*. . . . . 349.

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| Lotus 1-2-3 | WordStar 2000 |
| Symphony | MultiMate |
| dBase III | WordPerfect |

. . . . . *each* 12.

**Toshiba ... 1 year**
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- P351 S/P printer Mod 2 *(136 col., 288 cps)* 1049.
- Toshiba T1100 PLUS Laptop Computer . . . call
- Toshiba T3100 Laptop Computer. . . . . call

**Tseng Labs ... 1 year**
- EVA 480 *(supports 640x480 resolution, includes drivers for Lotus 1-2-3 ver. 1A)* . . 399.

**Video 7 ... 2 years**
- VEGA *(half-card)* . . . . . 329.
- VEGA Deluxe . . . . . 399.

## DRIVES

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- 20 Meg Hard Drive Card *(85 ms)*. . . . . 459.

**IOMEGA ... 90 days**
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- 10 Meg cartridge. . . . . 57.
- Bernoulli Box 40 Meg w/PC2 card . . . . 2449.
- PC2B (Bootable) Card. . . . . 229.
- 20 Meg cartridge. . . . . 79.

**Mountain Computer ... 1 year**

*Both Drive Cards include Q & A Software.*
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- Drive Card 30 Meg *(78 ms)* . . . . . 599.

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**TEAC ... 1 year**
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**Toshiba ... 1 year**
- PC, XT 360k Drive *(5¼" half-height)*. . . . . 109.
- AT 360k Drive *(5¼" half-height)* . . . . . 117.

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- 256k Upgrade Set *(150 ns, set of 9)* . . . . . 35.

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- * Maxell MD-2 *(10 disks per box)* . . . . . 19.

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- Verbatim *(10 disks per box)* . . . . . 29.
- Maxell *(10 disks per box)* . . . . . 34.

**3½" Double-sided Diskettes** *(720k)*
- Verbatim *(10 diskettes)*. . . . . 26.
- Sony *(10 diskettes)*. . . . . 26.
- MAXELL *(10 diskettes)*. . . . . 26.
- 3M *(10 diskettes)* . . . . . 27.
- BASF *(5 diskettes)* . . . . . 14.

## MISCELLANEOUS

**Automation Facilities**
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- *(includes subscription, manual, $25 usage credit, monthly publications)* . . . . . 24.
- **Dow Jones** Membership Kit . . . . . 24.

**Environmental Software**
- Nylon Computer Covers PC, XT or AT . . . . . 20.

**Innovative Concepts**
- * Flip n' File 50 *(holds 50 disks)* . . . . . 16.
- * Flip Sort *(holds 70 disks)* . . . . . 15.

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Computer Toolkit *(all the tools you need to go with your PC in a software style binder)* . . . . . 29.

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  IBM-PC BASIC .... *each* $33.
- ★ ⌐ *TRAINING POWER PROGRAMS*
  Lotus 1-2-3 Wordperfect dBase III Plus
  WordStar Displaywrite 3 .... *each* 43.

**Individual Software ... CP**
- ★ ⌐ The Instructor II ..... 26.
- ★ ⌐ Professor DOS ..... 33.
- ★ ⌐ Tutorial Set *(both items above)* ..... 49.
- ★ ⌐ Typing Instructor II ..... 26.
- ★ ⌐ Training for Lotus 1-2-3 *(for vers. 1A & 2)* ... 37.

**Microsoft ... NCP**
- ★ ⌐ Learning DOS *(for any version)* ..... 33.

**Simon & Schuster ... NCP**
- ★ ⌐ Typing Tutor III 1.5 ..... 33.

## EDUCATIONAL

All educational programs listed are copy-protected except where noted.

**Barron's**
- ★ ⌐ Computer SAT ..... 35.

**Designware** *(reqs. CGA)*
- ★ Spellicopter *(ages 6 to adult)* ..... 22.

**Eduware** *(reqs. CGA)*
- ★ Algebra 1,2,3, or 4 ..... 22.

**Harcourt Brace Jovanovich**
- ★ Computer SAT ..... 49.

**Stone & Associates** *(reqs. CGA)*
- ★ ⌐ My Letters,Numbers,Words *(ages 1 to 5)* .. 27.
- ★ ⌐ Kids Stuff *(ages 3 to 8)* ..... 27.

**True BASIC, Inc. ... NCP**
- ★ ⌐ Calculus ..... 32.
- ★ ⌐ PreCalculus ..... 32.

## RECREATIONAL

All recreational programs listed are copy-protected except where noted.

**Blue Chip**
- ★ ⌐ Managing for Success *(American Dream)* . 36.
- ★ ⌐ Millionaire ..... 36.

**Electronic Arts ... NCP**
- ★ ⌐ Starflight *(requires CGA)* ..... 32.

**Hayden Software**
- ★ Sargon III *(highest rated Chess program)* .. 32.

**Infocom ... NCP**
- ★ ⌐
  Enchanter the Witness Planetfall
  Leather Goddesses Hitchhiker's Guide
  Moonmist Zork I ..... *each* 24.
  Zork II Zork III ..... *each* 27.
  *Invisiclues (hint booklets). Specify game* ... 6.

**Microleague Sports** *(reqs. CGA)*
- ★ ⌐ Microleague Baseball ..... 25.

**Microprose** *(reqs. CGA)*
- ★ F-15 Srike Eagle ..... 22.
- ★ Silent Service ..... 22.

**Microsoft** *(reqs. graphics brd.)*
- ★ ⌐ Flight Simulator 2.12 ..... 32.

**Mindscape** *(reqs. graphics brd.)*
- ⌐ Balance of Power *(avoid nuclear war)* ..... 30.

**1Step Software** *(reqs. CGA)*
- ★ ⌐ Golf's Best *(Pinehurst or St. Andrew's)* .... 19.

**Parlor Software**
- ★ ⌐ Bridge Parlor *(best Bridge simulation)* .... 49.

**Sierra On-Line** *(reqs. CGA)*
- ★ ⌐ Space Quest ..... 32.
- ★ ⌐ King's Quest II ..... 33.
- ★ ⌐ King's Quest III ..... 33.

**Simon & Schuster**
- ★ ⌐ Star Trek/Kobayashi ..... 27.

**Spectrum Holobyte** *(reqs. CGA)*
- ★ ⌐ Orbiter *(Shuttle simulation)* ..... 27.
- ★ ⌐ GATO ..... 27.

**Sublogic** *(reqs. graphics brd.)*
- ★ ⌐ Jet ..... 33.

**XOR ... NCP**
- ★ ⌐ NFL Challenge *(be the coach)* ..... 79.

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**HERCULES COMPUTER TECHNOLOGY, INC. ... 2 years**
**⌐ Graphics Card Plus**

Monochrome is great. You get fantastic resolution, no flicker, and all the green you could ever hope for. And, for you 1-2-3 lovers, the original Hercules Graphics Card was the answer to a prayer. Now Hercules has come out with a great new invention, aptly named the Graphics Card Plus. Not only does it do all the good old stuff, but it also does some nifty new stuff too...

- RamFont mode allows you to define up to 3072 standard characters (instead of 256)
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For the IBM-PC, XT, & AT .. $special price.

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330W

## HARDWARE

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- SixPakPlus 64k C/S/P ..... $169.
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- SixPakPremium Piggyback Board 256k .. 189.
- ⌐ Advantage Premium 512k S/P *(upgrades to 1 Mb or 2 Mb w/Piggyback)* .. 469.
- ⌐ Advantage Premium Piggyback 512k .... 289.
- RAMpage! 256k *(upgrades to 2Mb)* ..... call
- ⌐ RAMpage! AT 512k *(upgrades to 2Mb)* .... call
- ⌐ RAMpage EGA 512k ..... 699.

*AST Premium series boards and RAMpage! boards support EMS and fully support EEMS.*

**Amdek ... 2 years**
- ⌐ Video 310A mono monitor *(amber)* ..... 159.
- ⌐ Color 722 - EGA compatible ..... 519.

**Compucable ... lifetime**
- ⌐ 9-to-25 Pin Serial Converter cable ..... 19.
- ⌐ Smartmodem-to-AT cable *(9 feet)* ..... 19.
- ⌐ 15-foot Parallel Printer cable ..... 27.
- ⌐ 2-Position *(AB switch box)* ..... 39.
- ⌐ 3-Position *(ABC switch box)* ..... 65.

**Cuesta ... 1 year**
- ⌐ Datasaver 400 Watt *(backup power unit)* .... call

**Curtis ... lifetime**
*ACCESSORIES*
- ⌐ Printer Stand ..... 18.
- ★ ⌐ Universal System Stand ..... 25.

*CABLES*
- Smartmodem-to-PC Cable *(9 feet)* ..... 17.
- ⌐ Keyboard Extension Cable *(3 to 9 feet)* ..... 27.
- ⌐ Extension Cables for IBM Mono Display ... 33.
- ⌐ Printer-to-IBM cable *(9 feet)* ..... 17.

*SURGE SUPPRESSORS*
- ★ ⌐ Safestrip *(6 outlets)* ..... 21.
- ★ ⌐ Diamond *(6 outlets)* ..... 29.
- ★ ⌐ Diamond-Plus *(w/FAX & modem protection)* 41.
- ★ ⌐ Emerald *(6 outlets; 6 ft cord)* ..... 36.
- ★ ⌐ Sapphire *(3 outlets; EMI/RFI filtered)* ..... 47.
- ★ ⌐ Ruby *(6 outlets; EMI/RFI filtered; 6 ft cord)* ... 55.
- ★ ⌐ Ruby-Plus *(w/FAX & modem protection)* .... 65.
- ★ ⌐ Command Center .....SPECIAL ..... 79.

**DCA ... 1 year**
- ⌐ Irma *(3270 emulation board)* ..... 729.

**Epson ... 1 year**
- ⌐ EX-800 printer *(80 col., 300 cps)* ..... 499.
- ⌐ EX-1000 printer *(136 col., 300 cps)* ..... 569.
- ⌐ FX-85 printer *(80 col., 160 cps)* ..... 379.
- ⌐ LX-86 printer *(80 col., 120 cps)* ..... 249.
- ⌐ LQ-800 printer *(80 col., 180 cps)* ..... 549.
- ⌐ LQ-1000 printer *(136 col., 180 cps)* ..... 759.
- ⌐ LQ-2500 printer *(136 col., 324 cps)* ..... 1089.
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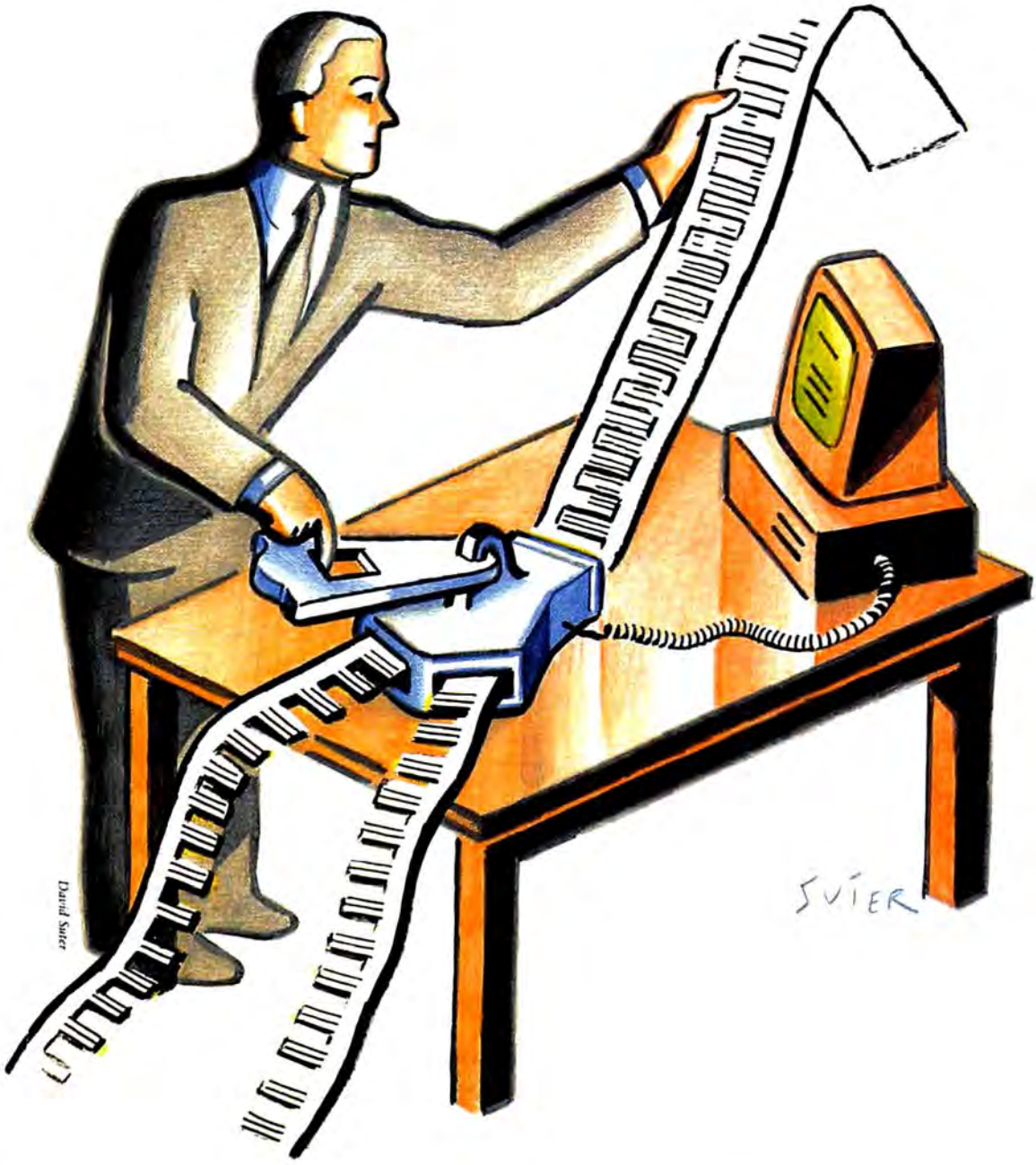
Has dBASE finally met its match? Microrim's R:base System V successfully bridges the gap between ease of use and capable data management and offers a menu-driven system that can create drum-tight turnkey applications without programming.

*William Urschel*

The synergistic rivalry between *dBASE* and *R:base* continues. But unlike many other free-market contests, the customer has walked away the winner. *dBASE* has become, dare I say it, almost user-friendly. And *R:base,* once an amiable file manager with promise, has evolved into a mature, full-featured data base manager complete with command language.

Yet a feeling of unfinished business persists. For all its improvements—a more astute menu-driven interface, plus a screen and program generator—*dBASE III Plus* is still a forbidding product for workaday users. When it comes time to forge a complex custom application, you usually find yourself back at the infamous dot prompt, tapping in commands—or on the phone to a programmer. *R:base 5000* eliminated much of this unpleasantness with its diagrammatic prompt feature, hand-holding menu system, and capable Application Express. Yet Microrim failed to fully extend the Express concept to reporting and forms generation. The promise remained unfulfilled.

No longer. With the release of *R:base System V,* complete programming power is only a menu away. Microrim's answer to *dBASE III Plus* heals the schism between power and ease of use in the only way possible: with multiple solutions. *System V* includes the programming features that power users and developers pine for and introduces three menu-driven front ends—Definition Express, Forms Express, and Reports Express—that enable tyros and pros alike get to the heart of *System V* fast. With the tried-and-tested Application Express already in place, do-it-yourself business users can wrap all the elements of an application into one neat package.



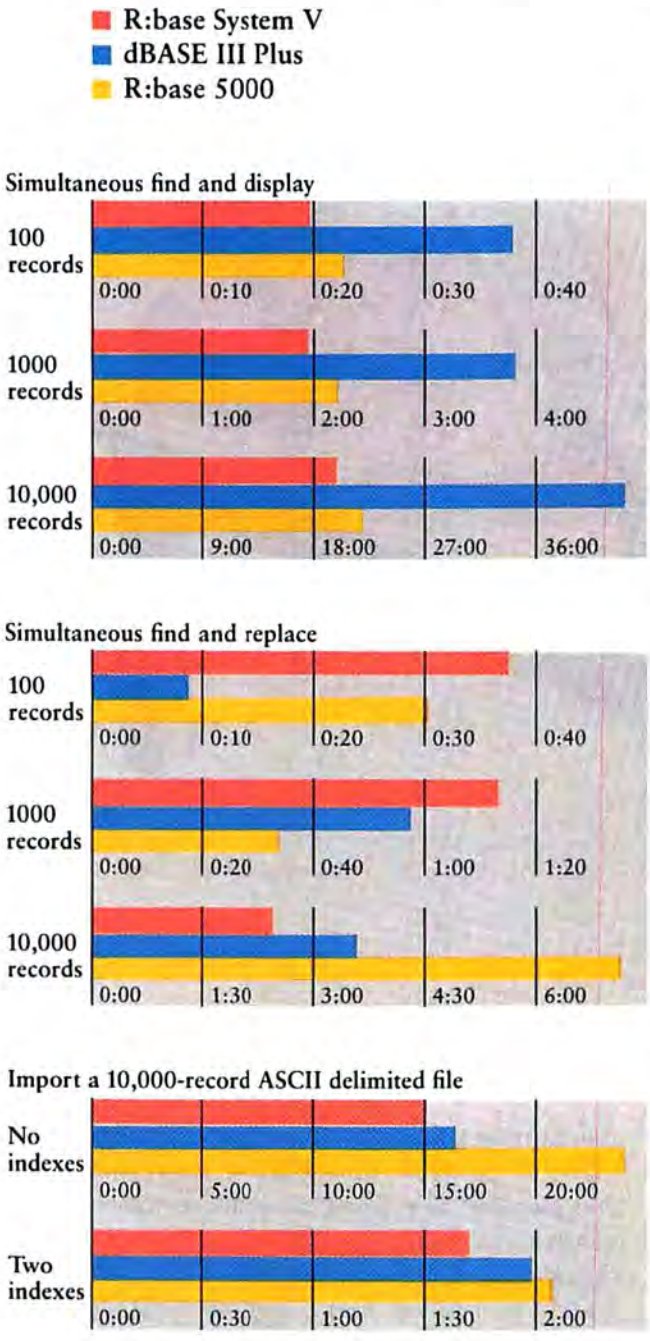

David Suter

### A Confederacy of Solutions

*System V* is not a single program, but a collection of like-minded modules. You can define a file's structure, enter data, or create reports at ground level by typing simple English-like commands at the R prompt and combining them with file names, field names, Boolean operators, and so on. Place Prompt before a command and *System V* will not only describe it but list the file names, keywords, and other parameters that would logically follow. The commands are relatively straightforward, but mastering the entire *R:base* lexicon is not something you can do in an afternoon.

Save your synapses. With *System V*'s new menu-driven Express modules, you can put the program through its paces without ever typing a command. If you follow the Definition Express menus and prompts, you can set up simple data tables or construct a huge network of interconnected tables, including lookup functions, cross-field calculations, and data validation. Forms Express and Reports Express give you the same automated power in creating reports and on-screen data entry/retrieval forms. And as we shall see, the Application Express can spin the necessary program code that fuses the parts.

**Figure 1: R:base System V, dBASE III Plus, and R:base 5000 single-user performance compared (times in minutes:seconds)***




*All tests were conducted on an AT-compatible, 8-MHz Hewlett-Packard Vectra.

## Movin' On Up

This kind of power doesn't come cheap—but at least you get your money's worth. The *System V* package tips the scales at nearly 8 pounds and includes three manuals, seven pamphlets, a hard-shell disk case, and 11 floppy disks totalling 4MB. However, *System V*'s core program and overlay files occupy less than 1MB, so once you've created applications with the Express modules, you can remove the modules from your hard disk.

Although moving up to *System V* is relatively simple, it involves more than clearing out the back forty on your hard disk. Irritatingly, *System V* can't read *R:base 5000* data base files directly, but a supplied utility makes the necessary transformation. The process isn't speedy: For example, on an AT-compatible hard-disk HP Vectra, converting a 10,000-record file with 13 fields per record and 2 key fields into *System V* format took almost 1½ hours.

Likewise, *System V* can't directly run programs created with *R:base 5000*'s Application Express module. But converting an application is simple: Use the 'Modify Existing Database' option from *System V*'s Application Express menu to select the application and then save it back to disk. Because the Application Express generates highly stylized, structured code, you cannot convert programs written from scratch or Express applications that have been heavily modified by hand.

## R:base and dBASE Basics

As Table 1 shows, *System V* can handle twice as many data bases as *R:base 5000*, concurrently manipulating 80 files or 800 fields, whichever comes first. Humble *dBASE III Plus* is limited to 15 open files, with a maximum of 128 fields. This may sound paltry by comparison, but don't base a purchase decision solely on this factor—few applications require more than 5 or 6 files.

More practical additions are the note field and the double field. Note fields can store as much as 4K of text. Since they're variable length, they take only the disk space an entry requires, making program operations more efficient. Double fields can hold real numbers of up to 15 digits' precision, useful for many scientific and statistical applications.

*System V* has the speed advantage, too (see Figures 1 and 2). In a simple find-and-display test, *System V* was 40 percent faster than *dBASE III Plus*, re-

gardless of file size or the number of people using the product on a local area network (LAN). *dBASE III Plus* worked twice as fast on smaller data bases during a more complicated find-and-replace test, but turned snail-like when either the file size or the number of network users increased. In the same test, *R:base 5000* generally placed a respectable second.

## Commands and Functions: New Faces

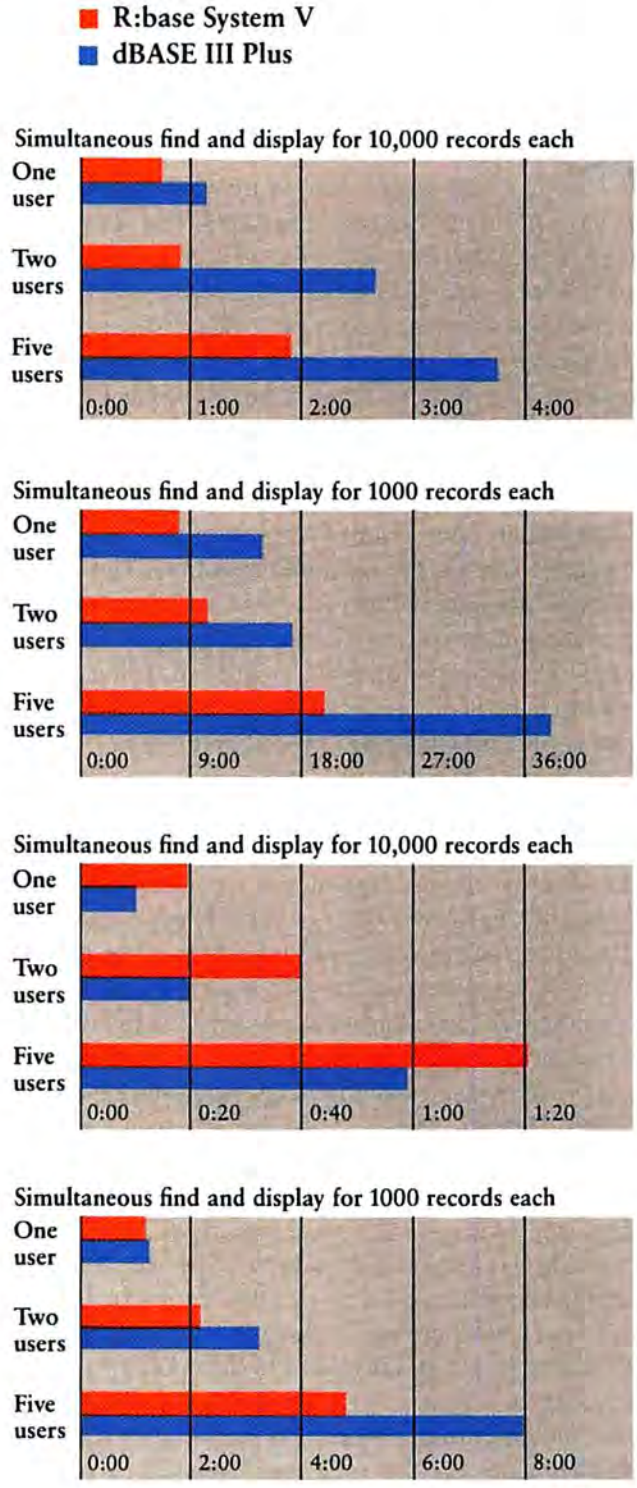
Except for a few new network-specific commands, *System V* largely adopts the *R:base 5000* command set. However, there are some notable additions. The View command creates a temporary table that draws fields from a number of sources—a quick way to visualize how different data bases might be combined without actually altering their data structures. And by popular request, Microrim has included a Record command that stores keystrokes like *ProKey* does. Naturally, you can play back a macro file, edit it with a text processor, or use it when building custom applications with *System V*'s command language.

Those with a yen for financial analysis will undoubtedly turn to Crosstab, a cross-referencing form of the Tally command that lets you zero in on two unique fields in a table. For example, if you manage a fleet of trucks and your data base lists each truck and its model type, carrying capacity, and current location, you could use Crosstab to list the trucks by location and capacity (see Screen 1).

If you keep the books with *dBASE* and are continually frustrated by the lack of specialized financial functions, fume no more. *System V* users can draw on a collection of new "supermath" functions that, among other things, help compute payment schedules, various forms of future and present value, and interest rates. But don't be misled by Microrim's enthusiastic advertising—these functions don't provide immediate gratification, as do their spreadsheet peers. You can use them only when assigning values to a variable or formula. Note, too, that *System V* permits only 10 calculated fields in a file.

The Supermath set also includes mathematic, string, trigonometric, type conversion, date and time, and logic functions. The math contingent deals with

**Figure 2: R:base System V and dBASE III Plus on the LAN (times in minutes:seconds)***




*These tests were performed using PC's Limited AT computers with 6-MHz clocks, 1MB of RAM, 40MB Seagate voice-coil drives, and Gateway Communications G-Net Key Cards at the workstations and file server. The Novell Advanced Netware/86 V2.0 operating system was used at the file server.

absolute values, exponents, logarithms, and remainders; string functions convert text from lowercase to uppercase and vice versa, fill in spaces with a given character, center text, and return a string to its original function or program.

## Extra Express

When the Application Express debuted in *R:base 5000,* the aim of turning data base application development into a simple menu-driven process was somewhat hampered by the fact that you still had to create tables, forms, and reports with *R:base* commands. *System V* finally brings these key functions into the fold with Definition Express, Forms Express, and Reports Express. Building a table that cross-references five other data bases, an on-screen form that validates data, or a report that subtotals stock on hand by part number involves picking options from menus offered by the appropriate module. The Application Express will likewise lead you along the straight and narrow, helping you pull together the parts of an application at the right time. You never confront the R prompt or experience the Sturm und Drang of command-language programming.

Some highlights in the expanded Express clan:

*Definition Express.* The groundwork for a data base is laid here. Pick 'Define a New Database' from the Definition Express main menu; name the file, records, and fields; and then specify field types and lengths as you go. A number of field types are available, but computed fields are perhaps the most useful because they can calculate values (such as subtotals) based on other fields. This not only saves typing time but provides some answers before you even generate a report. Definition Express also lets you secure a file (such as a payroll data base) with a password, create temporary tables with the View command, and most important, impose rules on specific fields.

*Rule* is just another name for data validation—an important feature when novices are entering data in a system. Depending on the parameters you supply, a field might accept only dates in the *dd/mm/yy* format, accept only zip codes that fall between 80000 and 90000, or double-check an entered part number by referencing another table (see Screen 2).

Fashioning rules is a complicated operation with most data management programs, but the Definition Express is positively avuncular during the process. Choose 'Rules' from the Definition Express main menu, select 'Add a New Rule' from the menu that follows, and identify the targeted table from the list displayed by the module. Next, supply the error message you want the application to display if the rule is broken. When you identify the field the rule applies to, the program displays a "setting sheet" in which you specify operators (greater than, less than, equal to, and so on) and the value or field the entry is being compared to. You can apply as many rules as you want to a field using AND, OR, AND NOT, and OR NOT connectors.

*Forms Express.* Once a data base is defined, you move on to the Forms Express, which initially displays a blank screen. To design a form, you type in permanent text, such as headers, footers, and field labels, and then point to the spots where data will actually appear when printed out (see Screen 3). To speed data entry, a form can even fill in its own blanks with fixed values (such as today's date), values taken from the previous record (a great timesaver if you are entering several records for the same company), or values grabbed from a field in some other file. A form can span five pages; include computed fields; and, for security's sake, restrict user access to a file on a read-only, edit-only, or enter-only basis.

A form can also display the results of a lookup. For example, I stored the expression 'vname = vname in vendors where vnumber = vnumber' in a computed field and retrieved a vendor's name, address, and credit rating simply by entering the vendor number (vnumber). I devised this construct without ever consulting the manual, and it worked just fine—a testament to *System V*'s logical design.

A form isn't glued to a single file, either. With the Region and Tier features, you can open windows into five different files and display or collect data for all of them. For example, a single form could route selected sales data (customer name, address, company, and so on) to a customer file and funnel shipping orders to an inventory file (see Screen 4).

Of course, menus can sometimes lead you down electronic rabbit holes. If you're not careful, you can inadvertently create circular dependencies and discover several files frantically locked together, each expecting vital results from the other. In general, make sure formulas forward results from file to file in only one direction.

*Reports Express.* Part of *System V*'s charm is the similarity among its modules. Laying out report

```
R)CROSSTAB
-ERROR- Syntax is incorrect for the command

                                SYNTAX
     CROSSTAB ┌                                  ┐ colname1 BY colname2 —...
              │ COUNT    │
              │ MINIMUM  │
              │ MAXIMUM  ├ colname3 FOR
              │ AVERAGE  │
              └ SUM      ┘

          ...— FROM ┌ tblname  ┐ ┌                  ┐
                    └ viewname ┘ └ WHERE condlist   ┘

R)CROSSTAB location BY capacity FROM trucks WHERE capacity GT 4000
capacity ¦ Lot_A    Lot_B    Lot_C    (Total)
---------¦-------- -------- -------- --------
4000     ¦       1        1        1        3
6000     ¦       1        1        0        2
8000     ¦       0        0        1        1
         ¦
         ¦       2        2        2        6
```

Screen 1: Error-handling is System V's forte. In this case, the error screen depicts the proper syntax for a cross-tabulation and, at the bottom, a successful Crosstab operation. This table collates trucks by carrying capacity and storage log.

```
                                SYNTAX
                          ┌ AVE      ┐
                          │ COUNT    │
COMPUTE ┌               ┐ │ MAXIMUM  ┐ ┌ colname    ┐ FROM ┌ tblname  ┐ ┌              ┐
        └ varname AS    ┘ │ MINIMUM  ├ └ expression   ┘      └ viewname ┘ └ WHERE condlist ┘
                          │ SUM      │
                          │ STDEV    │
                          └ VARIANCE ┘

COMPUTE ALL ┌ colname    ┐ FROM ┌ tblname  ┐ ┌              ┐
            └ expression ┘      └ viewname ┘ └ WHERE condlist ┘

COMPUTE ┌               ┐ ROWS FROM tblname
        └ varname AS    ┘

 For additional HELP text, enter a command name. To leave HELP, enter END.
 For the previous help menu press [ESC]
H)-
```

Screen 2: The rules-creation worksheet in the Definition Express. This rule references the vendor table to ensure that the vendor number entered in the product table is legitimate.

```
                          Form Definition Menu
  Edit  Expression  Customize  Draw

   Invoice: S       E                                Date: S         E

     First: S         E            Last: S                E
     Title: S     E                Company: S                      E
    Street: S                         E
     Suite: S                         E
      City: S                   E   State: SE      Zip: S   E
     Phone: S          E      Pay Method: S     E  Shipping Type: S      E

  S       E  S                                  E  S            E  S  E
  S       E  S                                  E  S            E  S  E
  S       E  S                                  E  S            E  S  E
  S       E  S                                  E  S            E  S  E
  S       E  S                                  E  S            E  S  E

  Merchandise: S              E
          Tax: S              E
     Shipping: S              E
        Total: S              E

[ESC] Return  [F3] Review  [F7] Prev table  [F8] Next table  [F10] Help
```

Screen 3: The Forms Express definition screen. Field labels have been typed in; 'S' and 'E' tell System V where a field starts and ends.

headings, footers, control breaks, and fields and defining variables and lookup functions are almost the same as designing a data entry/retrieval form. But it wasn't always so easy. In *R:base 5000,* pasting down the city, state, and zip fields in an address line meant defining three variables and concatenating them. Worse still, report width was limited to 131 characters.

*System V*'s Reports Express corrects these deficiencies and completely supplants the *Extended Report Writer* utility created by Microrim for disgruntled *R:base 5000* users. Among other improvements, a report can span 255 characters across a page, and editing a format is easier thanks to an expand mode that inserts lines in a section as needed.

After mastering the Forms Express, I quickly jumped into the Reports Express and created single-record vendor profiles, lists that subtotaled sales by product, and labeled summary reports that tallied sales activity by vendor. For simple tasks like this, leaping before you look is seldom fatal. As we shall see, putting an entire system together with the Express modules takes planning.

## The Sum of R:base's Parts

Once a data base and its forms and reports are defined, you can run the assemblage from the R prompt or tightly bind the elements together with a program written from scratch or generated by the Application Express. Opt for the command approach if you're not sure how the data will be used. For example, if you're a Civil War historian and your data base contains bibliographic entries for books, journal articles, and unpublished diaries, plus sketches of key officers, battles, and campaigns, setting up *System V* like an accounting program doesn't make much sense. Instead, you will probably need to root around in files, spontaneously concoct cross-references, and enter and edit data on the fly.

If free-form data management isn't appropriate, a *System V* program might be in order. Writing a large, bug-free application from scratch with menus, help screens, automatic data conversions, and so on, is a major undertaking—but not if you rely on the Application Express.

The Application Express poses questions and, based on your answers, builds menus to run the application. Typically, you name each menu, select the menu type (either table of contents or *1-2-3* command-line style), and declare whether the user will be allowed to back up to the previous menu using <Esc>. If a help screen is needed, the Application Express produces a blank screen for you to fill in. Finally, you type in the options that will appear in each menu.

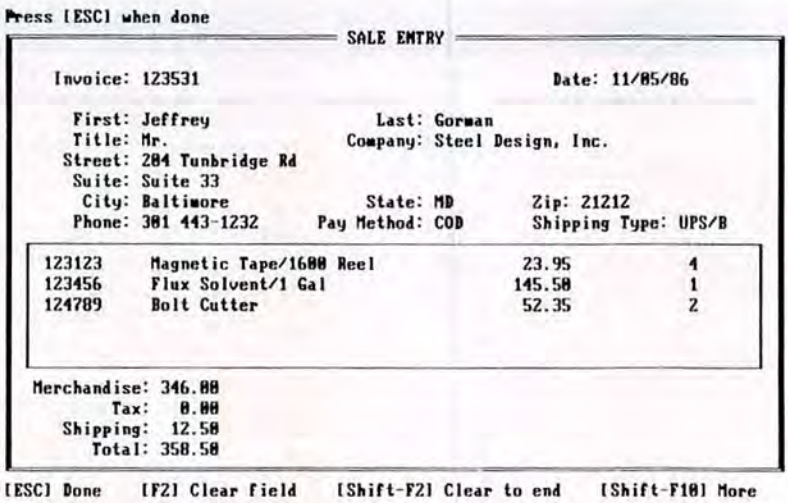
Here's where program design rears its head: Each option must be assigned an action (see Screen 5). The actions, which parallel *System V* commands such as Load, Edit, Modify, and so on, are plucked from a menu at the bottom of the screen. If an option forces the program to open a file, display a data-entry form, or print out a report, Application Express will list and integrate any files, forms, and report formats you created earlier.

The last question is the knottiest: Does any menu option lead to a submenu? If it does, follow the same steps, assigning actions to submenu items and creating still more submenus if necessary. This is how an application grows and, sometimes, takes on a life of its own. Planning is key—don't immediately sit down in front of the PC and start rattling away at the keyboard.

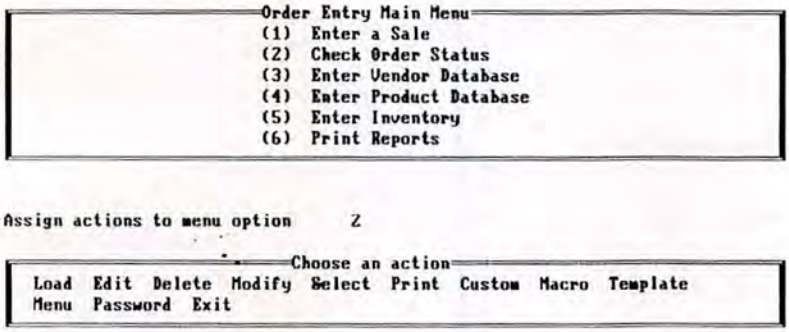
Once an application is complete, the Application Express drops the source code into an ASCII file, saves a special version for editing with the Modify an Existing Application function, and creates a binary file that *System V* can execute. The latter is a little bulky and inefficient by professional programming standards, but it's just as powerful as any handwritten application. If you want to protect your code and perhaps squeeze some extra performance out of it, you can convert the binary file to an unmodifiable form with *System V*'s CodeLock utility.

## Multiuser R:base

Although the Year of the LAN has yet to arrive, both Microrim and Ashton-Tate have taken care to add network components to their latest data managers, just in case. Like *dBASE III Plus, System V* is compatible with the IBM PC Network and runs on 3Com and EtherLink LANs using *3Com3 +* or *Novell Advanced Netware/86* software, and Ungermann-




Screen 4: One form, two files. With the Region and Tier features, you can enter data for two different files from one form.




Screen 5: With System V, you follow the menus and answer the prompts to build a custom application. Here, the choices on an Order Entry menu have been entered, and a System V function has been linked to the second option.

Bass Net/One using IBM's *PC Network Program, Microsoft Networks,* or the *U-B Personal Connection.* However, similarities between the two data managers end there (see "A Plus for dBASE III," *PCW,* October 1986).

As Figure 1 shows, *System V* cleans *dBASE III Plus*'s clock in most network operations, particularly when five users are working on the system at once. However, add a sixth user and *System V* either crashes the network or denies the new user access. Increasing the wait value (the length of a time a user can stand in line for a file) has no effect. *dBASE III Plus,* on the other hand, picks up a sixth workstation uncomplainingly, although the network runs noticeably slower.

In *System V*'s favor, file locking is performed smoothly and automatically. (This is a manual operation in *dBASE III Plus.*) Neither program supports record locking, but *System V* alerts you if someone changes and saves the record you're working on. You can then either save your changes (and overwrite the previous user's edits) or exit the system.

Like most networked data management programs, *System V* provides several levels of security. A network manager can allow a user to read and change all data at will, record and change data in

## Table 1: R:base System V, dBASE III Plus, and R:base 5000 features side by side

| | | System V | dBASE III Plus | R:base 5000 |
|---|---|---|---|---|
| Requirements | Memory | 512K/640K[1] | 256K/384K-640K[1] | 256K |
| | Hard disk | required | recommended | recommended |
| Capacity | Maximum number of open files | 80 | 15 | 40 |
| | Maximum number of fields | 800 | 128 | 400 |
| | Maximum record length (characters) | 4096 | 4000 | 1530 |
| | Command-line length (characters) | 5000 | 254 | 1600 |
| | Number of digits of precision | 15 | 15 | 6 |
| | Calculated fields | 10 | 0 | N/A |
| | Variable-length fields | • | • | |
| | Maximum number of sort keys | 10 | 10 | 5 |
| Relational operations | Project, join, append | • | • | • |
| | Union, intersect, subtract | • | • | • |
| | View | • | • | |
| | Cross-tabulation | • | | |
| Functions | Mathematical | • | • | |
| | String | • | • | |
| | Statistical | • | • | |
| | Financial | • | | |
| | Date and time | • | • | • |
| | Logical | • | • | |
| Data base definition | Visual setup | • | • | • |
| | Intercolumn math | • | | |
| | Data entry validation without programming | • | | |
| | Note field type | • | • | |
| | Search on note | • | | N/A |
| | Views without programming | • | • | |
| Form generation | Multiple tables in single form without programming | • | • | |
| | Multiple rows in form with scrolling | • | | |
| | Custom colors | • | • | |
| | Custom borders | • | • | |
| Report generation | Subtotal levels | 10 | 2 | 10 |
| | Maximum report width (characters) | 255 | 255 | 131 |
| | Columnwise reports | • | • | • |
| | Rowwise reports | • | | • |
| | Custom borders | • | | |
| Application generation | Automatic generation | • | • | • |
| | Multilevel menus without programming | • | | • |
| | Edit applications without programming | • | | • |
| | Integrate custom forms and reports | • | | • |
| | Incorporate custom help screens | • | | |
| Networking | File locking | • | • | |
| | Record locking | • | • | N/A |
| | Cost per workstation | none | $199 | N/A |
| File import | ASCII delimited | • | • | • |
| | ASCII text | • | • | • |
| | dBASE II | • | • | • |
| | dBASE III | • | • | |
| | dBASE III Plus | • | • | |
| | R:base 5000 | • | | • |
| | 1-2-3 | • | •[2] | •[2] |
| | Symphony | • | •[3] | •[3] |
| | pfs:file | • | • | • |
| | DIF | • | • | • |
| | SYLK | • | • | • |
| Miscellaneous | Copy protected | | | |
| | Macros | • | | |
| | User-defined function keys | 40 | 9 | 0 |

[1] For network server and workstations [2] Only .WKS format [3] Only .WRK format

some files but not in others, or merely browse. Passwords can also be used to bar unauthorized users from sensitive areas.

But for many, *System V*'s overriding advantage is simplicity. Once the LAN manager installs *System V* on the network's server, you merely run a brief installation program (which creates a CONFIG.SYS file) and type *set multi on* to get in on the action. In the *dBASE III Plus* world, life is not as simple. Every workstation must have its own access disk. Unfortunately, *dBASE III Plus* comes with only one access disk, so you must lay out a cool $995 for an Ashton-Tate LAN Pack to get five more disks.

### Not-So-Light Reading

When you consider *System V*'s scope and multiplicity of modes, it's not surprising that the documentation sometimes fails to impart the lay of the land. Given the complexity involved, Microrim deserves a round of applause for providing a complete and logically organized set of manuals. The user manual, learning guide, and building applications/command dictionary are your primary sources; Microrim throws in pamphlets covering single and multiuser installation, *R:base 5000* file conversions, and error messages, as well as a handy template for designing complex forms. However, the de rigueur disk tutorial is absent, as are thorough programming samples. Although *System V*'s Prompt feature, help screens, and menus greatly aid the new user, I hope the next vintage of *R:base* includes a disk tutorial.

### dBASE on the Run?

Although garlands such as "user-friendly" are tossed about when *System V* is discussed, user-friendliness is a relative thing. Although the Express modules shelter you from *System V*'s commands and syntax, they can't help you devise the underlying plan that dictates how data is organized and interconnected. That's up to you, so study *System V* carefully. Unless you are thoroughly prepared or very familiar with data management and programming structures, your application will probably end up snarled despite pretty forms and comprehensive reports.

Nonetheless, *System V* succeeds in satisfying users of almost all stripes. If you yearn to escape the limitations of your current file manager, *System V*'s foolproof menu system may be enticement enough. If you're an intermediate user who's tired of *dBASE III Plus*'s halfhearted menu system and patchwork program generator, you're another candidate for conversion. And if you're a professional developer, *System V*'s superior applications generator could cut programming time down to size.

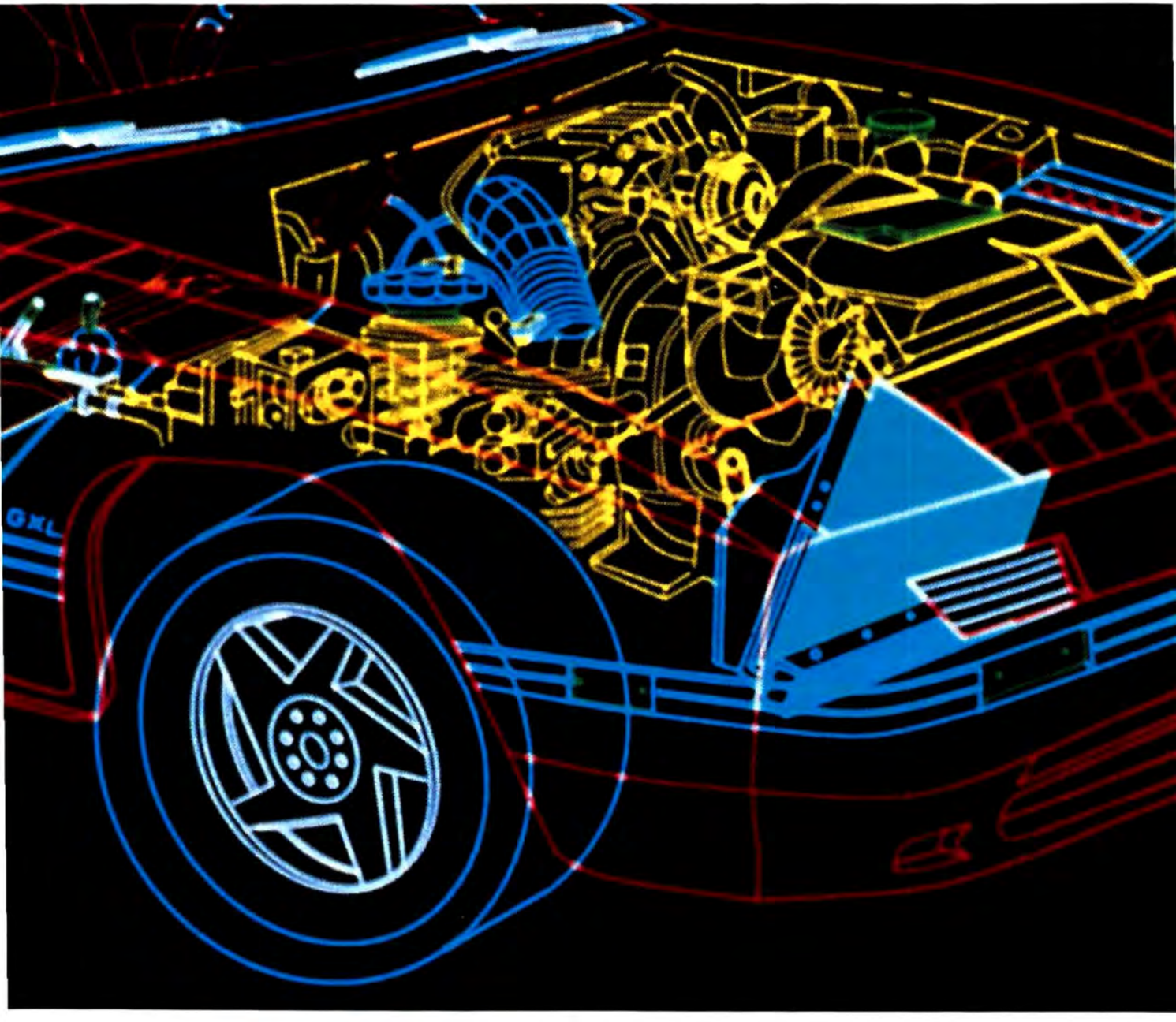
In short, *System V* might be the only data manager you'll ever need. It offers the raw power of *dBASE III Plus* (and then some), a nose-to-the-grindstone applications generator, simple yet accomplished forms and reports generation, and no-penalty networking.

Still, the last word has not been heard. If *dBASE III Plus* pushed Microrim to produce *System V*, I'm eager to see what comes next.

*William Urschel is president of Arc Tangent, a software development firm in Santa Barbara, California, and is a frequent contributor to* PC World *on business software. Network benchmarks were performed by The Lambda Group, a San Francisco consulting firm specializing in the integration of PCs in business.*

*R:base System V*
*Microrim, Inc.*
*3925 159th Ave. NE*
*Redmond, WA 98073-9722*
*206/885-2000*
*List price: $700, upgrade for registered R:base 5000 owners $200*
*Requirements: 512K (640K for local area network operation); hard disk drive; DOS 2.00 or later version for single user setups, DOS 3.10 or later version for networking*
*Not copy protected*

# VersaCAD Tries Harder



**Assembled from separate two-dimensional views, this stunning isometric construction was produced using VersaCAD 5.00.**

## Loaded with beefed-up drawing features, capable symbol and viewing options, and a built-in programming language, VersaCAD Advanced 5.00 is shooting for more than a distant second in the PC CAD competition.

***Steven Lord***

A few years ago, you could have looked long and hard for an effective PC-based CAD program and still come up empty-handed. Nowadays you face a happier dilemma—deciding which hot CAD program best suits your application. Although Autodesk's *AutoCAD* currently claims well over half the PC CAD market, the number of alternatives to this dominant package is steadily growing.

Second to *AutoCAD* in popularity is T&W Systems' *VersaCAD*. The latest versions of these two well-respected programs—*VersaCAD Advanced 5.00* and *AutoCAD 2.5*—are similar in power, scope, and price. Both packages can handle almost any drafting task, and extensive hardware support makes either one well suited for a variety of environments.

In the PC CAD marketplace as a whole, *VersaCAD*'s brightest facets are its fast screen redraw, blockbuster drawing command set, and consummate customizability. The program offers an effortless way to create macro commands, and a high-level programming language is included for truly exhaustive modifications. Because the user interface is sometimes cumbersome, however, you may want to refashion several aspects of *VersaCAD*—more groundwork than seems reasonable with a $2495 program.

## Preliminary Sketch

When you open up the *VersaCAD* package, you're confronted with a full-size, 3-inch-thick binder stuffed with 7 floppy disks, a menu map, a digitizer template, and several hundred loose-leaf pages of text. This behemoth occupies plenty of PC territory, not to mention shelf space, requiring 2MB of your hard disk and a full 640K of RAM. Despite its intimidating size *VersaCAD* is easy to install, offering menus that guide you through all phases of system configuration, as well as a large, expanding library of hardware drivers. At this writing, no less than 36 graphics display boards, 18 digitizers, 25 plotters, and 4 laser printers are supported.

As with several other CAD programs, *VersaCAD* gives you the option of either keeping the menus and the drawing area on a single graphics monitor or adding a second monochrome monitor for menus to expand your drawing space. On a single monitor *VersaCAD* looks much like *AutoCAD*, except that menus form a vertical column along the left edge of the screen rather than the right (see Screen 1). You select options by typing the first letter of the command or by pointing with the cursor and clicking the left button on your mouse or puck. (The cursor appears as either a small cross or a pair of orthogonal lines traversing the entire drawing area.) One annoying flaw in this otherwise ordinary interface is that the cursor can disappear off the bottom of the menu column, leaving you to find your own way back to the screen.

Depending on the option you've chosen, up to two more menu layers may appear before you reach the command you want. In fact, the frequent need to run up and down menu trees is one of the least attractive aspects of using *VersaCAD*. Luckily, the program enables you to customize the menu organization and write macro commands to eliminate unnecessary menu-hopping. You can also select commands from the accompanying digitizer template or design your own template and plot it.

*VersaCAD*'s viewing options are particularly robust. Especially useful are the ability to save and recall named views, move backward and forward through a series of views, and zoom to the smallest window that can hold your entire drawing. You can also instruct *VersaCAD* to redraw the screen, starting with the most recently added objects—a time-saver if all you need to see are the parts of the drawing you last worked on. To speed screen redraws even further, *VersaCAD* can use expanded memory to store a special vector drawing file that provides almost instant pan and zoom capabilities. The only viewing options missing are zooming by numerical factor and—more significantly—the ability to see several views simultaneously on the same screen.

Like its competitors, *VersaCAD* lets you place a grid of dots over the working area as a construction aid. You can subdivide the grid for finer resolution and separately scale or subdivide the *x*- and *y*-axes. An increment snap option, which can be set independently of the grid divisions, forces the cursor to jump from point to point in specified increments. You can also set the snap so the cursor simply jumps from object to object or to line intersections.

*VersaCAD's brightest facets are its fast screen redraw, blockbuster drawing command set, and consummate customizability.*

## Drawing to Spec

*VersaCAD*'s drawing universe is more than adequate for typical drafting applications. You can work with up to 250 drawing layers, 4096 colors, and 8 default line styles (up to 55 additional line styles can be created and saved for special applications). There's no restriction on mixing line styles and colors on the same layer, and you can specify the plotter pen number, line width, and line density for any entity.

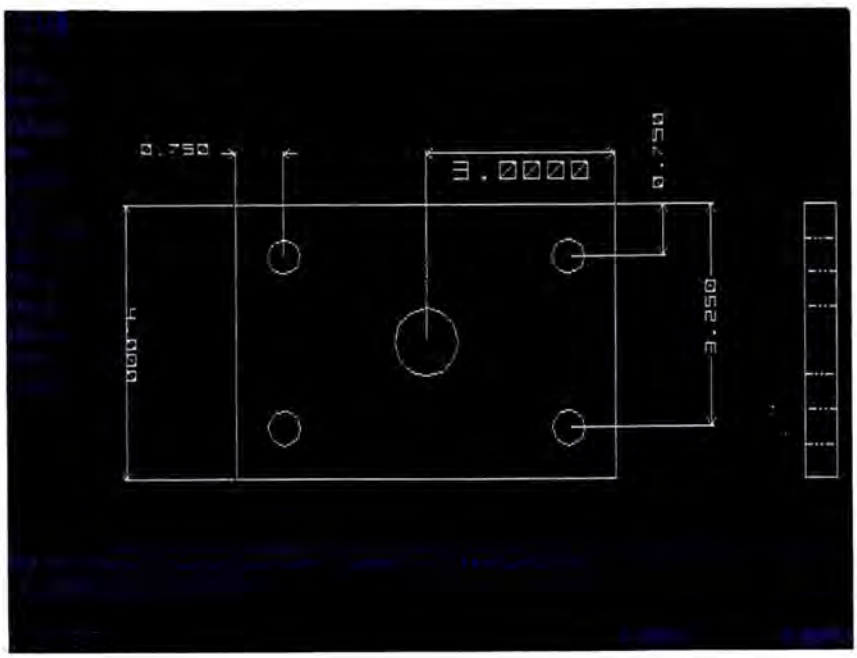
One of *VersaCAD*'s strongest suits is its exceptionally complete set of two-dimensional drawing

commands. Besides supporting the usual array of points, lines, rectangles, arcs, and circles, the program enables you to draw multiple parallel lines with a single stroke. *VersaCAD* can even cap these lines automatically if you wish—a boon to architectural draftspeople who tire of capping off walls and other constructions by hand. In addition, a full-blown family of ellipses and regular polygons are provided, as well as a superb set of Bezier curves and splines. Each of these entities can be optionally locked to the orthogonal drawing axes, and you can automatically finish off lines, arcs, Beziers, and splines with arrowheads. Aside from lines defined by open polynomial or transcendental functions, it's hard to conceive of any shape that can't be drawn easily using *VersaCAD*'s drawing tools.

Any of *VersaCAD*'s drawing entities can be designated as a temporary template, which appears on screen as a dotted-line construct for tracing purposes. With the exception of splines and Beziers, you can also rotate entities around a fixed starting point by a user-defined incremental angle. If like many draftspeople you draw most entities in 15-degree increments relative to the orthogonal axes, you'll find this feature a real time-saver.

*It's hard to conceive of any shape that can't be drawn easily using* VersaCAD's *drawing tools.*

Two more crucial productivity functions round out the program's capabilities: symbols and isometric view construction. Although *VersaCAD* provides only a handful of sample drafting symbols, you can store up to 1000 predrawn shapes in a symbol library and import them into any drawing. Once summoned, symbols can be scaled, rotated, moved, or flipped, and a handy "cut" feature even breaks existing lines to make




**VersaCAD's basic screen layout, shown here with prompts along the bottom and the characteristic left-hand menu. Note that the dimensioning facility allows you to break the leaders with measurements.**

room for a symbol. The only notable shortcoming is that symbols cannot contain subgroups, a restriction that limits their flexibility somewhat. *VersaCAD* permits only one symbol library to be open at a time.

Unfortunately, *VersaCAD* restricts isometric view contruction to simple rectangular shapes by making the constituent orthographic views (plan and elevation) strictly two-dimensional. This means that to build an isometric view, you must draw separate front, side, and top orthographic views. Then you define each view as a group, use the View command to identify a group's position in the isometric view, and place the group in the desired location. Finally, you delete any hidden or erroneous lines from the isometric view and add details impossible to append using the View command (see Screen 2). All in all, creating isometric views with *VersaCAD* is a geometrically restrictive and time-consuming process.

In conjunction with the basic drawing commands, *VersaCAD*'s Construct menu furnishes several other important drafting aids. These features enable you to quickly create lines that are parallel, perpendicular, or tangential to existing entities. The program also offers automatic filleting, as well as commands that trim or extend two lines to their intersection. Surprisingly, no automatic chamfer is provided; except for this omission, however, you'd be hard pressed to find a PC-based CAD program with more comprehensive drawing features—including *AutoCAD*.

VersaCAD *stumbles when used to edit the drawings you've produced; the whole editing process is unnecessarily slow and clumsy.*

Tucked away in the Filer utility submenu is a handy little command called Extended List. It gives you a list of all your current drawing files with the date and time each file was last modified, the cumulative drawing time, and the number of objects and symbols in the drawing. This function is ideal for tracking time and billing among several projects.

### Editing by Group

In contrast to its strong drawing performance, *VersaCAD* stumbles when used to edit the drawings you've produced. T&W has omitted several highly useful commands, and the whole editing process is unnecessarily slow and clumsy. The source of this awkwardness is *VersaCAD*'s cumbersome group-building procedure, which you must use when editing two or more entities simultaneously. Other programs such as *AutoCAD* allow you to select any number of entities simply by picking them out individually or by surrounding them with a rectangular window—a simpler, faster, and far less annoying alternative. If you're willing to spend the time, *VersaCAD*'s keyboard macros and programming language can ease the burden considerably; but you'd expect a program in *VersaCAD*'s class to deliver more efficient editing right off the shelf.

Standard editing commands include Move, Copy, Rotate, Scale, Delete, Undelete, and Mirror-Image (with or without copying). Using the Modify menu, you can also change colors, line styles, working layers, and plotter pen numbers, as well as line densities and line widths. Before executing any of these commands, you must first pick the entity or define the group of entities that the command will affect. The selected object blinks so that there's no question which entity you're modifying.

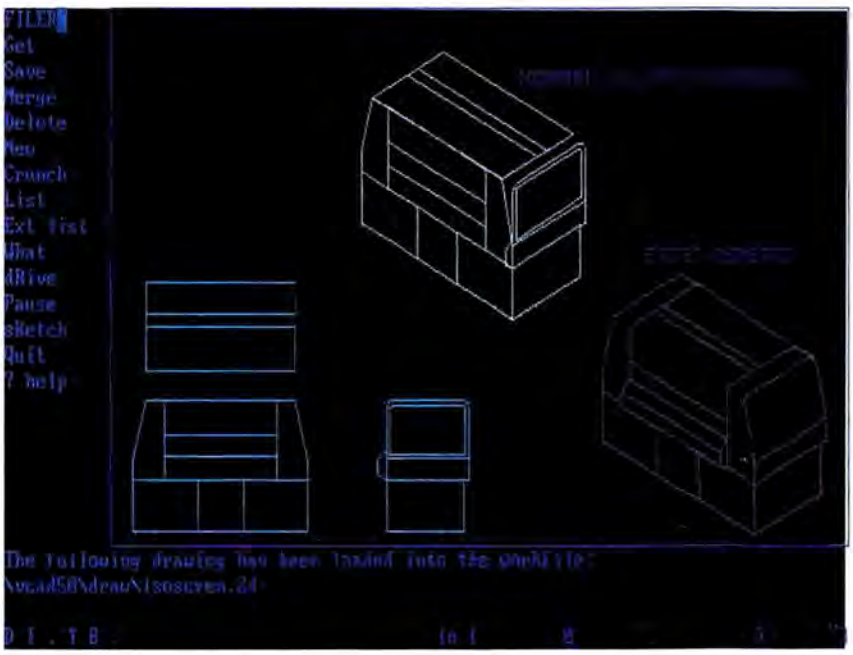
One major deficit of the editing facility is its lack of a general-purpose stretch or drag command. In other programs, such as *EasyCAD* or *AutoCAD*, this feature enables you to define a box around the end points of a group of lines (or a single line) and then move the boxed end points any distance. The points at the opposite end remain fixed, while the lines "rubberband" in any direction. This function is particularly useful for changing the overall proportions of objects within de-

signs or layouts. For example, if you wanted to transform an isometric drawing into a perspective drawing, you'd simply construct a set of perspective guidelines from the front corner and then drag the rear corners onto the guidelines. *VersaCAD,* on the other hand, would require you to erase and redraw the lines that converge.

A few nice editing touches, however, deserve special mention. One of these is the ability to scale an object or group of objects along a single axis as well as along both axes simultaneously. Another is a circular-array copy function that lets you control not only the number of copies and the angular increments between them, but also the rotation of each copy around its own reference point (see Screen 3). In addition, the Construct submenu contains several extremely useful features, including a command to trim lines or objects to their intersecting points and a Break command that enables you to isolate and either move or delete all the geometry within a rectangular area. *VersaCAD* also lets you individually delete the most recently added objects first, making it easy to back out of an unsuccessful construction.

*VersaCAD* provides a competent cross-hatching facility with nine standard hatches, which you can augment by creating and saving your own special patterns. Cross-hatching is not fully automatic; you can't simply place the cursor inside a closed form and enter a command to hatch the interior. Instead you must pick out the lines that delineate the hatched area one by one, although the program is smart enough to end a hatch pattern where it encounters gaps in a boundary. Hatch patterns are not normally connected

*Creating isometric views with* VersaCAD *is a geometrically restrictive and time-consuming process.*




**Screen 2: This example of isometric view construction shows the three constituent orthographic views in the lower left part of the screen. The finished view in the lower right was completed by editing and adding to the partial isometric views.**

to their borders, so if you later move a boundary line, the hatch lines remain behind. To establish a hatched area and its borders as a single entity, you must reinvoke the group function.

The Hatch submenu includes a command that automatically calculates the approximate area, perimeter, center of mass, moment of inertia, radius of gyration, and section modulus of any bounded area. As with the Hatch command, you must pick out the boundary lines individually; the program then writes the data to disk as a text file or displays the results on screen. This is a highly desirable feature for designers who need to determine the masses and inertias of mechanical parts.

*Dimensions may be edited without regard to drawing geometry, permitting you the dangerous option of overriding the calculated dimensions to produce unscaled drawings.*

### Dimensioning and Annotation

*VersaCAD*'s dimensioning facility, like most of its PC-based competitors', leaves much to be desired. Several dimensioning formats and options widely used in mechanical design are missing, including radii and diameters, ordinate dimensioning, and tolerances. Standard drafting symbols are not included with the program, though a partial set is available from T&W Systems.

The program provides passable linear and angular dimensioning with good flexibility in setting parameters, such as text size and location, number of decimal places, leader length, and external or internal arrows. Linear dimensions may be forced to run parallel to the *x*- or *y*-axis or parallel to the two reference points selected; chain and baseline modes are available for both linear and angular dimensions. Disconcertingly, no gap separates the leaders from the dimensioned object on screen, but a small gap is inserted during plotting.

*VersaCAD*'s dimensions are not associative. If you move or scale an entity to which a dimension has been attached, the dimension remains unchanged and must be erased and redrawn to match the revised geometry. (Most competing programs share this flaw, although *EasyCAD* is a notable exception.) Dimensions may be edited without regard to drawing geometry, permitting you the dangerous option of overriding the calculated dimensions to produce unscaled drawings. Therefore, you can revise drawings quickly, but only at the expense of the true scaling that's one of the biggest advantages of a CAD data base.

*VersaCAD* provides a fine set of tools for creating, modifying, and editing text. Text can be scaled in both height and width, and you can rotate, flip, justify (right, left, top, bottom, or center), copy, and move text in just about any way you desire. To speed up screen redraws, you can even temporarily replace all text with pairs of lines that simulate text. Moreover, the Modify and Add submenus offer a small set of intraline editing commands so that you don't have to start over if you detect a mistake. Two standard fonts are included with the software, and the manual's customizing section provides complete instructions for designing your own fonts using *VersaCAD*'s drawing capabilities. For practical drafting purposes, *VersaCAD* supplies all the text features you could want.

### Adding Value to VersaCAD

Customization is one of the areas where *VersaCAD 5.0* really shines. Not only can you completely reorganize the command menus and combine existing commands into macros, but you can also write commands and procedures that don't exist in the standard program. The key to this outstanding flexibility is *VersaCAD*'s new CAD Programming Language, which is included in the standard package. It's a complete, high-level, dedicated programming language that gives you direct access to basic system commands and lets you revise virtually any

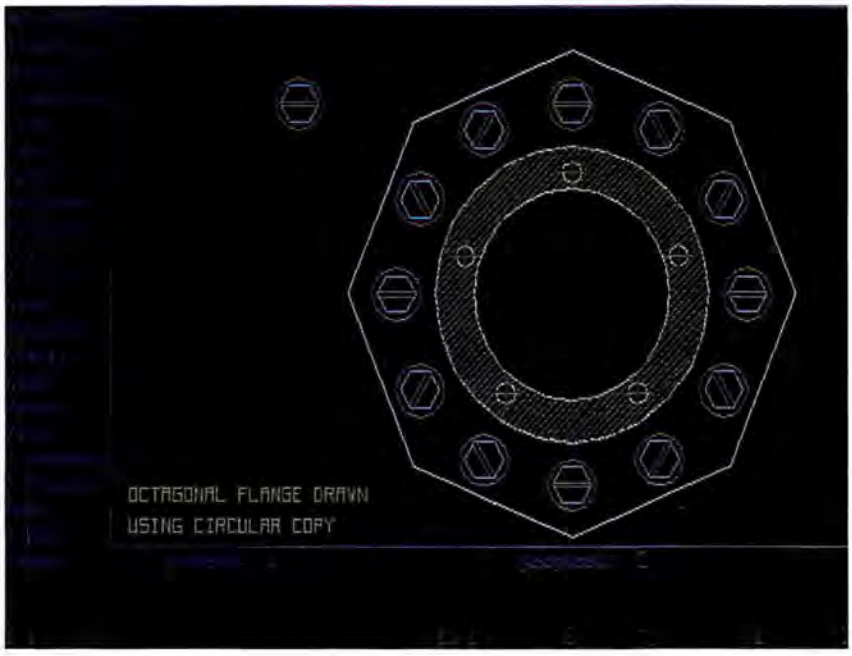
aspect of the program. This is powerful stuff, and though adequately documented for an experienced programmer, it's not something the typical user will be able to handle without considerable study and practice.

The macro facility, on the other hand, is easy to use. The macro-recording routine is particularly clever, allowing you to save any sequence of standard commands as a named macro. You simply press <F9> to begin recording, press <F9> again to stop, and store the macro by pressing <Ctrl>-<F9>, whereupon you're prompted for a macro name up to eight characters long. When you want to run the macro, press <Ctrl>-<F9>, then press E for execute and enter the macro name.

Revising *VersaCAD*'s menus is a bit more complicated. First you transform the existing menu file into a text file, edit it with a word processing program, and then convert it back to a *VersaCAD* menu file using the Crunch command. The manual also supplies detailed instructions for creating your own digitizer overlays, which can multiply your productivity as you develop special menus and libraries of frequently used symbols.

*VersaCAD* comes with a utility that converts *VersaCAD* files to *AutoCAD* files, and vice versa. For an additional $500, you can purchase *VersaLink*, a program that transforms *VersaCAD* files to IGES (initial graphics exchange specification) format, a standard widely supported in the CAD industry. The *VersaLink* program can also convert any text in a *VersaCAD* drawing file into an ASCII text file, which you can then manipulate with a data management or word processing program.

T&W Systems markets several other worthwhile add-ons that are (or soon will be) compatible with *VersaCAD 5.0*. These include *VersaList*, a bill-of-materials package; *VersaData*, a data management program; and *VersaCAD 3D*, a wire-frame modeling program. For generating fully shaded three-dimensional views of objects or constructions, T&W Systems also offers *VersaModel*, an $8000 solids-modeling program that can




**Screen 3: This drawing of a flange illustrates VersaCAD's circular-array copy function. The top view of a bolt head and washer shown in the upper left was automatically reproduced in 30-degree increments around the flange with a few keystrokes, as were the five holes on the central ring. Note that the bolt heads were rotated 60 degrees for each successive location, while the holes were not rotated.**

# Glossary

*Wes Nihei*

*Angular dimensioning.* Using text, arrows, or lines to label the degrees or radians of an angle

*Associative dimensions.* Dimensions that change according to changes in the size of an object

*Baseline mode.* A dimensioning format that labels the center point of an object or group of objects based on its distance from a vertical axis

*Cap.* A line segment that connects the ends of multiple parallel lines

*Chain mode.* A dimensioning format that labels the distance of the center point of an object or objects from a vertical axis

*Chamfer.* A line segment connecting two lines to form a beveled edge

*Circular-array copy.* Multiple copies of a drawn object arranged in a circle or an arc

*Cross-hatching.* A fill-in design used to highlight a portion of an enclosed area in a drawing

*Digitizer overlay.* A template placed over a digitizing tablet to help generate certain symbols or execute particular commands

*Dimensioning.* Labeling the spatial relationships (dimensions) of an object with text, arrows, or lines

*Entity.* A primitive CAD graphic element such as a line, an arc, or text

*Fillet.* An arc connecting two lines to form a round corner

*Groupbuilding.* Identifying several entities as a single cluster

*IGES (initial graphics exchange specification).* A standard text file format for CAD programs

*Isometric view.* A way of representing a three-dimensional object in two dimensions; three-dimensional representation without perspective

*Linear dimensioning.* Using text, arrows, or lines to label the distance between two points on a straight line

*Open polynomial functions.* Mathematical calculations that produce parabolas, ellipses, and high-order curves

*Ordinate dimensioning.* A dimensioning format based on the relationship of an object to the horizontal axis on a two-dimensional plane

*Orthogonal.* Two lines intersecting at right angles, such as cross hairs

*Rubberbanding.* To display a line with one end fixed while the second point is in the process of being moved and fixed

*Section property calculations.* A mathematical description of the static and dynamic properties of an entity of uniform sections

*Solids modeling.* Creating a filled three-dimensional object

*Splines and Bezier curves.* Types of curves extrapolated from the point where two lines intersect; enables the production of a complete

curve with as few as three points; used to contour irregular or jagged shapes and patterns

*Tolerance.* The maximum amount of allowable error for a particular dimension

*Transcendental functions.* Mathematical calculations that involve logarithms and exponentials and produce sinusoid figures like sine waves and exponential curves

*Vector drawing file.* A data file containing a series of numbers representing the coordinates of a line—its starting point, direction, and length; represents whatever is on the screen—text or graphics—as a series of line segments

*Wireframe modeling.* Creation of a three-dimensional object entirely with line segments

*Wes Nihei is an Assistant Editor for* PC World.

be used either with *VersaCAD* or as a stand-alone package. *VersaCAD Advanced 4.0* is supported by a long list of third-party add-ons for vertical architecture and engineering applications, and many of these will be available for version 5.0 in the near future.

*VersaCAD*'s manual gets high marks for clear writing, good organization, and a trove of useful tips and examples. A step-by-step tutorial quickly introduces basic features, and the command reference section guides you from there. T&W Systems maintains a telephone hot line for registered users, and the technical support staff is competent and helpful.

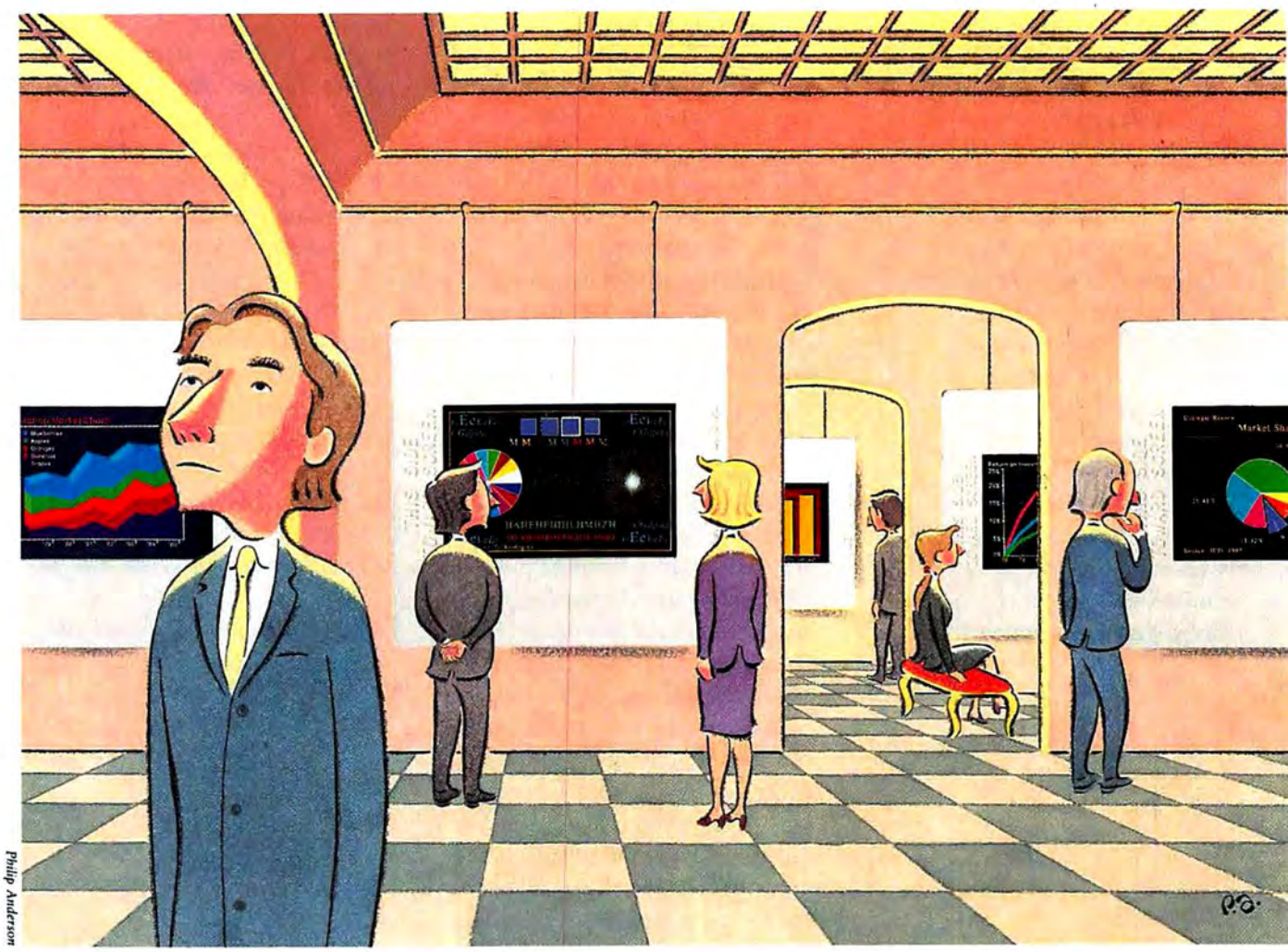
There's a lot to like in this substantial design and drafting program. When compared with *AutoCAD, VersaCAD* offers more extensive drawing facilities, including more complete Bezier curves and multiple lines, a superior set of section property calculations, and a wider array of grouped entity selection and editing features. In other areas *AutoCAD* has the edge, including better dimensioning, a more powerful Undo capability, better hardware support, and a bountiful array of third-party add-on packages. Given the power and flexibility of both packages, their pluses and minuses effectively balance each other out. Aside from *VersaCAD*'s lack of copy protection (AutoCAD recently adopted hardware-based copy protection), the deciding factor for many prospective purchasers will be dealer support. Getting a CAD system up and running is no picnic, and help from a dealer well versed in the package you've chosen can be invaluable.

In the final analysis, you might wish *VersaCAD*'s programmers had taken the time to smooth some rough edges. Either you live with the program's awkward editing features and menu structure or you make your own modifications. Within the current collection of CAD packages, *VersaCAD*'s drawing, viewing, and symbol manipulation makes it one of the brightest gems, but you may need to polish it further. ●

*Steven Lord is a mechanical engineer and freelance writer living in Tewksbury, Massachusetts.*

*VersaCAD Advanced 5.0*
*T&W Systems, Inc.*
*7372 Prince Dr.*
*Huntington Beach, CA 92647*
*714/847-9960*
*List price: $2495, VersaModel $8000, VersaData $995, VersaLink $500, VersaCAD 3D $495, VersaList $495,*
*Requirements: 650K, hard disk, graphics display, DOS 2.10 or later version*

# Pictures for an Exhibition



Philip Anderson

If you frequently make slide presentations or create portfolios of computer-generated graphics, a film recorder provides a fast and cost-effective way for you to produce slides without leaving your desk.

*Cindy Hamburger*

Photography is the most versatile of the techniques available for producing hard-copy output from computer-generated images. Though ink jet plotters and laser printers are popular alternatives, film expresses the greatest depth of color and, in most cases, can be processed faster than printed or plotted images. For artistic and business presentation graphics, film ensures the most realistic images possible.

Until recently, the cost and complexity of film recorders limited their use to service bureaus or production shops. Equipped with a mainframe or minicomputer and sophisticated communications and graphics software, these firms receive graphics files from clients and generate slides or plotted or printed images. Depending on the amount of data and the complexity of the finished product, this process can take anywhere from 24 hours to 30 days. Like any project done under contract, the drawbacks can be slow turnaround time, unjustified expense, and the possible lack of confidentiality.

The processing power of 80286- and 80386-based PCs has brought film recorders to the PC market, and prices have plummeted. Many businesses that routinely use slides for presentations are investing in film recorder systems as sophisticated as those used by professional service bureaus.

In 1984 *PC World* reviewed the Polaroid Palette, one of the first color film recorders for the PC (see "60-Second Slides," *PCW*, Volume 2, Number 8). The Palette set the standard for PC-based film recorders. It provides a simple solution for taking PC graphics off the screen and putting them on film. Of the units reviewed here—the Matrix PCR, the Calcomp Samurai, General Parametrics' PhotoMetric 200, the Bell & Howell Color Digital Imager IV, and Presentation Technologies' ImageMaker—all but the ImageMaker are designed around Polaroid Palette hardware, but with software and hardware embellishments that overcome the Palette's limitations.

The units reviewed here range in price from $5290 for the ImageMaker to $14,000 for the PCR. Compared to the average production house fee of $20 per slide, purchasing a film recorder at either end of the spectrum may be worthwhile, depending on how frequently you create slides. Using the ImageMaker to produce 25 slides ten times will justify its purchase. Add to this the convenience of having a desktop film recorder, and this is a hard system to resist.

## Behind the Shutter

With the exception of the ImageMaker, all the recorders reviewed use a similar image-processing technology. Each recorder contains a 35mm camera; a black-and-white, flat-faced internal monitor; and a red, blue, and

green color wheel. Most of the systems also require a separate graphics board. You create graphics on the PC using either a recorder manufacturer's proprietary graphics software or, ideally, a popular commercial graphics package.

The film recorder's application software translates the digital images into video format, passes them to the recorder, and displays them on the recorder's internal monochrome display. (Color graphics are converted to black and white to take advantage of a monochrome display's superior resolution.) The recorder exposes the film with the internal monitor and color wheel, not the PC's monitor or display adapter. Therefore the quality and aspect ratio (of horizontal and vertical distances) of your monitor and graphics board do not restrict the quality of the photographed image.

## Judging Quality

Manufacturers use the term *resolution* to differentiate the quality of images produced on one machine from that of another. Resolution is expressed in the number of pixels (picture elements, each composed of several phosphor dots) a program can address. Matrix claims that the PCR can address 2048 by 1366 pixels in draft mode and 4096 by 2732 pixels in finished mode—approximately 75 times the EGA's resolution (see Table 1).

But these figures aren't as impressive as they seem. Images lose resolution as they pass from the film recorder's internal monitor through the camera's lens to the film. Degradation is common to all the film recorders reviewed except the ImageMaker.

A film recorder's output is better judged by *sharpness* than by resolution (see Figure 1). Sharpness is the perceived merit of the image. When scan lines, caused by photographing an image from a monitor, are eliminated and jaggies (unsmooth edges) are refined, images look sharper. Film recorders vary in their ability to sharpen images. The PCR excels in creating sharp-looking charts; the ImageMaker's sharpness of text is unmatched by that of any other film recorder.

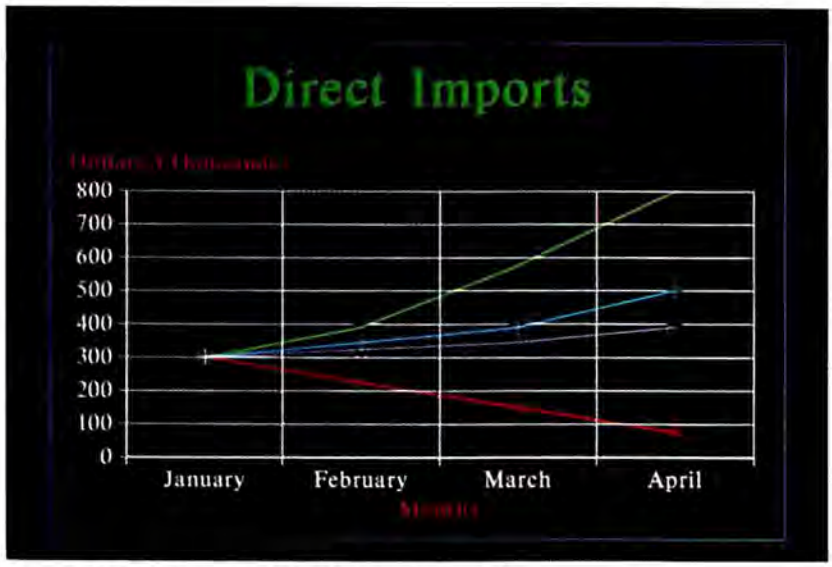



**Figure 1: The ImageMaker's incomparable brightness and legibility of text is a result of its unique film-processing technology, which does away with CRT scan lines.**

## Graphics Without Standards

In an ideal world you could pick up a graphics software program and use it without considering compatibility. However, to use a film recorder, printer, or plotter, your graphics software requires an appropriate interface. Because there is no single accepted standard, film recorder manufacturers have developed their own graphics languages that convert the commands in picture files into slide images.

The Samurai and the PhotoMetric 200 follow the North American Presentation Level Protocol Syntax (NAPLPS) (see "Toward a Graphics Standard," *PCW*, Volume 2, Number 12). You're likely to find a large selection of NAPLPS-compatible graphics programs, such as *Microsoft Chart* and Lotus Development's *Freelance*, to use with your film recorder. NAPLPS-compatible files can also be used with compatible printers and plotters. With the

Table 1: Film recorder features comparison

| | Matrix PCR | Calcomp Samurai | General Parametrics PhotoMetric 200 | Bell & Howell CDI-IV | Presentation Technologies ImageMaker |
|---|---|---|---|---|---|
| **Price** | $13,796 | $11,950 | $5995 | $5500 | $5290 |
| **Graphics software** | optional | optional | optional | optional | included |
| **Resolution** | 2048 by 1366[1]<br>4096 by 2732[2] | 2048 by 1366 | 2000 by 2000 | 832 by 630 | 8000 by 8000 |
| **Graphics processor required** | yes | yes | yes | no | no |
| **Fonts** | 1 | 9 | 1 | 70 | 4 |
| **Colors** | 256 | 25 palettes of 8-14 colors | 1000 | 16 | 16 palettes of 4-16 colors |
| **Palettes** | user definable | fixed | user definable | user definable | fixed |
| **Preview** | yes | no | yes | yes | yes |
| **Sharpness** | professional | professional | professional | fair | professional |
| **Films supported** | Ektachrome 100<br>3M Colorslide CRT 100<br>Fujichrome 100<br>Agfachrome 100 | Ektachrome 100<br>Polachrome CS 40<br>Polapan CT 125<br>Kodachrome 64<br>Vericolor 100<br>Fujichrome 100<br>Fujicolor 100<br>Agfachrome 100<br>Agfacolor 100<br>3M Colorslide CRT 100 | Ektachrome 100<br>Kodacolor 100<br>Kodachrome 64<br>Polachrome 64<br>Panatomic X<br>Polacolor 669<br>Colorgraph 691 | Ektachrome 100 and 64<br>Fujichrome 100<br>3M Colorslide CRT 100<br>Polachrome 64 | Ektachrome 100<br>Polaroid Polachrome 100 |
| **Graphics software supported[3]** | | | | | |
| Microsoft Chart | ● | | ● | ● | |
| Chart-Master | | | ● | ● | |
| Freelance | ● | | ● | | |
| Graphwriter | ● | | ●[4] | | |
| Harvard Presentation Graphics | ● | ● | | | ●[5] |
| 1-2-3 | | ● | ●[4] | ● | |
| 35mm Express | ● | | | | |
| pfs:graph | | ● | | | |
| AutoCAD | ●[4] | | ●[4] | | |
| Mirage | ● | ● | ● | ● | |

[1] Draft mode
[2] Final mode
[3] Ten popular commercial graphics programs
[4] Requires use of graphics software's translation program
[5] Available spring of 1987

Figure 2: A high-resolution bar chart produced on the Matrix PCR shows the PCR's ability to overlay a step chart on top of a simple bar chart without losing the luminance of either graph.

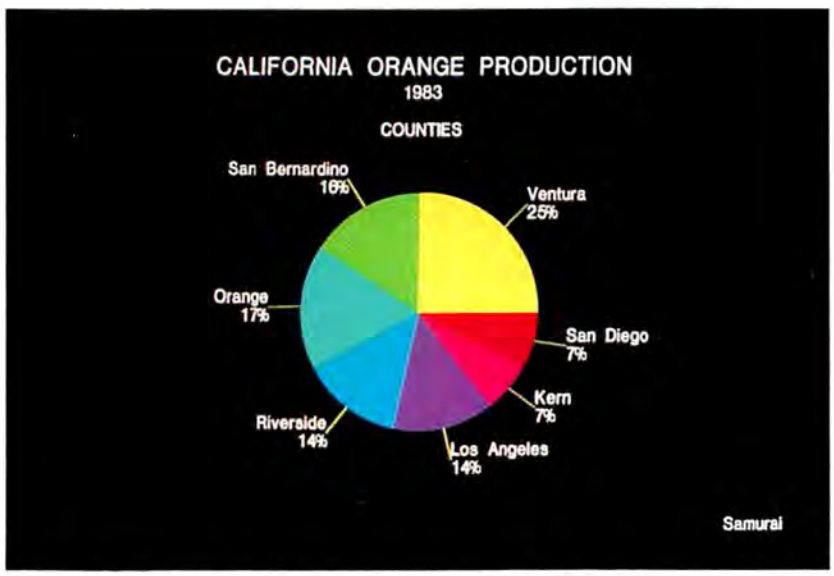



Figure 3: Samurai and Image-1 create simple pie charts that maintain definition.

other film recorders, you are generally limited to the manufacturer's proprietary graphics programs, although manufacturers are constantly adding software drivers to their products (see Table 1).

## Sneak Previews

The film recorder's application software and your business graphics software contain an assortment of palettes, fonts, type sizes, and graph options. When these elements are combined for output to a film recorder, the resulting capabilities greatly exceed those of a single graphics software program. Since film recorder manufacturers concentrate on the slide's image quality, most give short shrift to on-screen previews. Nevertheless, you may need to see what you're going to get in order to get it right. Only one of the tested recorders, the PhotoMetric 200, offers full-color graph, text, and font preview.

## Matrix PCR

Three feet high and weighing in at 42 pounds, the Matrix PCR dubs itself a "deskside portable." Its awkward frame and unsightly cables make you long for a few inches less, or an obscure place to house the unit. Selling for $11,795 (plus $2000 for the required MVP processor board), the PCR includes an easily accessible 35mm camera securely embedded in the system's top panel. You select options, such as film exposure, from the LED digital display panel. (The PhotoMetric and ImageMaker require you to select exposures using the recorder's graphics software. Both methods accomplish the same task, but the PCR's is more convenient.)

The PCR produces professional-quality slides of either 2048-by-1366- or 4096-by-2732-pixel resolution (see Figure 2.) However, for the price, it does the job only marginally better than do far less expensive systems.

To use the PCR with a PC, an XT, or an AT, you must have exactly 512K of memory and two open slots in your system unit—one for the MVP graphics board and one left empty for ventilation. If your system has more than 512K, you must reset the DIP switches on your system unit and memory expansion cards to reflect a total 512K of installed RAM. The MVP board is incompatible with systems over 512K whose memory expansion card cannot disable banks of memory.

The PCR goes through a 5-minute memory, software, and hardware check. If the machine finds an error, it beeps and flashes an error number on the digital display. (The PCR also beeps when it's ready, so you must listen carefully to distinguish the different sounds.) The most helpful suggestion in the unwieldy manual's ten pages of error descriptions is to call a technician. Matrix's technical support, based on *PC World*'s experience, is adequate.

Matrix claims that the PCR is compatible with 27 graphics programs including *Microsoft Chart* and Lotus's *Freelance*. Most are high-end drawing programs like *Lumena* and *Mirage*. But regardless of the software you use, the PCR has limited preview capabilities. When used with an IBM Color/Graphics Adapter and Color Display and Management Graphics' *PC-Slide* software, you can preview only 4 colors at a time—when 62 are actually available.

Matrix's SCODL (Scan Conversion Object Description) conversion language adds time to the slide-making process because it requires that the graphics processor record the location, color, luminance, and saturation of every pixel in an image. SCODL helps the PCR generate slides of extremely high quality, but the language is a cumbersome intermediary between the PC and the PCR. You need programming experience, a keen interest in tackling the language, or a VAR (very attentive retailer).

### Calcomp Samurai

Unlike the PCR, Calcomp's Samurai Color Film Recorder and the Samurai SIGHT (Slide Image and Graphics Hardcopy Transmission) application software are easy to install and use. Plug the graphics processor board into any empty slot in the PC, connect the interface cable to the film recorder, turn on the film recorder, and you're ready to roll.

Like the PCR, the Samurai is a cumbersome machine. Lumbering in at a hefty 80 pounds, it's the only nonportable recorder reviewed. Though sketchy, the documentation is helpful.

When used with Calcomp's *Image-1* business graphics software, the Samurai produces a good selection of graph types, including point, step, and line graphs (see Figure 3). Although lacking the ability to create Gantt, PERT, or organization charts, *Image-1* will satisfy the needs of most people who desire simple, high-quality slides.

Even if you're new to the Samurai, creating slides with it is painless. You choose the desired chart type from the software's main menu and specify legends, colors, aspect ratios, shading, and data fields using straightforward on-screen forms. With *Image-1*'s unique overlay feature, you can create special graphics effects and add an unlimited number of overlays (such as grids, maps, and borders) to the foreground or background of any chart.

Matrix PCR

Calcomp Samurai

Figure 4: Used with PictureIt, the PhotoMetric 200 creates sophisticated and professional-looking slides.

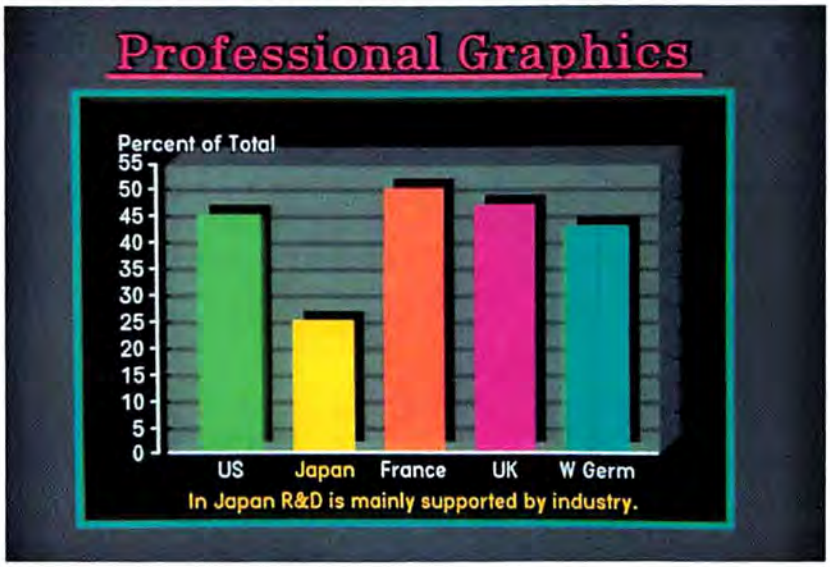


Figure 5: The PhotoMetric 200 can produce 3-D business graphics, with shaded backgrounds and outlined text, unlike any other film recorder.

Like most of the recorders reviewed, the Samurai is marred by an inadequate preview capability. Regardless of your system's or monitor's capabilities, you can preview images only in black and white. Until you shoot a roll of film, you have only an inkling of how good your slides will be. Furthermore, the system's proprietary graphics software, *Image-1,* is hampered by a limited font selection. You can specify character size and color only in text charts. For all graph charts, character size and color are predetermined by the system. In comparison, General Parametric's *PictureIt* software does not restrict text characteristics.

Samurai's *SIGHT* application software is compatible with a wide selection of popular printers and plotters. The recorder supports the broadest selection of print and slide films of the systems reviewed (see Table 1).

### General Parametrics PhotoMetric 200

The PhotoMetric 200 is a standalone film recorder that operates independently of General Parametrics' popular VideoShow 150 business-presentations package (see "Show Business," *PCW,* June 1985). When used with the manufacturer's *PictureIt* graphics software, the PhotoMetric 200 can display up to 1000 colors simultaneously with a choice of 25 chart types. It's compatible with *Freelance, Microsoft Chart, ChartMaster,* and *Diagram-Master,* among other graphics programs.

You don't have to radically reconfigure your computer to capture slides with the PhotoMetric

200. Its graphics board fits into any single slot on the PC's system unit; the most tinkering you'll have to do is change a jumper on the board when you want to switch monitors to view images on a monochrome, CGA, or EGA display.

The PhotoMetric 200 produces professional slides despite a resolution rated lower than that of the Samurai and the PCR (see Figure 4). Its images are sharp because of some simple design techniques. First, the brightness inside the film recorder box is kept low. This produces rich colors and clean whites. Second, the PhotoMetric can show shaded backgrounds and can vary background illumination—features that translate into sharpness (see Figure 5).

The PhotoMetric's triumph is its unique on-screen preview capabilities. It's the only film recorder reviewed that lets you view graphics and available fonts in full-scale color before you shoot.

A serious flaw, however, is the PhotoMetric 200's lack of on-screen help. The system's graphics software, *PictureIt,* was developed for use with VideoShow 150 and has inadequate help features when used only with the PhotoMetric 200.

### Bell & Howell CDI-IV

Bell & Howell's Color Digital Film Recorder (CDI-IV) includes more features and fancy enhancements than any film recorder on the market. It's mechanically similar to the Polaroid Palette but has such a complete array of utilities and embellishments that it hardly resembles its predecessor.

A relatively inexpensive system, the CDI-IV is easy to use and does not require a graphics processor board. Its only hardware requirement is an RS-232C serial port. The system weighs about 36 pounds, which includes a central processing unit, a 35mm Minolta camera, and a module for plug-in fonts. You select film type and exposure settings directly from the unit. (Though not required, Bell & Howell offers a high-resolution preview monitor as an option.)

While most film recorders use software-generated fonts, the CDI-IV uses interchangeable cartridge fonts. This system is especially good for text-intensive presentations. The $300 font module can hold up to 4 cartridges, each containing five type sizes; 16 font cartidges are available, including European-language character sets and scientific and mathematical symbol character sets.

The CDI-IV supports a broad selection of business graphics programs. When used with Bell & Howell's optional *Slideport* utility, it produces slides directly from *WordStar, 1-2-3,* and *Symphony* files. With this memory-resident program, you can send files directly to the film recorder without exiting the application. You can add dimension, color, grids, text style, and symbols to word and data charts; preview the charts on a high-resolution monitor; and then easily deliver the charts to the film recorder.

Despite its bells and whistles, the sharpness of the CDI-IV's slides is only adequate (see Figure 6). The recorder uses Polaroid Palette hardware without improving on the image quality. Given that the Palette sells for $1999, the CDI-IV's $5500 price is pretty steep.

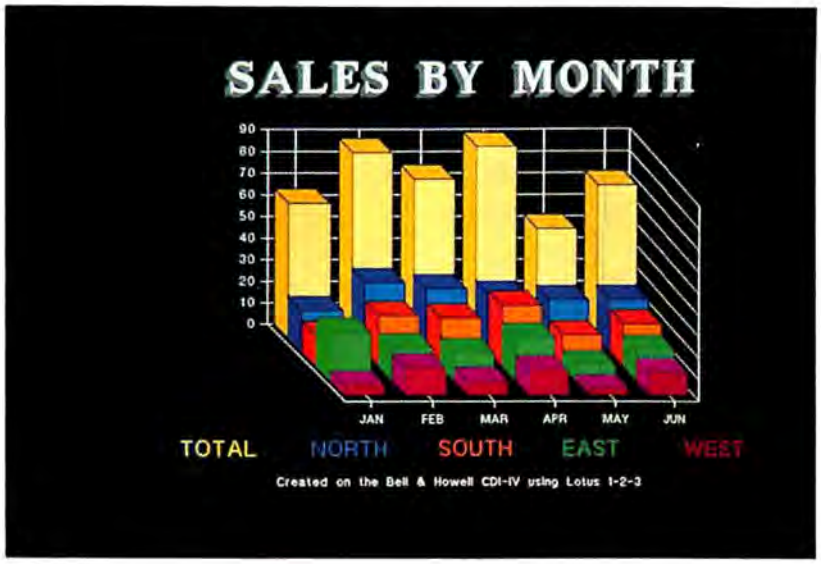
**General Parametrics PhotoMetric 200**

**Bell & Howell CDI-IV**

Fred Simson

**Presentation Technologies ImageMaker**

Figure 6: A single CDI-IV font cartridge has five point sizes and italic and bold typefaces. As the text size decreases, the letters get fuzzier and begin to blend together.



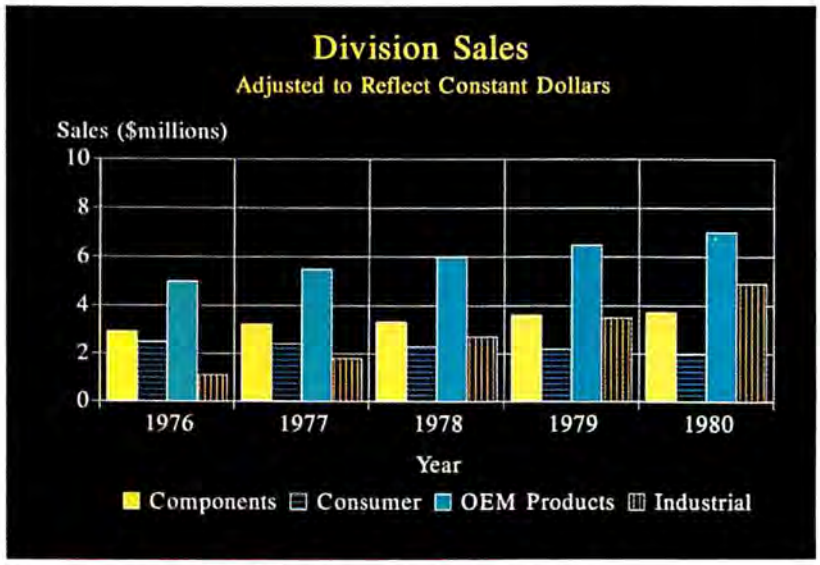




Figure 7: The crisp definition of light and dark is obvious on this sample slide taken with the ImageMaker. Note how letters stand out against a dark background.

## Presentation Technologies ImageMaker

Presentation Technologies' ImageMaker stands in a class of its own. It is the least expensive member of the test group and produces a sharper image than the $14,000 Matrix PCR. Its secret is its optical technology—the sharpness of its images is not dependent on an internal CRT. Because of the absence of CRT scan lines, the ImageMaker's images are sharper and brighter than those of its CRT-dependent cousins (see Figure 7).

Inside the ImageMaker is a high-intensity lamp, a color wheel, a wheel containing standard graphics shapes, a lens, and a graphics board. Interchangeable character wheels are inserted into the recorder.

Exposing the film is a process similar to phototypesetting. A beam of light is projected through the clear letters on the character wheel one character at a time. If you desire color, the color wheel moves into position behind the character wheel. *ImageMate* software calculates kerning and proportional spacing, and then projects each character onto the film surface. When creating graphs, the device acts like a plotter, except that it paints with light instead of a pen. The beam moves across the film surface, drawing lines, arcs, circles, and polygons.

Despite its apparent superiority, the ImageMaker has its drawbacks. The system is noisy and operates at a snail's pace. Other film recorders take 2 to 4 minutes to process a slide; the ImageMaker takes as long as 13 minutes to per-

form the same task. However, there's a remedy for its lethargy. For an additional $295, the *ImageMate* graphics software provides batch processing. You can select the images you want, go home for the night, and retrieve your prepared slides in the morning.

But the ImageMaker's unique technology poses a more serious problem: At press time, *ImageMate* was the only graphics program compatible with the system. The program is easy to use, but its features and selection of chart types are only adequate, and it can't create overlays or 3-D graphs. But if you can live with the ImageMaker's software limitations, you will be stunned by the quality of its slides. By the spring of 1987, Presentation Technologies expects to provide a software driver for *Harvard Presentation Graphics.*

## You Get What You Need

No single file recorder excels at image quality, software compatibility, features, and convenience. You generally must choose which areas are most important to you—and slog through the rest.

The high price and high-quality output of the Matrix PCR should be reserved for professionals who seek to capture and recreate original artwork, schematics, and fine-line drawings on film at any cost; but be prepared to install and use a cumbersome system. The Calcomp Samurai is a remarkably durable machine, but the high price and inadequate preview option are drawbacks. For compatibility with the broadest range of graphics software, for a preview option that comes closest to the final product than any other film recorder, and for professional-quality slides, General Parametrics' PhotoMetric 200 is a great buy. And if you don't mind sacrificing sharpness for a raft of features, look at the CDI-IV. With its *SlidePort* utility, the CDI-IV is the only film recorder that doesn't require graphics software. And although the ImageMaker's cutting-edge technology cuts you off from all commercial graphics software programs, you can create superb slides with the system's proprietary software. ●

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*Color Digital Imager IV*
*Bell & Howell Co., Quintar Division*
*411 Amapala Ave.*
*Torrance, CA 90501*
*800/223-5231, 213/320-5700 California*
*List price: $5500; SlidePort $195; font module and one font $300*
*Requirements: 120K when used with SlidePort, RS-232C serial port*

*ImageMaker*
*Presentation Technologies*
*743 N. Pastoria Ave.*
*Sunnyvale, CA 94086*
*408/749-1959*
*List price: $4995; ImageMate $295*
*Requirements: 512K, RS-232C serial port*

*Matrix PCR*
*Matrix Instruments, Inc.*
*1 Ramland Rd.*
*Orangeburg, NY 10962*
*914/365-0190*
*List price: $11,795; MVP board $2000 when ordered with the PCR*
*Requirements: 512K, two expansion slots*

*PC-Slide*
*Management Graphics*
*1401 E. 79th St.*
*Minneapolis, MN 55420*
*612/854-1220*
*List price: $595*
*Requirements: 256K*

*PhotoMetric 200*
*General Parametrics Corp.*
*1250 Ninth St.*
*Berkeley, CA 94710*
*415/524-3950*
*List price: $5995; PhotoMetric 200 VS $4195 (for use with VideoShow 150); PictureIt version 2 $700*
*Requirements: 256K, one expansion slot*

*Samurai*
*Calcomp*
*2411 W. La Palma Ave.*
*Anaheim, CA 92801*
*800/225-2667, 714/821-2000*
*List price: $11,950; Image I $495*
*Requirements: 256K, two disk drives, one expansion slot*

# Print Along the Dotted Line

New printers by Epson, Toshiba, and NEC illustrate that dot matrix technology is not just getting older–it's getting better.

*Bill Crider*

In the past year dot matrix printers have become faster and more affordable, and the quality of their output has improved markedly. Although these proletarians of printing can't produce the crisp output of daisy wheel or laser printers, dot matrix printers continue to edge their way toward letter quality printing while retaining their traditional low price.

When you shop for a printer, you should keep three key factors in mind: quality of output, speed, and price. The Epson LQ800, the Toshiba P321 Three-in-One, and the NEC Pinwriter P6 are high-quality 24-pin dot matrix printers that sell for between $699 and $799. These three printers are speedy, capable of well over 100 characters per second (cps) in draft mode.

All three printers offer a near letter quality (NLQ) overstrike mode that approximates the output from a daisy wheel printer. Of course quality takes a toll on speed: The printers slow to an average of about 23 cps in NLQ overstrike mode because they print each line twice, using twice as many dots as in draft mode. Nevertheless, as inexpensive, all-purpose progenitors of drafts, graphics, and correspondence, these dot matrix printers are tough to beat.

## Epson's LQ800

Because an Epson printer is the PC's most frequent desktop companion, just about all software can drive an Epson printer. The company's latest contender is the LQ800, an 80-column printer priced at $799. (The LQ1000, at $1095, is its 132-column cousin.)

The LQ800 has three built-in modes: draft, near letter quality, and proportional. Five optional cartridge fonts are available for $59.95 each: Courier, Prestige, Script, OCR-B, and Sans Serif. You can also purchase disk-based fonts from third-party manufacturers, which can be downloaded into the printer's RAM. Each font can be printed in pitches ranging from 5 cpi (characters per inch) to 20 cpi. You can select any of the LQ800's 13 character sets by setting the appropriate DIP switches.

*Print quality.* In draft mode the Epson turns out the least readable characters of the three printers (see Figure 1); its rendition of an *s* is particularly sketchy. On the other hand, its NLQ output is the most crisp and attractive of the three. Compared to the Toshiba and the NEC, the Epson prints more sharply defined serifs in NLQ mode, making the text easier to read. In fact, the LQ800's NLQ output most closely approximates that of the Diablo 630 daisy wheel printer.

The Epson's graphics output is slightly less crisp than the Toshiba P321's and much fuzzier than the NEC P6's (see Figure 2). Differences between the Epson and the Toshiba aren't immediately appar-

ent, but small text characters (such as "In Thousands of Dollars") reveal the superiority of the Toshiba's output.

The Epson LQ800 can print up to 180 dpi in graphics mode. The documentation is misleading on this point: Epson says the LQ800 can position a dot to within 1/360 inch anywhere on the page—which is true—but the LQ800 can't print the next dot closer than 1/180 inch. Thus, the printer positions the dots to an accuracy of 360 dpi, but prints only up to 180 dpi.

*Speed and noise level.* Clocking in at 52 cps, the Epson is faster than both the Toshiba and the NEC in NLQ mode (see Figure 3). When printing NLQ in overstrike mode to produce the best print quality, the Epson also outpaces the other members of the trio at 27 cps. In draft mode, the Epson is slower than the NEC but faster than the Toshiba. (In all cases, the printers did not perform at the speeds claimed by their manufacturers. For an explanation of this discrepancy, see the sidebar "Speed Tests: Fact and Fantasy.")

At 77 decibels (dBA) in overstrike mode, the LQ800 is slightly quieter than the Toshiba P321 (see Table 1), but it's still too loud to permit normal conversation nearby. In comparison, a typical telephone's loudest ring is about 64 dBA, and the noise from a Diablo 630 daisy wheel printer measures 80 dBA.

*Compatibility.* Virtually all software works with the Epson printer command set, so compatibility with the LQ800 is unlikely to be a problem. This

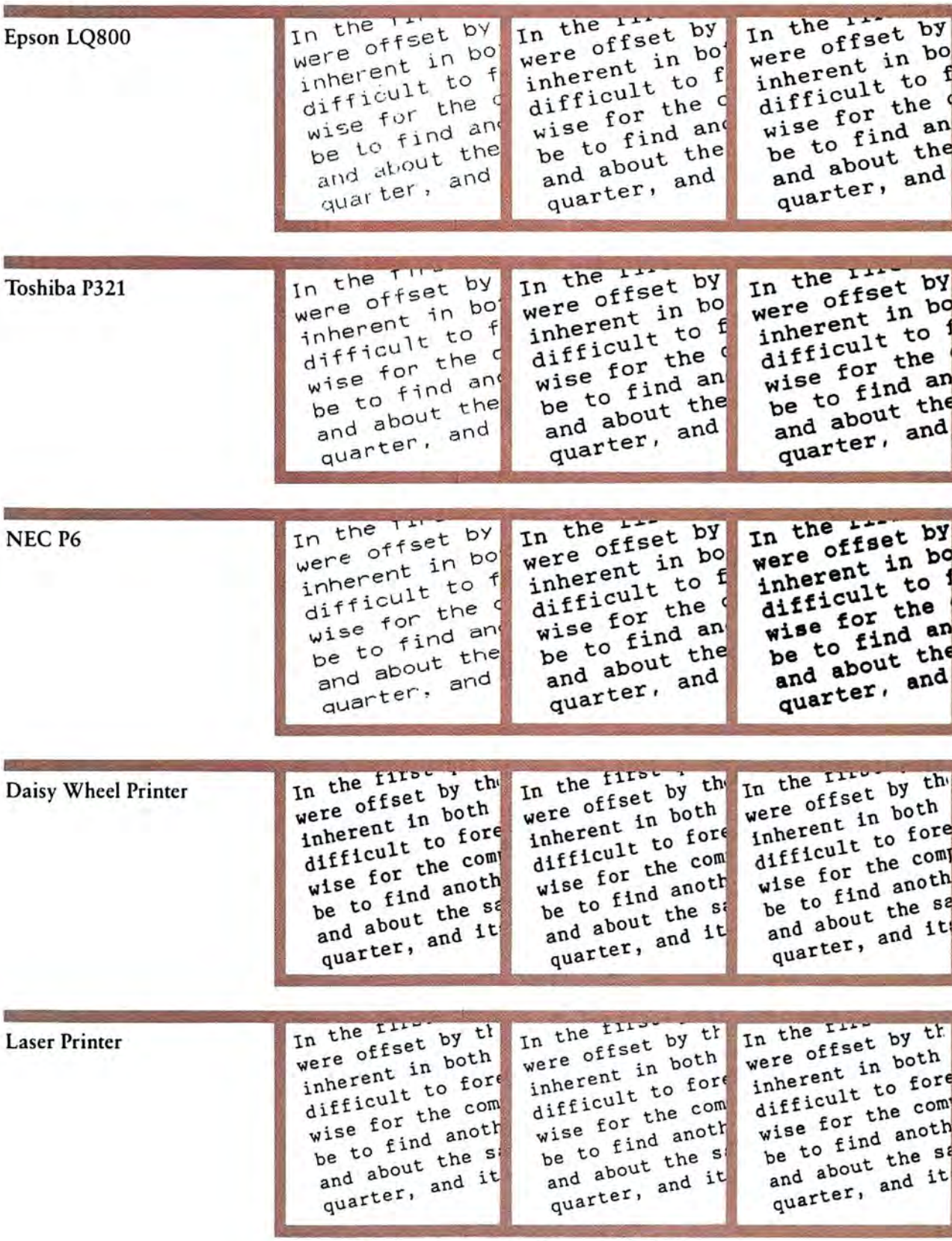



Figure 1: Comparison of the Epson LQ800, the Toshiba P321, the NEC P6, a daisy wheel printer, and a laser printer (from left to right) in draft, NLQ, and overstrike modes

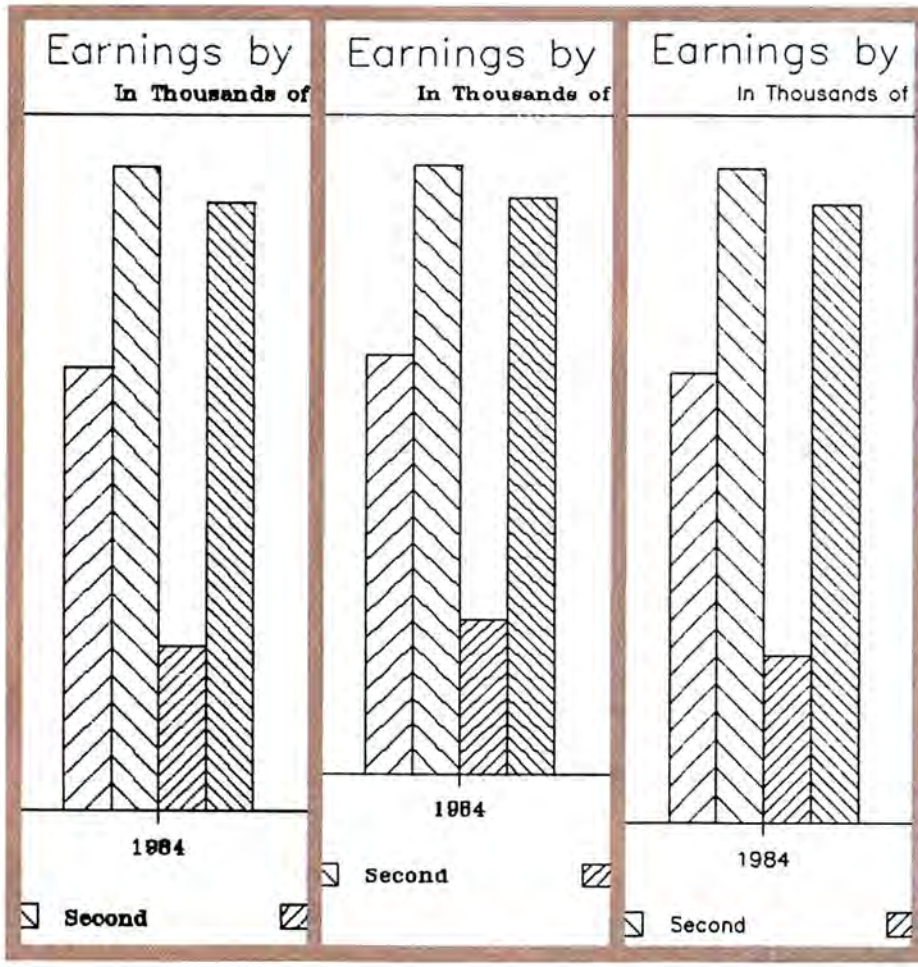



**Figure 2: 1-2-3 bar graph printed with (from left to right) the Epson LQ800, the Toshiba P321, and the NEC P6, illustrating comparative printing speeds**

printer can also emulate the IBM Graphics Printer and the Diablo 630 if you buy an optional cartridge for $89.95.

*Special features.* The LQ800 has a 7K input buffer, which, like most fairly large printer buffers, is both a blessing and a nuisance. On the one hand, you can have the computer send a medium-size document to the printer quickly and then proceed with other tasks. On the other hand, it's difficult to stop a print job once it starts; about all you can do is turn off the printer.

The Epson LQ series comes with both a parallel and a serial interface. The serial port, however, does not use the standard 25-pin connector. Instead, you must buy a cable with a 6-pin circular DIN connector similar to the IBM PC's keyboard plug. This nonstandard cable is difficult to find—you must order it directly from the company. A telephone poll of seven Epson dealers revealed that not one had it in stock, and only one dealer was even aware that a DIN connector was required.

*Ease of use.* The control panel on the LQ800 is clearly marked and easy to use, and you can select draft or NLQ mode without sending printer codes from the computer. Unfortunately, the Epson is not an unqualified delight to work with. During performance tests it suffered far more paper jams than the other two printers. Even when high-quality paper was used, the optional tractor feed, which costs $59.95, was unable to cope with the slightest misalignment of the paper. Inexpensive paper became snarled even more quickly. If you purchase this printer, plan to buy good-quality paper and baby-sit its progress through the tractor feed. Of course the tractor feed is a necessity for big jobs, and the $129.95 sheet feeder is recommended if you plan to use letterhead.

*Documentation.* For years, the documentation for the Epson MX80 series has been a perfect

example of how *not* to write documentation. Fortunately, Epson has learned from its mistakes, and the LQ800 has some of the clearest documentation the company has produced. Epson makes a good manual even better by providing a quick-reference card that includes the most commonly used printer control codes and switch settings.

*Durability.* The Epson manual lists the LQ800's mean time between failures as 400 million characters; the life of the printhead is approximated to be 200 million characters. This life span is typical for dot matrix printers; what's unusual is that you can replace the LQ800's printhead yourself instead of taking the printer in for servicing. Epson also claims that you can expect the typical ribbon to print about 2 million characters.

*Best use.* The Epson LQ800 is an excellent all-purpose printer, suitable for anyone who wants the speed and quality of a 24-pin printer and compatibility with most software. The main caveat is that you must buy high-quality paper to decrease the likelihood of paper jams.

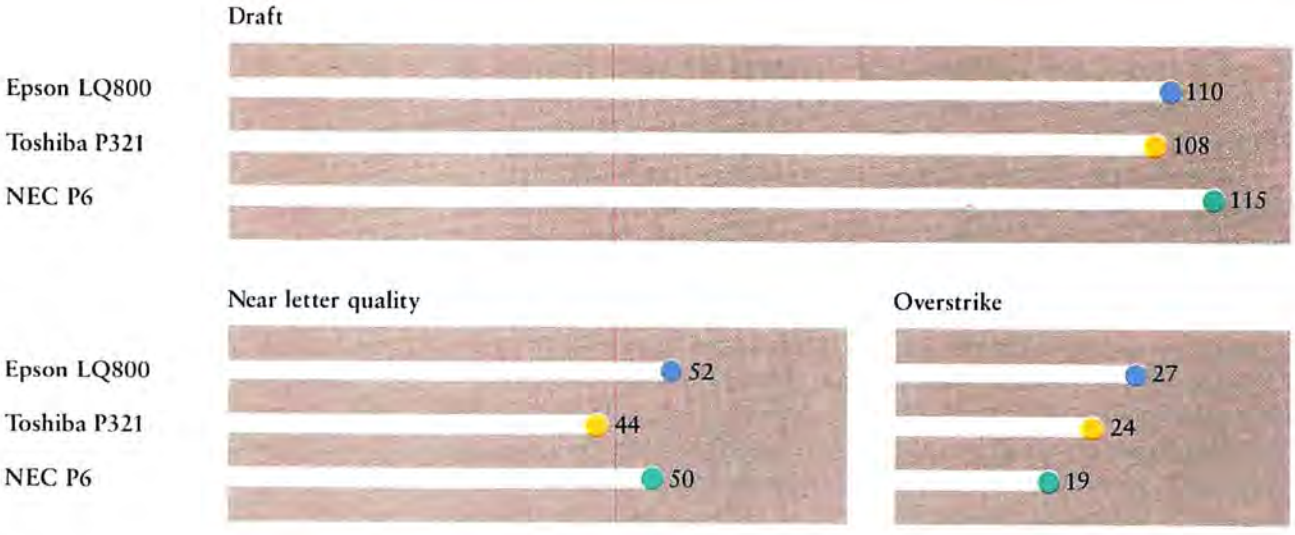
### Toshiba P321 Three-in-One

Named for its ability to print draft and letter quality text as well as graphics, the P321 Three-in-One costs $699 with a parallel port and $749 for a serial/parallel model. The printer is the low-end version of the P351, but with many of the same features available as options.

With the P321 you can have seven fonts available for printing at any given time. Four fonts are internal (Courier and Prestige Elite in draft and letter quality), two fonts can be accessed from a single cartridge, and one font can be downloaded. Each cartridge font costs $69 and comes with two typefaces: Bold and Letter Gothic; Elite Italic and Mini Gothic; Greek/Math I and APL; Greek/Math II and Scientific-Pie; Orator I and II; Outline I and Script; Theme and Light Italic; and O.C.R.B. and Bold Italic. However, to download fonts you must buy a circuit board for $89. You can print the fonts in pitches ranging from 5 cpi to 16.7 cpi. Eight character sets are also available.

*Print quality.* In draft mode the P321's output is hardly distinguishable from that of the NEC P6, but it's noticeably better than what the Epson LQ800 produces (see Figure 1). In NLQ mode, the Toshiba's print quality is a shade fuzzier than the NEC P6's and is outshined by the Epson's.

**Figure 3: Comparative printing speeds in characters per second[1]**




[1]Based on a 10,000-character file printed without form feeds

Like Epson, Toshiba says the P321 can position dots with an accuracy of 1/360 inch in graphics mode, but its actual output ranges only up to 180 dpi. Of the three bar charts shown in Figure 2, the Toshiba's output is closest in quality to the Epson's.

If you plan to create custom characters in text mode using a program like *Fontrix*, note this revelation gleaned from the manual: The printhead may overheat when the total number of printed dots in a user-defined character exceeds 15 percent of the printable dots for that character. If you intend to create large shaded areas, this limitation could defeat your purpose.

*Speed and noise level.* The Toshiba ends up on the short end of the speed stick (see Figure 3); its 108-cps draft speed and 44-cps NLQ speed make it the slowest of the trio. However, its 24 cps in NLQ overstrike places it between the NEC and the Epson.

When it comes to noise, the P321 closely approximates the Epson, except that it's slightly louder in NLQ and overstrike modes (see Table 1). Both the Toshiba and the Epson are much noisier than the NEC.

*Compatibility.* The P321 emulates the Qume Sprint 11 letter quality printer, and you can make the P321 compatible with the IBM graphics printer by adding a $49 ROM chip. The Toshiba uses a different command set than IBM or Epson printers use, however, so it doesn't work perfectly with many software packages. Fortunately, you can buy a $44.95 Epson emulation program called *Set-It* from M.A.P. Systems in Houston.

**Table 1: Noise levels in decibels**

| | Epson LQ800 | Toshiba P321 | NEC P6 | NEC P6 in quiet mode |
|---|---|---|---|---|
| Draft | 78 | 78 | 69.3 | 67 |
| Near letter quality | 76.6 | 77.3 | 71.4 | 68.2 |
| Overstrike | 77 | 79.1 | 73 | 69.3 |
| Laser printer | | 55* | | |
| Diablo 630 daisy wheel printer | | 81 | | |

*55 is a peak figure; the average is less than 35 decibels.

*Special features.* The Toshiba uses standard cables and adapters in both its parallel and serial/parallel versions. It comes with friction feed and with a single-sheet guide for inserting letterhead. Optional extras include a $99 tractor feed and a $219 sheet feeder. The Toshiba's 2K printer buffer is small compared to those of its competitors.

*Ease of use.* Because the P321's cable plugs in to a recessed receptacle out of the way of the paper, paper jams are less likely. The P321 is simple to use, too. DIP switches are easily accessible, and the ribbon is a breeze to replace.

*Documentation.* Filled with technical jargon, Toshiba's documentation is simply not geared to the needs of the novice. If you're willing to puzzle it out, you'll find the instructions thorough, and the numerous explanatory photographs should help you along.

*Durability.* According to the manual, the P321's printhead will print 100 million characters before expiring. But this is only half the life of Epson's printhead, and you must visit a Toshiba dealer to get the printhead replaced. Ribbons are rated to yield 1.6 million characters if used only in draft mode.

*Best use.* The Toshiba P321 is a good choice for those who like to use a wide variety of fonts in their documents. However, the lack of Epson compatibility limits the number of programs that will work with the P321.

### NEC Pinwriter P6

The P6 is a successor to the NEC Pinwriter P5 (see "Dot Matrix Triple Play," *PCW*, November 1985), and like its predecessor, it supports the creation of custom characters and features a quiet mode. The P6 comes with ten built-in typefaces, which can be printed in pitches ranging from 5 to 20, and it supports twelve character sets. The P6 also has a unique capability: It can enlarge printed characters vertically by a factor of 2 and enlarge them horizontally by a factor of 2 or 3.

## Speed Tests: Fact and Fantasy

Never ask the size of a fish, the score of a golf game, or the speed of a printer: The answer won't be dependable. Printer manufacturers just can't be trusted to honestly evaluate their printers' speeds. Toshiba, for example, claimed a 216-cps draft speed and a 72-cps speed in letter quality mode for the P321. Tests conducted for this review yielded 108 cps in draft and 44 cps in letter quality. Epson claimed 180 and 60 cps but yielded 110 and 52 cps; NEC promised 216 and 65 cps but delivered only 115 and 50 cps.

Why this discrepancy? Print conditions and test print material may vary, but the main reason is that printer manufacturers measure only "burst speed." Burst speed is the speed at which the printer prints when it's in the middle of a line (the Epson manual calls this "characters per second per line"). Real-world phenomena such as carriage returns, line feeds, and form feeds apparently have no place in the manufacturers' ivory tower laboratories. Therefore, those of us who live in the real world will never achieve the advertised print speeds.

The choice of typeface can also influence test results. Manufacturers' speeds are often based on elite type or a combination of elite and pica; the tests for this review were performed with pica because that is the typeface used in most offices. Pica type has fewer characters per line, so the combination of carriage returns and line feeds has a greater overall effect on print speed.

The only consolation in knowing about this speed-measuring subterfuge is recognizing that all the printer manufacturers do it, which means you can judge all of their printers accordingly.
*–B. C.*

*Print quality.* The P6's output in overstrike mode is good, but its typeface has an odd quirk. The printer's 4s and 2s are low and squat, calling attention to themselves as you read through a document (see Figure 1).

When it comes to graphics, however, the NEC P6 is no slouch; it's the only one of the three machines that actually *prints* 360 dpi, a graphics resolution rivaling that of most laser printers. As Figure 2 illustrates, its rendition of the *1-2-3* bar chart is the best of this group of printers.

*Speed and noise level.* At 115 cps the NEC is the fastest of the three printers in draft mode. However, at 19 cps in overstrike mode it ranks lowest of the three and makes high-quality printing interminable (see Table 1). Its 50-cps speed in NLQ mode falls between that of the other two printers.

Among dot matrix printers whose buzzing can drive even the hard of hearing from the room, the P6 is endearing. The printer is 5 to 8 dBA quieter than the other two printers under normal conditions, and up to *11* dBA quieter in its quiet mode (see Table 1). This mode slows the printer to half-speed, but if quiet is what you want, this printer will deliver.

*Compatibility.* The NEC P6 emulates the Epson LQ1500 and uses the same control codes as the LQ800. You can easily print both text and software using software configured for an Epson. Additional codes control the extra fonts available for the NEC.

*Special features.* The P6 has a built-in 8K buffer. If you use

many fonts, you'll appreciate this printer's LED font display, which indicates the font you've selected. A list of fonts is conveniently located next to the visual display.

*Ease of use.* The P6's parallel version is easy to set up and use, but the serial model has a couple of drawbacks. The switches you use to select serial port parameters (such as data transmission speed and protocol) can be reached only by taking the cover off the printer; when you want to test the switch settings, you must put the cover back on. Furthermore, the P6's serial port uses a nonstandard cable. Last and most important, the serial port simply doesn't perform well. Although rated at up to 19,200 bits per second (bps), the printer would not perform reliably above 1200 bps during tests conducted for this review. Using a line length of 50 characters, 4800 bps was possible, but 9600 bps was completely inaccessible; the printer choked when sent more than a dozen lines of print and had to be switched off.

*Documentation.* NEC wisely separated the documentation for the P6 into two parts: a simple user guide and a technical reference manual. Beginners can easily perform basic printer setup tasks by referring to the user guide; the more proficient will welcome the opportunity to locate technical information quickly.

*Durability.* NEC claims a 5000-hour mean time between failures for the printer; the printhead is rated at 200 million characters. As with the Toshiba, you must take the printer to a dealer to have the printhead replaced. The life expectancy of the ribbon is claimed to be 2.2 to 3 million characters.

*Best use.* The NEC P6 is extremely convenient if you use many fonts. On the other hand, if print quality is not your primary concern, remember that the P6 is also the fastest of the three printers in draft mode. In overstrike mode, the NEC P6's output is similar to the Toshiba P321's.

## Three for the Road

None of these printers has all the advantages. However, the Toshiba P321 is the overall loser in this particular test group, with print speeds that are generally slower than those of the other two printers and without built-in Epson compatibility.

Choosing between the Epson and the NEC is more difficult. The Epson has the best NLQ mode, a high level of compatibility with software, and an easy-to-use front panel. Unfortunately, frequent paper jams mar its otherwise excellent reputation. The NEC gets kudos for its many extras: a quiet mode, a wide selection of fonts, a convenient front-panel font selection, and the ability to enlarge printed characters and to actually print 360 dpi in graphics mode.

Establishing your priorities will help you determine which printer is most appropriate for your business environment. If you want letter-perfect documents in NLQ mode, the Epson has a significant edge. But if speed, quietness, and a slew of extras are more appealing, the NEC is the printer of choice.

*Bill Crider is a microcomputer training consultant in Tucson, Arizona, and a Contributing Editor for* PC World.

*Epson LQ800*
*Epson America, Inc.*
*2780 Lomita Blvd.*
*Torrance, CA 90505*
*213/539-9140*
*List price: with serial and parallel ports $799, tractor feed $59.95, sheet feeder $129.95, cartridge for Diablo 630 and IBM graphics printer emulation $89.95, cartridge font $59.95*

*NEC Pinwriter P6*
*NEC Information Systems, Inc.*
*1414 Massachusetts Ave.*
*Boxborough, MA 01719*
*617/264-8000*
*List price: with parallel port $699, with serial port $775, tractor feed $150, sheet feeder $239*

*Toshiba P321 Three-in-One*
*Toshiba America, Inc.*
*2441 Michelle Dr.*
*Tustin, CA 92680*
*714/730-5000*
*List price: with parallel port $699, with serial and parallel ports $749, tractor feed $99, sheet feeder $219, IBM graphics emulation hardware $49, font-download circuit board $89, cartridge font $69*

# IBM Business Adviser: What Cost Accounting?

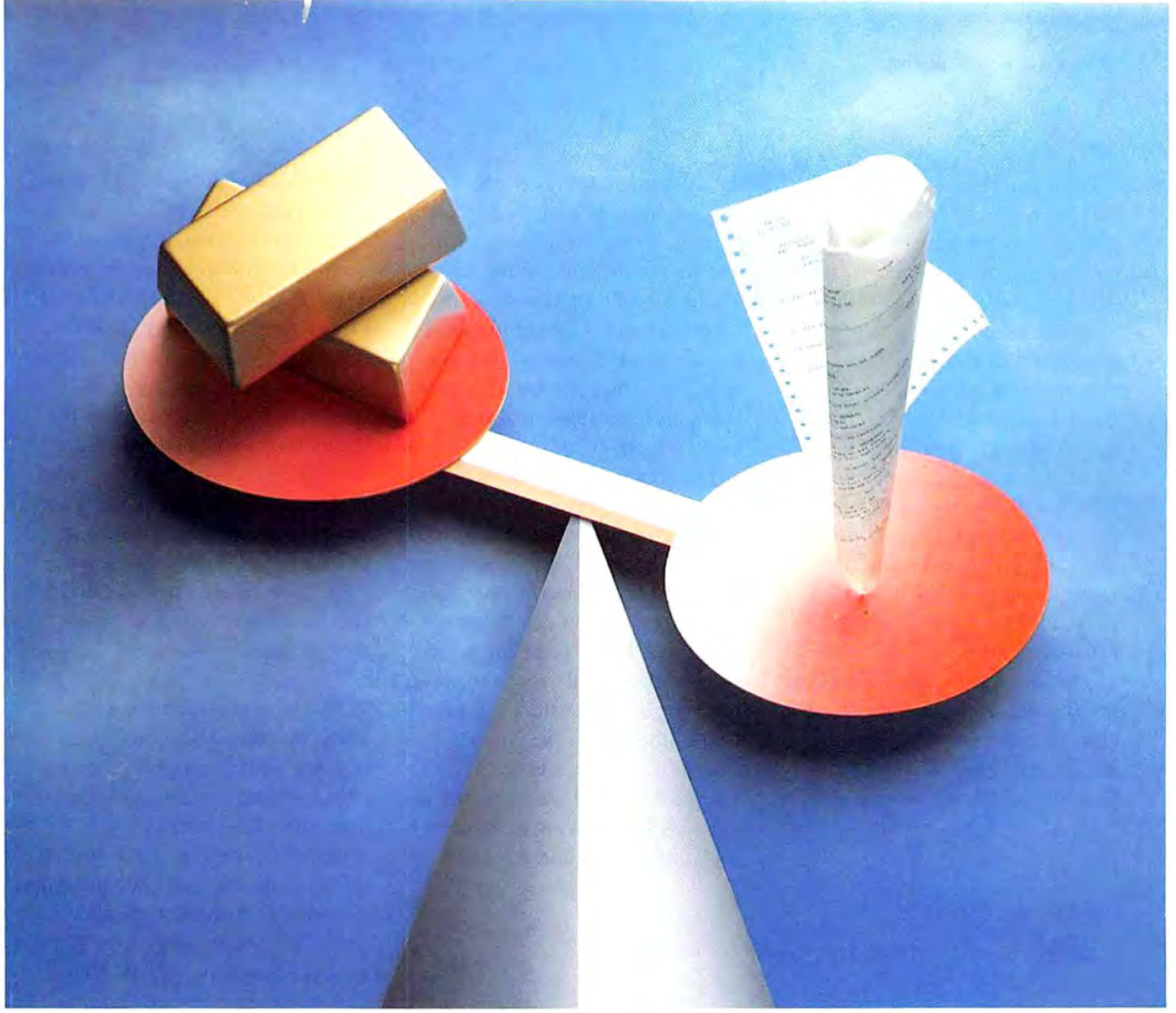
IBM's latest accounting software is flexible, easy to use, and offers one of the best payroll programs to date. But its hefty price tag and megabyte-munching size may keep the Business Adviser from gaining a following.

*Charles Rundgren*

*IBM Business Adviser* is out to buck accounting software's reputation for being hard to use. Composed of separate General Accounting, Accounts Receivable, Accounts Payable, and Payroll modules, the *Business Adviser* displays unusual flexibility throughout its applications and offers one of the most complete and easy-to-use payroll packages available. This program works overtime to ease the complexity of many setup and data entry tasks. As with the *IBM Business Management Series (BMS),* the *Business Adviser* delivers abundant, context-sensitive help to guide you. And like the *BMS,* the *Business Adviser* voraciously gobbles disk space and—at $995 per module—takes a healthy bite out of your budget.

The *Business Adviser*'s most innovative feature is the seamless integration of its constituent parts. Rather than forcing you to shuttle between modules to record a general journal entry here or an invoice there, the *Business Adviser* attempts to dissolve divisions between applications, consolidating access to all functions on a single master menu (see Screen 1). This structure expedites some aspects of data entry, although many users might find the arrangement awkward for reporting.

Written for IBM by BPI Systems, the *Business Adviser* reflects its BPI parentage by offering an all-in-one General Accounting module. Like the earlier BPI General Accounting module, it provides an inexpensive alternative for users with modest accounting needs, merging a full-featured general ledger with rudimentary accounts receivable, accounts payable, and payroll functions. If you require such fundamentals as calculated payroll deductions, invoices, or payables aging, however, you'll need the additional modules.



Charles Kemper

## Big Is Beautiful

The first thing you notice about the *Business Adviser* is its bulk. The General Accounting module alone weighs in with 15 floppy disks, 7 of which make up the program proper; the remaining 8 hold the on-line help, the tutorial, and sample data. This flock of floppies occupies 7.2MB of hard disk space, and the Accounts Receivable, Accounts Payable, and Payroll modules require an additional 2MB to 2.4MB each. Including elbowroom for data files, the entire system demands approximately 14MB of storage. Add the announced Inventory Control and Order Entry modules (unreleased at this writing), and it becomes clear that IBM wants you to dedicate your AT's 20MB hard disk to accounting.

Besides a hard disk drive, the *Business Adviser* requires at least 384K RAM (512K is recommended). The program actually requires PC-DOS, so if you have a compatible with a proprietary version of MS-DOS, you're out of luck. With the addition of one $245 Network Extension module per PC, the *Business Adviser* can run on either the IBM PC Network or IBM's Token-Ring.

Installing the *Business Adviser* is a matter of swapping floppies until the installation utility has completed its somewhat time-consuming assignment. Once you have copied all the files onto your hard disk, the program asks you to establish a system manager ID number. If you activate the *Business Adviser*'s gatekeeping function, entering this special user ID number is the only way to gain access to the entire package. The system manager can also create user IDs that permit access only to specified tasks.

Once you've logged on, you'll find the *Business Adviser* remarkably easy to handle. Setting up beginning balances and prior-period data is a snap, whether for customer or vendor accounts or for general ledger balances. Unlike many other packages, prior-period general ledger account balances don't require journal entries. Instead, you use a handy financial calendar to key in ending balances for periods in current and prior years. For balance-forward customers, you enter the proper amounts into any of the program's five user-defined aging categories.

The list of amenities offered by the *Business Adviser* is practically endless. You can set up prompts for general ledger account numbers almost anywhere, including in the sales invoice register, the voucher journal, and the payroll journal. To find account information on the fly, you can use asterisks for wild-card searches. Moreover, many frequently used commands are assigned to function keys whose designations are listed at the bottom of almost every screen.

The function keys can also be used in concert with the <Alt> key to expand the list of possibilities. <Alt>-<F2>, for example, temporarily freezes the operation in progress so you can do something else. If you've begun an invoice and suddenly remember you need to add the customer information to the master file, you can stop in midentry, add the account information, and return to the invoice without having to start over. This global stop-and-start capability is unique among PC-based accounting packages.

Perhaps the most surprising aspect of the *Business Adviser* is that it includes two RAM-resident utilities—a notepad and a personal calendar. For IBM to offer utilities at the touch of a hot key may seem a radical departure, but the addition of a calculator would have been a more useful one. The *Business Adviser* also includes a handy print spooler, so you can print any document or series of documents (except invoices and checks) without tying up your workstation.

F1:Help BIGBLU: Sales Invoice Journal Invoices. REVIEW

Entry No.: 1 of 2
Fiscal Year 86 G/L Period 9 S/L Period 9 Entry Date: 09/24/86

Trans Type : NI Description : Charge
* Customer ID: WAVE * Name: New Wave Computing
* Invoice No.: 16
Due Date: 10/24/86 Discount Date: 10/04/86
* Sales ID : FOX Fox, Carrie
Remarks : PO # 112233

| * G/L Account | Description | Amount |
|---|---|---|
| 4000 | SALES - BIG TICKET | $ 1,500.00 |
| 4100 | SALES - LITTLE STUFF | $ 30.00 |
| 2230 | SALES TAX PAYABLE | $ 91.00 |

Invoice Total $ 1,621.00
OK? (Y/N) Y
Batch Total $ 1,621.00

F3: Insert Line F4: Delete Line F5: Batch F6: Review F7: Del Entry

Screen 2: To speed data entry, the line items on this Accounts Receivable input screen have been assigned default general ledger account numbers.

## General Accounting

The *Business Adviser*'s General Accounting module can serve either as the general ledger core of a multimodule system or as a stand-alone, all-in-one accounting solution. As the latter, the module is similar to a number of other small-business packages (see "Accounts Affordable," *PCW*, May 1986). All the expected features are present, including multiple checking accounts, departmental reporting, check printing, and the ability to design custom reports.

On closer inspection, however, General Accounting falls short as an all-in-one package in several respects. The accounts receivable features are quite limited: Open-item accounting is lacking, as are accounts receivable aging and invoice printing. General Accounting's accounts payable features are a bit more substantial, offering check printing and the ability to reconcile bank accounts—but again, aging reports are omitted.

Although you can use the General Accounting module to print

payroll checks, its capabilities don't include wage and tax calculations. As an after-the-fact storehouse of payroll data, however, the program generously accommodates up to nine deductions per employee. And for retailers, General Accounting's unique Cash Drawer Journal makes recording daily cash transactions a cinch.

But in the long run, General Accounting can't keep pace as a stand-alone package. The lack of a cash requirements report and both receivables and payables aging reports, all of which are available in Peachtree's $395 *Back to Basics* program (as well as in the *Business Adviser*'s own Payables and Receivables modules), seems unforgivable. If IBM were serious about providing an all-in-one accounting solution, these fundamental reports would certainly have been included.

As a general ledger, however, the General Accounting module is an able proponent of the *Business Adviser*'s bigger-is-better philosophy. How does a 14-character general ledger account number grab you? Is the old 13-period fiscal year too restrictive? If so, you can divide the fiscal year into as many as 53 periods. And as a test of your cash management savvy, you can create up to 99 checking accounts.

To set up General Accounting, you first define the fiscal calendar and the chart of accounts. (A default chart of accounts is supplied, but the 3-digit account numbers severely limit its usefulness.) Next, you enter prior- and current-year balances. You can also distribute budgeted amounts by entering the total annual budget; the program then divides the aggregate amount into equal amounts for each period. Finally, you define checking accounts and set up recurring journal entries.

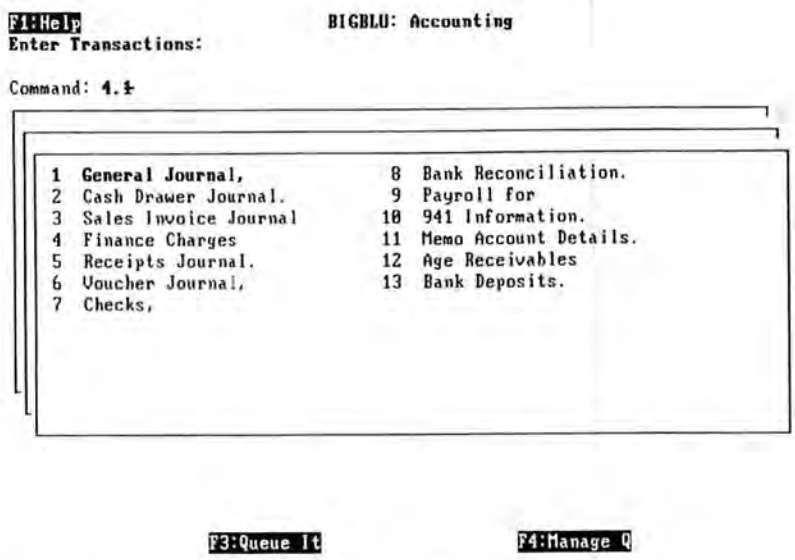
Departmental accounting, multiple open periods, and user-defined journals are all supported. You can institute both recurring and automatic reversing entries, and a provision for up to ten 40-character lines of journal entry description indicates that someone has finally realized the importance of full documentation in this area. The program can also handle the books for multiple companies, although there's no way to consolidate the books.

The *Business Adviser*'s reporting capabilities are a mixed bag. On the plus side, all the journals, ledgers, and financial reports can be viewed on screen. And the 20 predefined reports, including a comparison of actual balances to budgeted or prior-year amounts, provide a solid foundation for most reporting needs (see Figure 1). Especially welcome are spreadsheet reports that detail each period for the entire year to date.

BIG BLUE, INC.
Income Statement
Period versus Period Budget As Variance
Period Ending September 30, 1986

| | Actual | Budget | Variance |
|---|---|---|---|
| Income | | | |
| SALES - BIG TICKET | 16,000.00 | 14,500.00 | 1,500.00 |
| SALES - LITTLE STUFF | 900.00 | 1,000.00 | (100.00) |
| SALES RETURNS | (50.00) | (100.00) | 50.00 |
| Total Income | 16,850.00 | 15,400.00 | 1,450.00 |
| COST OF SALES | | | |
| COST OF SALES | 9,300.00 | 7,500.00 | (1,800.00) |
| Total COST OF SALES | 9,300.00 | 7,500.00 | (1,800.00) |
| Gross Profit (Loss) | 7,550.00 | 7,900.00 | (350.00) |
| SELLING EXPENSES | | | |
| SALARIES AND WAGES | 1,500.00 | 1,000.00 | (500.00) |
| TRAVEL | 150.00 | 100.00 | (50.00) |
| PAYROLL TAXES | 150.00 | 100.00 | (50.00) |
| Total SELLING EXPENSE | 1,800.00 | 1,200.00 | (600.00) |
| G & A | | | |
| SALARIES AND WAGES | 2,600.00 | 2,000.00 | (600.00) |
| PAYROLL TAXES | 260.00 | 200.00 | (60.00) |
| RENT | 600.00 | 600.00 | 0.00 |
| REPAIRS & MAINTENANCE | 75.00 | 50.00 | (25.00) |
| TELEPHONE | 55.00 | 60.00 | 5.00 |
| INSURANCE | 100.00 | 100.00 | 0.00 |
| BAD DEBTS | 0.00 | 50.00 | 50.00 |
| DEPRECIATION | 500.00 | 500.00 | 0.00 |
| MISCELLANEOUS | 50.00 | 75.00 | 25.00 |
| Total G & A | 4,240.00 | 3,635.00 | (605.00) |
| Net Income (Loss) | 1,510.00 | 3,065.00 | (1,555.00) |

**Figure 1: This spreadsheet-like income statement, produced by the Business Adviser's report generator, provides a clear-cut breakdown of actual and budgeted amounts, plus the variance between the two.**




**Screen 1: The Business Adviser consolidates the lion's share of accounting activities on a single main menu.**

About the only option missing from the fixed reports is a statement of changes in financial position.

If you want to create custom reports, however, you'll find the report writer extremely cumbersome. To accumulate the balances of a group of accounts, for example, you must use department ID codes in the account numbers. In addition, the cursory documentation does little to help you design layouts and select report contents—making sophisticated custom reports close to impossible. IBM acknowledges this failing and promises to amend its documentation with the next release of the *Business Adviser*.

The menu arrangement for the reporting options could also stand revision. The problem stems from the consolidated menu structure, which, ironically, is designed to permit fast access to all the modules' functions. Selecting the master menu's report option summons a submenu that lists not only generic reports, such as Journals and Ledgers, Schedules and Lists, and Financial Reports, but also Receivables Reports, Payables Reports, and Payroll Reports. This means that if you want to print all month-end accounts receivable reports, you'll have to shuttle between submenus for Receivables Reports and for Journals and Ledgers. To top it off, each time you select a report for printing, you're brought back to the primary report submenu, not the menu from which you made your last selection. Including all the necessary report suboptions in each report group could eliminate much of this menu-shuffling.

## Cashing In and Paying Out

Like any receivables application worth its salt, the *Business Adviser*'s Accounts Receivable module supports both balance-forward and open-item accounting. The module also prints invoices, records cash received, verifies credit limits, calculates sales discounts and finance charges, and processes invoices, credit memos, and debit memos. More interestingly, the module can compute finance charges based on either the average daily balance or a percentage of the ending balance. You can also set up payment terms for balance-forward customers in the form of a revolving balance or as fixed payments.

The twofold bottom line for a receivables package is ease of use and the ability to handle irregular transactions. The *Business Adviser*'s Accounts Receivable module scores well on both counts. It easily handles partial payments, payments larger than the invoice amount, and single payments covering a number of invoices. The data entry screens are uncluttered and logically arranged, and you can use the wild-card function to search for customer and salesperson ID numbers.

Setting up journal entry prompts that list the default sales and sales tax payable accounts for each customer should save a lot of time when you enter invoices (see Screen 2). Unlike many packages, however, the *Business Adviser*'s Accounts Receivable module does not compute sales tax; you have to enter the sales tax amount on two different data entry screens.

The Accounts Receivable reporting options are pretty standard and include a sales journal, a cash receipts journal, an aged trial

balance, and a customer ledger that details each customer's transactions. The Customer Analysis Report shows year-to-date sales and aging of customer balances, but little is actually offered in the way of sales analysis. Reports comparing current year-to-date sales with prior-year sales by customer or by salesperson would have been particularly useful. Considering the $995 price of each module, it would be reasonable to expect more reporting muscle.

The *Business Adviser*'s Accounts Payable module has all the features you'd expect, but it's somewhat more sophisticated than the Accounts Receivable module. The Payables module provides default general ledger account numbers for each vendor, disburses payments to one-time vendors, voids computer-paid checks, and generates voucher and check numbers. It also supports vendor discounts, automatic vouchers, and manual checks. Some features display unusual versatility; for example, you can set up the system to take discounts even if a discount date has passed. Moreover, you can pay vouchers by vendor, due date, or discount date.

One critical failing, however, is that the module doesn't prevent you from paying the same invoice twice. Granted, an error message appears, but you can choose to ignore it and complete the redundant operation.

Most of the Accounts Payable reports are fairly pedestrian, although you can print some of them in a variety of formats. For example, you can print out a Voucher Journal showing all vouchers for the period and all vouchers paid, open, or on hold. However, 1099 reporting is not supported.

Cash management is a vital issue for any business, and a number of the Accounts Payable module reports should help. First, you can review a Check Selection Report (or precheck register) before printing checks to determine the total cash outlay, or you can place a voucher on hold prior to payment. Second, a Cash Requirements Report shows the total amount required to pay all bills due through the selection date. Unlike most cash requirements reports, you can add items such as payroll to the report and get a more accurate picture of your total cash needs (see Figure 2). Finally, the Aged Accounts Payable Report is something of a misnomer. Rather than indicating how long an invoice has been due, it shows future amounts due—another useful tool for projecting cash needs.

BIG BLUE, INC.

10/07/86 — Cash Requirements — Page 1
Due: 10/15/86
Report Date: 10/07/86

| Voucher Number | Invoice/ Due Date | Invoice Number | Invoice Amount | Discount /Finance | Paid Amount | Net Amount |
|---|---|---|---|---|---|---|
| APPLIE-Applied Business Systems | | | | | | |
| 09-0001 | 09/07/86 | 1111 | | (20.00) | | 1,000.00 |
| | 10/07/86 | | 1,000.00 | | | |
| ARIES-Aries Computer Systems, Inc. | | | | | | |
| 09-0002 | 09/07/86 | 2222 | | | | 2,000.00 |
| | 10/07/86 | | 2,000.00 | | | |
| Total Cash Requirements | | | 3,000.00 | 0.00 | 0.00 | 3,000.00 |
| Lost Discounts | | | | (20.00) | | |

BIG BLUE, INC.

10/07/86 — Cash Requirements — Page 2
Due: 10/15/86
Report Date: 10/07/86

| Voucher Number | Invoice/ Due Date | Invoice Number | Invoice Amount | Discount /Finance | Paid Amount | Net Amount |
|---|---|---|---|---|---|---|
| Total Cash Requirements | | | 3,000.00 | 0.00 | 0.00 | 3,000.00 |
| 1st Pay Period | | | 2,050.00 | | | 2,050.00 |
| 2nd Pay Period | | | 2,050.00 | | | 2,050.00 |
| Total Other Cash Requirements | | | 4,100.00 | 0.00 | 0.00 | 4,100.00 |
| Totals | | | 7,100.00 | 0.00 | 0.00 | 7,100.00 |

**Figure 2: The Business Adviser's Cash Requirements Report is only one of the program's many tools for predicting future cash needs.**

## Paying for Time

One of the most comprehensive, easy-to-use payroll applications on the market, the *Business Adviser*'s Payroll module stands out as the highlight of the entire package. Probably the most pleasing aspect of the program is its handling of deductions. For some reason, most accounting packages make payroll in general and deductions in particular nearly incomprehensible. With the *Business Adviser*'s Payroll module, not only do you have the flexibility of up to 20 companywide deductions (up to 9 per employee), but setup is a straightforward matter.

Flexibility is the keynote here. As with most packages, payroll can be calculated in three ways: by the hour, by salary, or by commission. However, the *Business Adviser* supports four types of overtime pay for hourly employees, and you can set up several different commission schedules, including straight percentage, base salary plus commission, and draw against commission. Employees can be paid weekly, biweekly, semimonthly, or monthly, and each employee's wages can be automatically distributed to as many as five general ledger accounts. Other features include printing payroll checks, processing tips and tips deemed as wages, and tracking vacation and sick pay both by the hour and by the dollar.

The Payroll module doesn't skimp on reports either. In addition to a payroll journal and check register, the module provides an employee earnings report, a deductions register, and W-2s, as well as reports for preparing quarterly payroll tax returns.

The program is designed as a multistate payroll package, accommodating employees who live in one state but work in another. It processes payroll for 58 tax districts, including Puerto Rico and the District of Columbia. The purchase price includes tax tables, but you must obtain them through the mail by sending in the module's registration card.

## State of the Art . . . Almost

With the exception of its report-writing features, the *Business Adviser* is generally easy to learn. Interestingly, IBM provides only 300 total pages of documentation for the four modules, with few screen examples and no sample reports. IBM has put nearly all the documentation in software, supplying just enough hard copy to get you started. An indexed on-line reference manual provides an ample resource, and the step-by-step, disk-based tutorial is nothing short of excellent. And if you forget your lessons, plentiful context-sensitive help is available at the touch of the <F1> key.

The perfect off-the-shelf accounting package will probably never exist, largely because accounting needs vary so widely from business to business. Nevertheless, the *Business Adviser* could stand improvement in several respects, especially in its approach to custom reporting and in its occasionally awkward menu structure. Also, lapses such as those enabling users to pay the same invoice more than once or to repost recurring entries seem indefensible in a high-end package.

Then there's the matter of sheer size. The voluminous on-line documentation enlarges the program, of course, but there's still little excuse for any application—short of a high-end scientific or engineering program—to occupy almost all of a 20MB hard disk. Without a doubt, the *Business Adviser* is easier to use than most accounting packages, and the bundled utilities are undeniably useful. But at $995 per module, you definitely pay for the extras.

*Charles Rundgren is a CPA and consultant in the Orange County, California, office of Deloitte Haskins & Sells, a Big Eight accounting firm.*

*IBM Business Adviser*
*IBM Corp.*
*P.O. Box 720576*
*Atlanta, GA 30358*
*800/426-2468*
*List price: General Accounting $995, Accounts Receivable $995, Accounts Payable $995, Payroll $995, Network Extension $245, tax table update $125*
*Requirements: 384K RAM (512K recommended), 20MB hard disk, PC-DOS 2.00 or later version*
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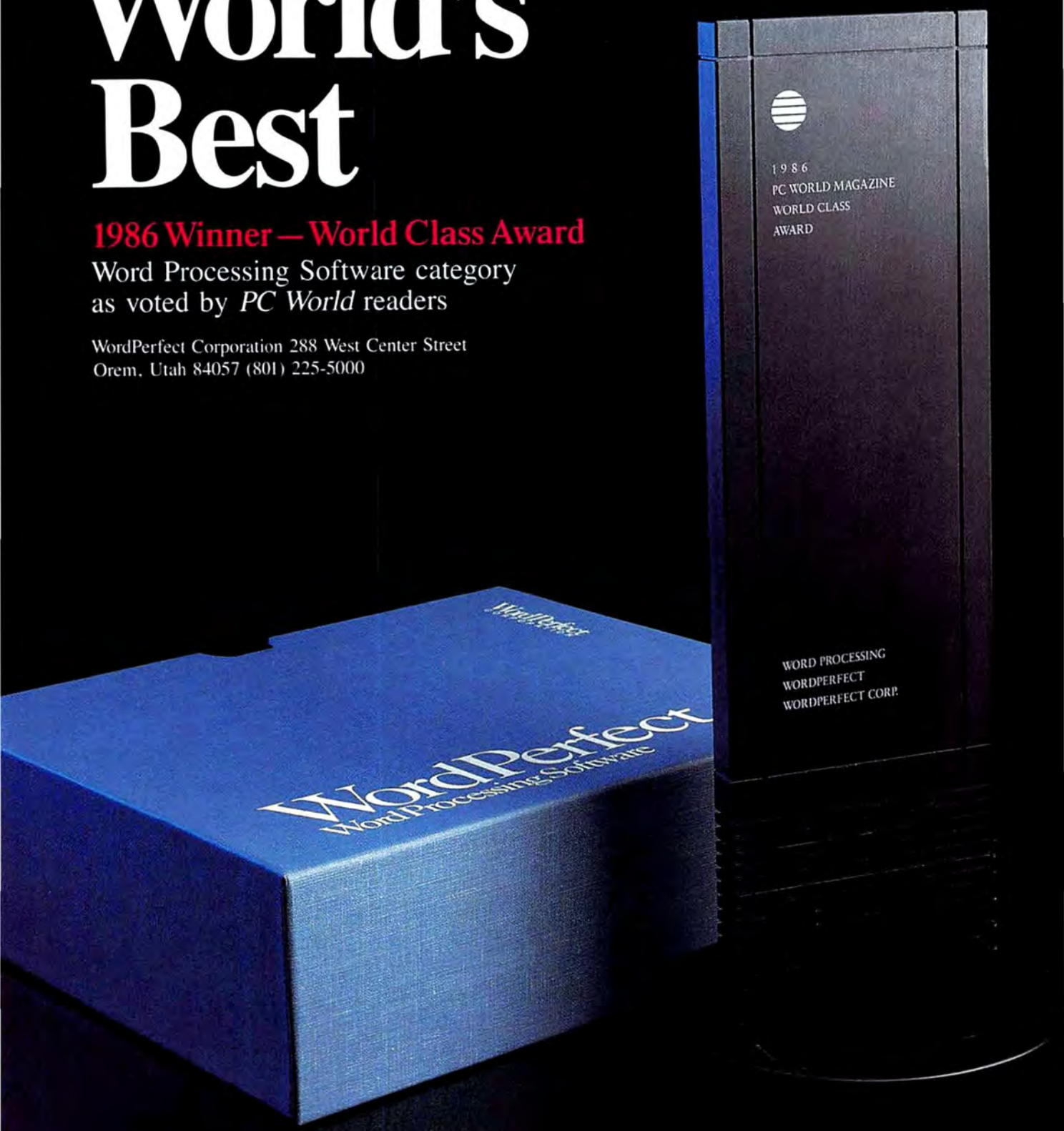
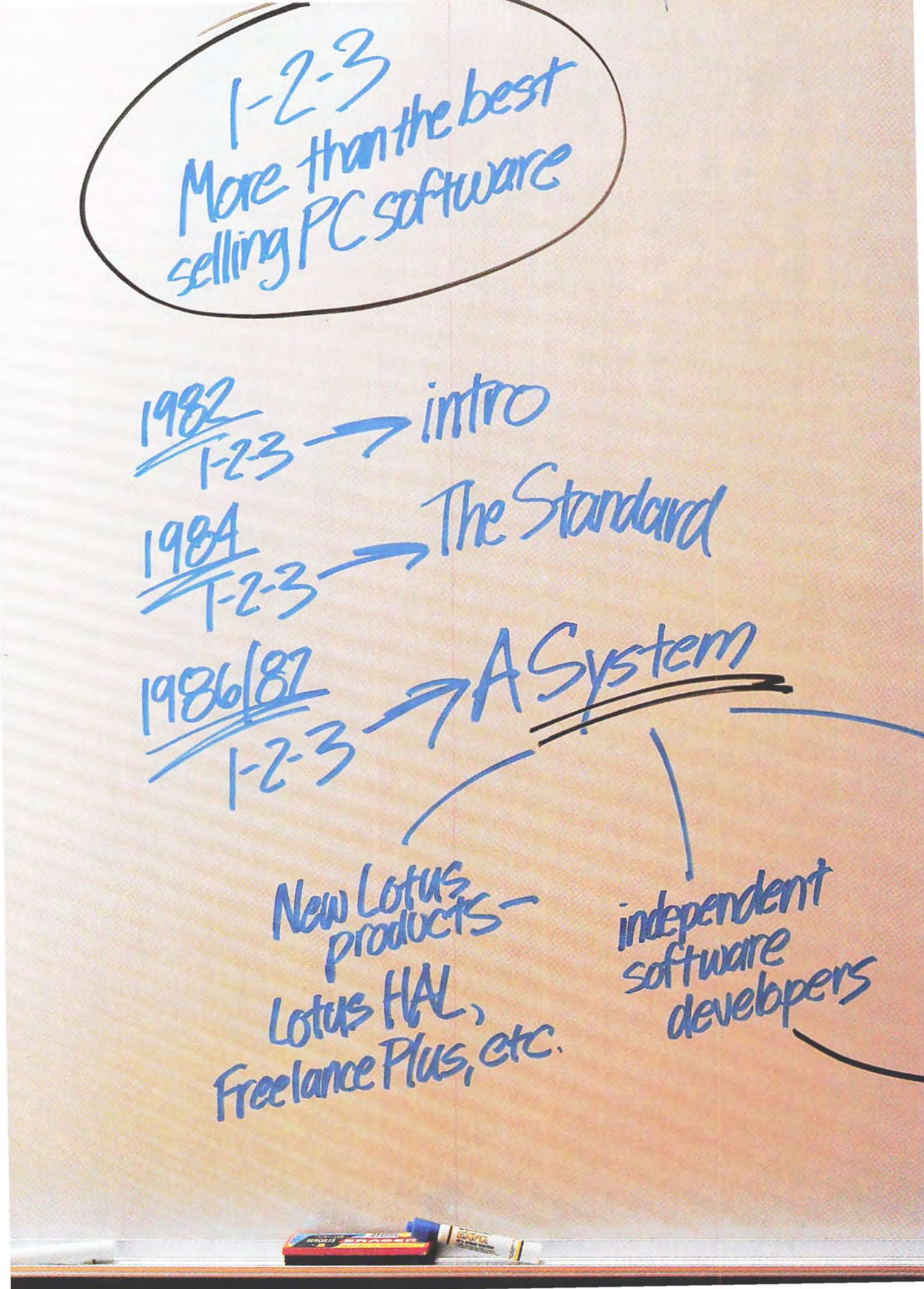



Circle 165 on reader service card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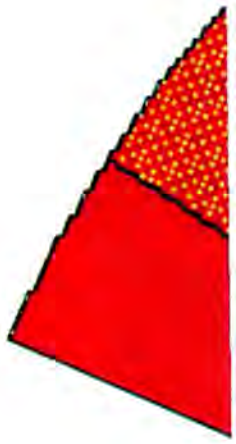
# The Color of the Future



Lasers have taken the printer industry by storm as a host of manufacturers scramble for a share of the market. But monochrome lasers may soon seem dated when colorful competitors arrive on the scene.

*Wes Nihei*

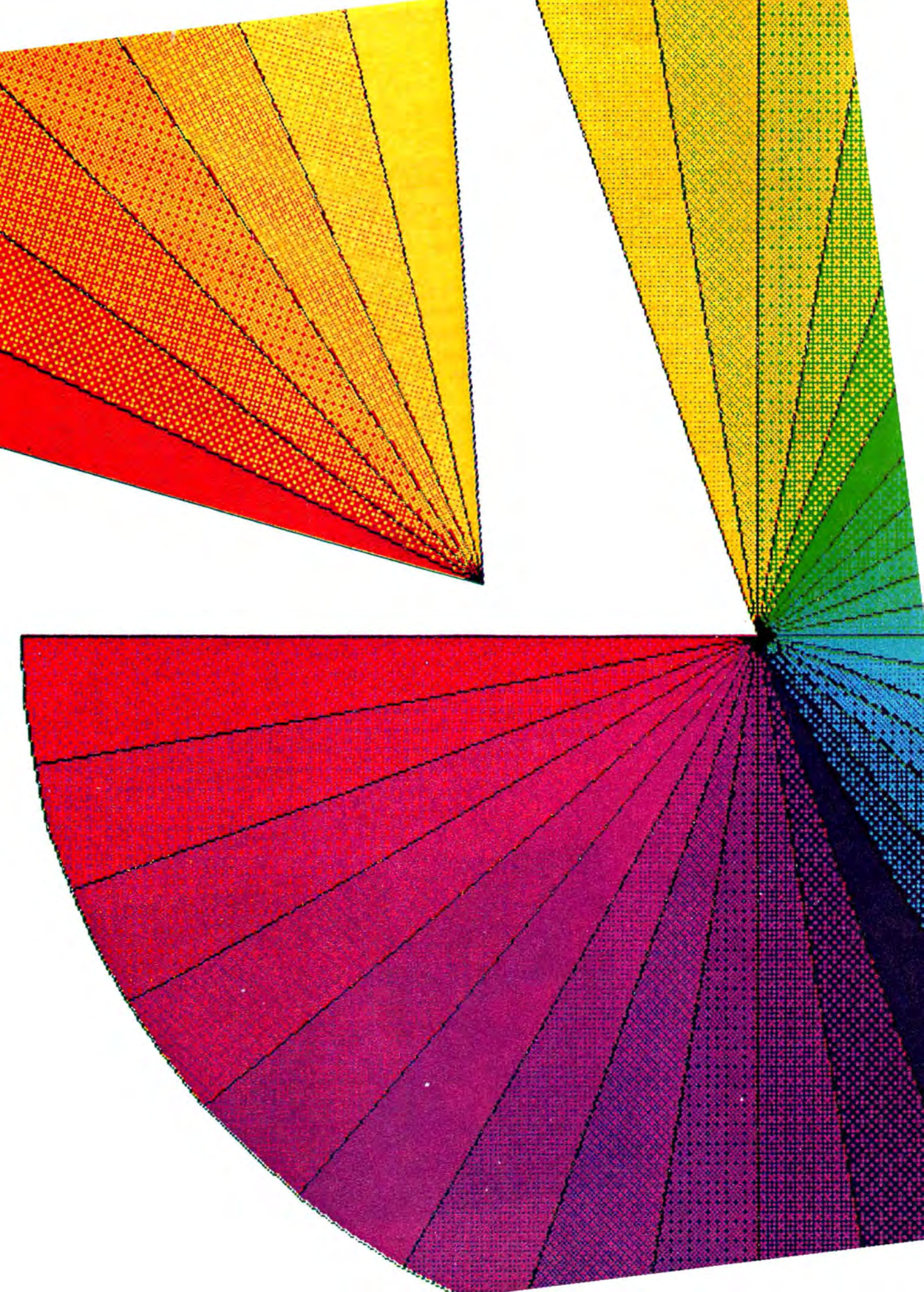
Color laser printers are more than the stuff of dreams. The next likely step along the laser printer's evolutionary path—the leap from monochrome to color—should begin by 1990.

Although the secrecy surrounding color laser technology resembles the mystery enshrouding space weapons research, it's plain as paper that printer companies and laser print-engine manufacturers have color on their minds. For potential players in the color laser printer market, it's not so much a matter of how but when. In fact, the color laser printer may be a technology waiting for a market.

## Xerox First Again

Color laser printers are nothing new—just ask Xerox, which offered the first color laser printer, the 6500 Color Graphics Printer (CGP) for mainframes and minicomputers, back in 1978. Xerox had essentially added a controller and a host-computer interface to its 6500 Color Copier to create the 6500 CGP.

The first color electrophotographic product to feature digital imaging, the 6500 CGP produced color prints by combining digital input with xerographics and laser scanning technologies. The device acted either as a printer or as a color photocopier. It cranked out color hard copy with 100-dots-per-inch (dpi) resolution at 3 pages per minute (ppm)—and all this five years before the Canon LBP-CX engine burst open the market for monochrome laser printers (see Figure 1).



Ever the product pioneer, in 1977 Xerox had been first on the monochrome laser scene with its 9700 laser printer. Like its monochrome predecessor, Xerox's initial color laser printer was a product ahead of its time; it left people scratching their heads trying to figure out what to do with it. Nonetheless, 2200 units were sold; and although the 6500 CGP is no longer available, Xerox continues to support it.

"At the time it was the only color laser printer and it still pretty much is," says Bill White, vice president for advanced technology at Xerox. "We learned a lot about color lasers from our experience with it." But Xerox prefers not to reveal what it learned just yet.

## The Photocopier Connection

Other photocopier manufacturers apparently concluded from Xerox's experience that it was best to tread lightly on the path toward color laser printers. Jonathan Dower, senior analyst for Datek Information Services, a printer market research firm in Newtonville, Massachusetts, sums it up: "Right now color lasers are pie-in-the-sky stuff. Nobody's got one, even though there are plenty of people working on them."

Canon, for instance, unveiled a prototype color copier with a scanner and a color laser print engine that could be extended to a color laser printer. "We can't comment on when we might introduce a color laser printer," says Koichi Kadokura, product manager for laser products at Canon U.S.A., "but technically it's no problem."

Ricoh's CIP-LA color copier uses a laser to project an image onto the photoconductor drum for color electrophotographic printing at 400-dpi resolution. "We just don't see a demand for color laser printers yet," remarks Arnie Peters, Ricoh's marketing manager for laser printers.

Colorocs, a relative newcomer poised to enter the color-copier market, has produced an electrophotographic print engine that can be configured as a color copier or as a laser printer. The 4-year-old company has inked an agreement with QMS to supply the engine for a color laser printer. But Frank Rowe, Colorocs's executive vice president, cautions, "It's really premature at this time to talk about a color laser printer—at least for another year."

## Basic Color

Although potential suppliers of color laser printers are playing it close to the vest, the basic techniques of color laser printing are nothing new.

Like all color reproduction methods, color lasers trick the human brain into perceiving a combination of primary colors as one new color. Color monitors and TVs perform this optical sleight of hand to produce all the colors of the visible spectrum using combinations of red, green, and blue. Color printers create the same illusion using magenta, cyan, and yellow.

Cyan and yellow, for example, team up to produce green. All three colors can be layered to produce

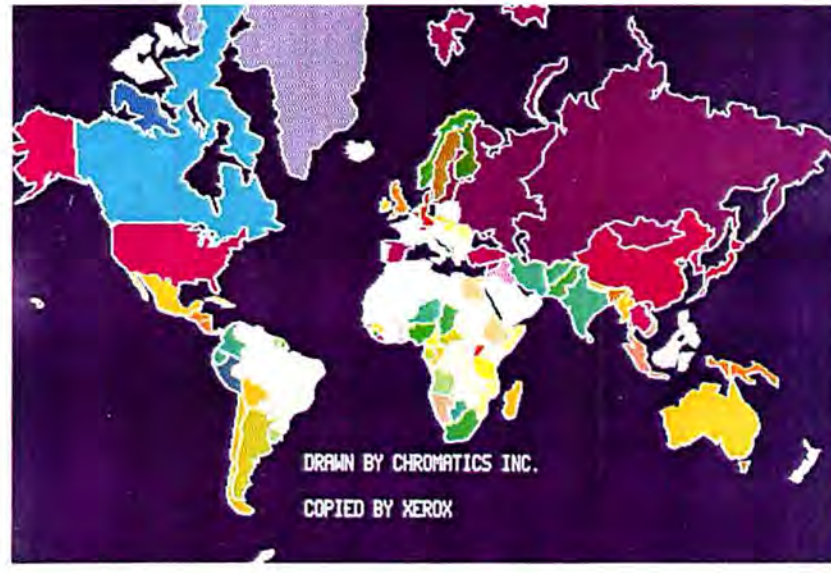



**Figure 1: A pioneer in color laser printer technology, the Xerox 6500 CGP produces full-color graphics at 100-dpi resolution and 3 ppm.**

a color called processed black. Since this color resembles midnight blue more than it does true black, the offset printing industry long ago perfected a four-color printing process using true black, magenta, cyan, and yellow.

The color printing process separates a full-color image into its black, magenta, cyan, and yellow components, scanning each of these onto separate photosensitive metal plates. A series of rubber rollers inks the plates and transfers the primary images onto a single piece of paper to reproduce the full-color image. Precise registration of the four images on the paper is a must. If the images are off by just a few millimeters, the reproduction takes on a psychedelic appearance.

**Xerox 6500 Color Graphics Printer: Color laser printing before its time**

### Color by Laser: No Easy Task

Combine the concept of four-color printing with laser printer technology and you've got the basis of color laser printing. The color laser printer varies only slightly from its monochrome cousin, with both employing the same electrophotographic process.

In a monochrome laser printer, the printer controller transmits text and graphics commands in bit-mapped form from a host computer to the print engine. A laser beam projects this bit-mapped image (called a latent page image) as a series of dots onto the printer's photoreceptor, a photosensitive drum.

The laser creates an electric charge wherever it strikes the drum. Powdered black toner (composed of minute plastic particles) with an opposite charge is brushed onto the drum, where it sticks to the image. The image is transferred to paper and fused into place by heat and pressure. The print engine scrapes the drum clean before the laser beam scans the next latent page image onto it, and then the process begins again.

A color laser printer mimics the traditional four-color offset printing process. First, the host computer separates the bit-mapped image into its magenta, cyan, yellow, and black color components and transmits that information sequentially to the printer controller.

The print engine scans, for example, the yellow portion of the image onto the photoreceptor and prints it onto the paper. Next the print engine prepares the magenta portion and, as in a printing press, lays the magenta on top of the yellow, and so on, to produce a full-color image (see Figure 2). Electrostatic charges hold the colored toners on the paper until, finally, the image is bonded to the paper.

In theory, this method of four-color printing is straightforward, but in practice it poses several major difficulties.

Just as with color offset printing, color registration is a fundamental concern. Paper handling is critical here because a piece of paper must touch the photoreceptor four times.

Four-color printing also slows down printer speed. If the basic process were to operate at current monochrome laser print engine speeds, a color laser would take roughly four times as long to print a single page. The challenge is to build a fast color laser print engine that still maintains precise registration.

If the laser printer runs faster, the print controller must be beefed up to manage image information more quickly. Since a bit-mapped image is basically a series of dots, a full 8½-by-11-inch page at 300 dpi requires about 1MB of memory. Color printing requires four images per page, so the controller must manipulate 4MB of information to print a single page in color. Similarly, the data communications speed between the computer and printer must be increased

so that the path between them doesn't become a bottleneck.

Overall equipment size is less critical but still a significant factor, because a color laser uses four separate toner modules in addition to the paper-handling mechanism—almost like having four monochrome laser printers in one box. But don't worry about finding space on your desktop for a color laser printer; the Xerox 6500 CGP is the same size as a regular stand-alone office copier.

The cost of doing all this puts color laser printers in an entirely different price range from monochrome lasers. Where black-and-white printers currently flirt with $2000 price tags, color lasers will be hard-pressed to stay under $20,000. (The Xerox 6500 CGP, built around argon lasers rather than the semiconductor lasers found in today's devices, costs $39,000.)

## Somewhere Over the Rainbow

At those prices, don't expect to find a color laser printer on display at your local computer retailer soon. Most manufacturers predict it will take at least two years for color laser products to appear, and even longer for prices to start falling.

In the meantime, dot matrix, thermal, and ink jet printers will jockey with pen plotters in the PC color hard copy market. These devices currently offer text and color graphics at prices that fit most pocketbooks, so color lasers will likely be relegated to niche markets until costs are slashed.

Apple, whose LaserWriter is an acknowledged price and performance leader among monochrome laser printers, isn't even interested in color lasers yet. "We have no plans at the moment to get into color lasers, at least for the next few years," claims Apple spokesperson Steve Raddock. "The costs of development are too high at this time, and the market just isn't there."

But Roger Archibald, Hewlett-Packard's product manager for laser printers, expects a wave of color to splash in soon, beginning with medium- to high-end offerings. "Initially, high prices pay for the costs of developing the technology. The next generation of engineering is where you'll get a revolutionary product, like the LaserJet, that will drive the price of color laser printing down."

Canon has adopted a wait-and-see attitude. Undoubtedly, with its experience in laser print engines and its new full-color copiers, Canon feels it can pick its entry point into the color laser market. According to Canon's Koichi Kadokura, "Regardless of the

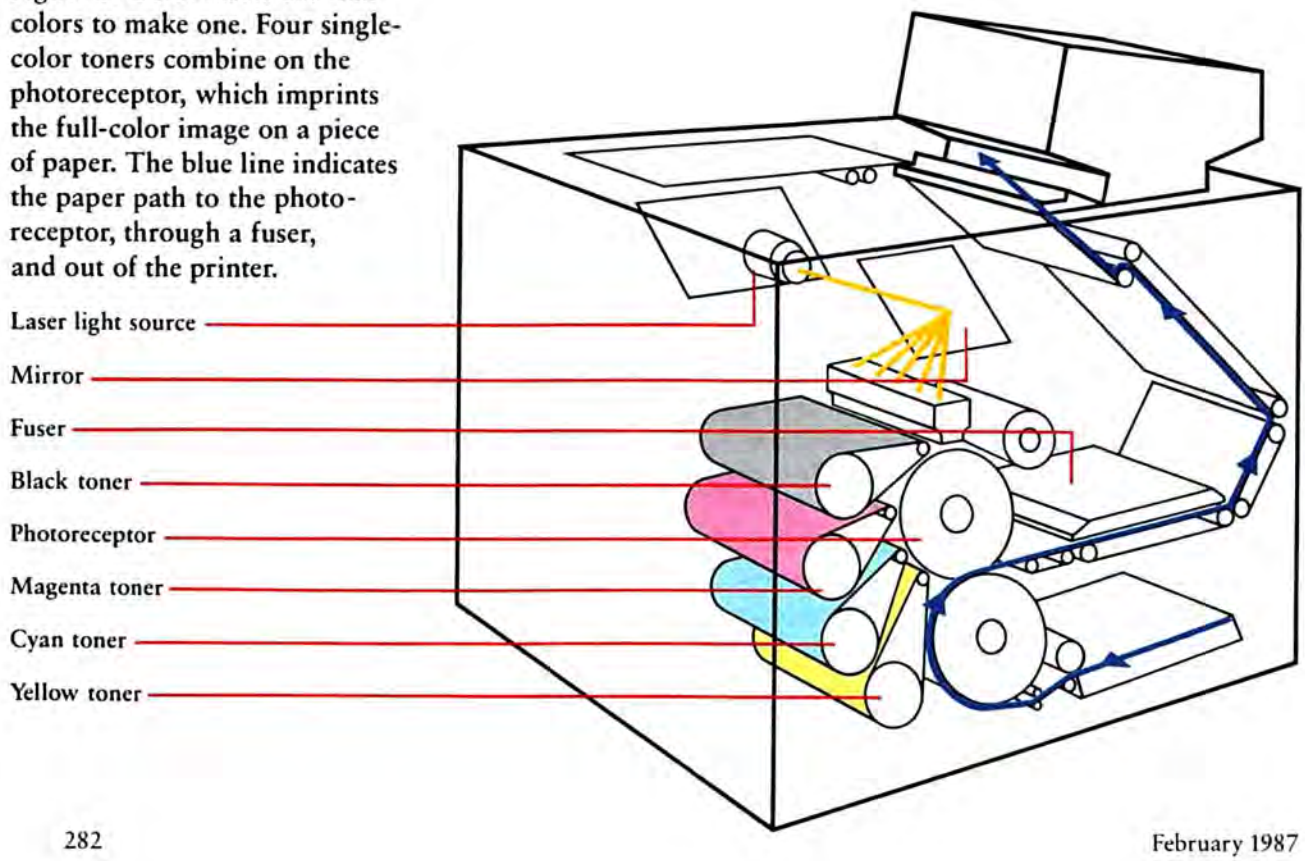



**Figure 2: Color lasers use four colors to make one. Four single-color toners combine on the photoreceptor, which imprints the full-color image on a piece of paper. The blue line indicates the paper path to the photoreceptor, through a fuser, and out of the printer.**

price, someone will have to come out with a quality color laser printer to fuel the market and test the technology. There'll probably be such a device in under two years, but not from Canon."

QMS hopes to have that device in production by late 1987. While details are being kept under wraps, Don Parker, vice president of technology, reveals that the QMS Color Graphix 30/10 will combine a QMS controller with a Colorocs print engine and will be capable of printing full-color images at approximately 7 ppm. "We don't anticipate any competition as far as performance," he says, "but this is going to be an expensive machine—close to $40,000."

AST Research would like to beat QMS to market. The company unveiled its first monochrome laser printer, the TurboLaser, just last year. But it's already hinting that a color laser printer might not be far away—maybe as close as this fall, although marketing director Chuck Cortwright qualifies the hint. "We'd only bring a color laser to market if it were in the $10,000 range," he suggests. "We're talking about the best of all possible color lasers."

Toshiba unveiled the first, if not the best, prototype color laser printer at the COMDEX show last fall. The Toshiba Twin-Color Laser Printer doesn't use the four-color printing process but can produce 300-dpi text and graphics at 26 ppm in black and either blue, red, or green. According to Yoji Maruki, marketing manager for Toshiba America, the printer will cost between $10,000 and $15,000. "Toshiba also has a four-color laser printer in research," Maruki says, "but we're not even sure when we'll bring the Twin-Color to market."

**Toshiba may be first out of the gate in the color laser derby, but the Twin-Color Laser Printer is limited to two colors.**

## A Black-and-White World

Whoever finally produces the first full-color laser printer will find a market punctuated with several question marks. Most analysts agree that desktop publishing, CAD/CAM applications, and scientific and medical applications are natural markets for color laser hard copy devices. But for color lasers to establish a significant presence in the printer market as a whole, they'll have to make inroads into the general office environment.

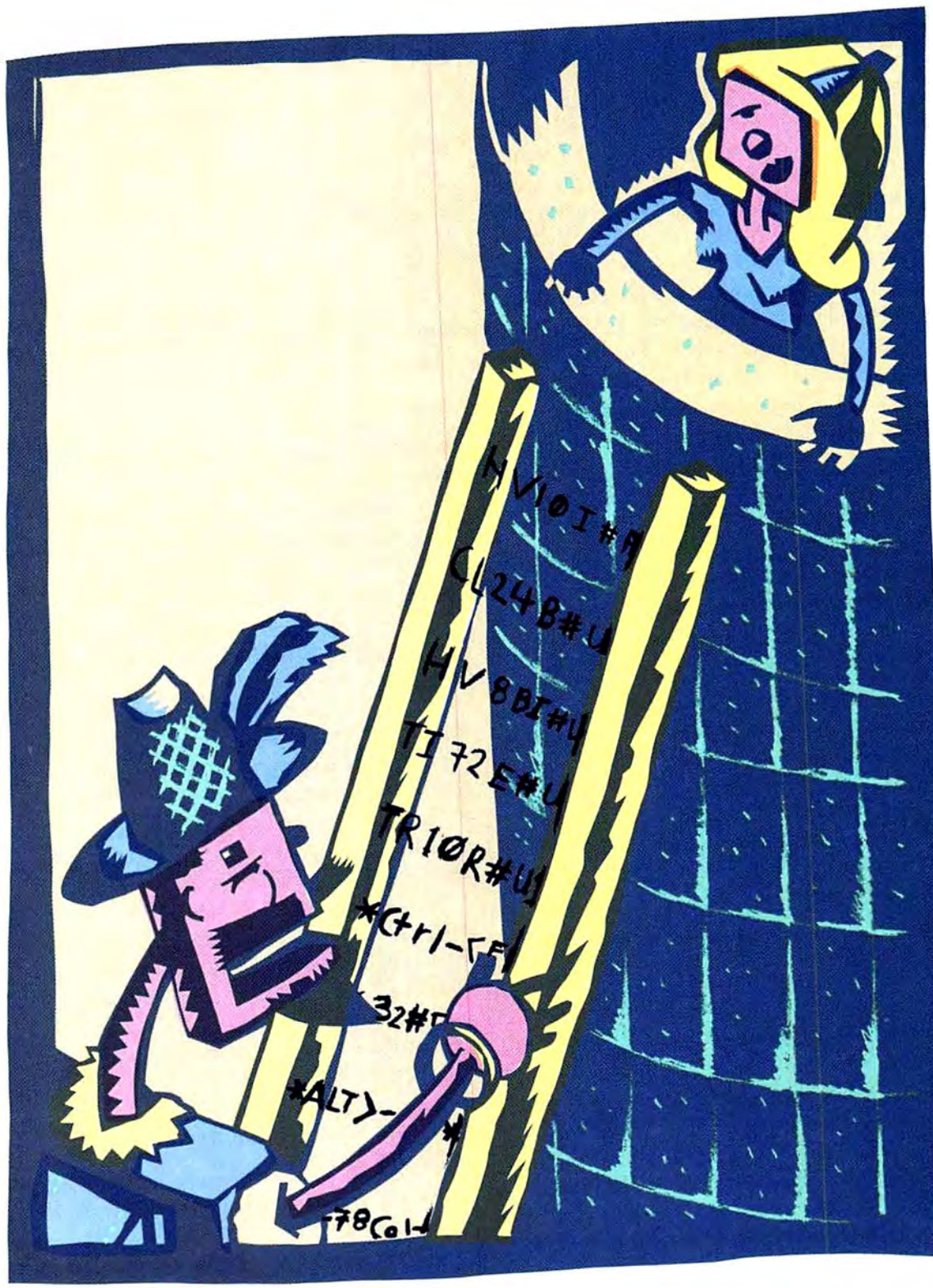
Again, cost is a key factor. At $30,000, a color laser printer may be cost-effective only in a mainframe or network environment. Only companies with large budgets and genuine needs for color hard copy will seriously consider color laser printers over other color printing technologies.

Another limitation is the lack of color copiers. Using color graphics to illustrate a report does little good if you can't make 20 quick copies when you need them. New full-color products from Ricoh, Canon, and Xerox might soon make an impact here, with products priced at $4,000 or less scheduled to appear late this year.

But the color laser's future may hinge on a more subjective factor—how quickly office workers break the habit of thinking strictly in terms of black and white. Says Xerox's Bill White, "People still need to learn how to use color in the workplace. They must learn to focus their thoughts and creative ideas into images that can be printed in color."

It's too early to say how and when color lasers will affect the printer marketplace. It's clear that they'll linger outside the price range of most PC users for quite a while. But as the demand for color grows and the technology improves, the next few years will see a broader spectrum of laser-drawn hard copy.

*Wes Nihei is an Assistant Editor at* PC World.




John Hersey

# WordPerfect Meets LaserJet Plus

Marrying two computer-industry heavyweights, WordPerfect and the LaserJet Plus, requires some fancy footwork. Here's how to use these powerful tools with soft fonts to create handsome documents.

*Daniel J. Rosenbaum*

When Hewlett-Packard introduced the LaserJet Plus, PC users frustrated by the original LaserJet's limitations rushed to take advantage of the new machine. In particular, the LaserJet Plus's ability to access downloadable soft fonts meant that users could incorporate a much wider spectrum of typefaces into their documents than they could with the LaserJet and its various font cartridges.

If you own and love *WordPerfect,* one of the most complete word processing programs available, you need specific instructions for loading and using soft fonts with the LaserJet Plus. Unlike word processing programs such as *Microsoft Word, WordPerfect* simply doesn't provide extensive support for the LaserJet Plus. However, you can produce attractive documents with *WordPerfect* and the LaserJet Plus by performing a four-step process: installing the appropriate *WordPerfect* printer drivers for the soft fonts, downloading the soft fonts into the LaserJet Plus's RAM, labeling your document with codes to indicate where font changes should take place, and finally, printing out the encoded document.

By following these steps, you can create a document like the sample in Figure 1. For the purposes of this article, it's assumed that you use or have access to *WordPerfect* version 4.1, the Hewlett-Packard LaserJet Plus, the Tms Rmn and Helv *LaserJet Plus Printer Soft Font,* and interpreted BASIC.

## Printer Driver Pointers

Using the LaserJet Plus with soft fonts is a bit more complicated than using cartridge fonts. Instead of plugging them in as you do the cartridges, you must load these disk-based fonts into the LaserJet Plus's RAM each time you turn on the machine. Despite this added effort, soft fonts provide significant advantages; first and foremost, you can mix a wider variety of fonts in a document than with cartridges.

Each cartridge contains only a few fonts, and you cannot switch cartridges in the middle of printing a document. And soft fonts may last longer: Cartridges are guaranteed for only 500 insertions, but disk-based fonts will last as long as any other software.

To use the LaserJet Plus with soft fonts, you must install the proper printer driver. First, load *WordPerfect* and summon the Printer Control menu by pressing **< Shift > - < F7 >** (for Print); then type **4** (for Printer Control). Next, type **3** to see which printer drivers have already been installed. (Even if you're using *WordPerfect* for the first time, two standard printer drivers will have been defined.) Press **< PgDn >** to see other definitions; about 200, arranged in alphabetical order, are available. (If you have a floppy-based system, the *WordPerfect* system disk should be in drive A:; you'll be prompted to insert the *WordPerfect* printers disk into drive B:.)

*WordPerfect* offers dozens of printer drivers specifically for the LaserJet or the LaserJet Plus, each one designed to drive a different combination of fonts. Press the **< PgDn >** key until you see '98 (LaserJt + ,500 + Soft: Tms, Helv)'; then type **98 < Enter >** at the 'Using Definition' prompt. (Note that printer definitions may vary among releases of *WordPerfect* version 4.1; if the Tms Rmn and Helv soft fonts are defined under a different number, enter that number.)

*WordPerfect* will prompt you for setup information, including printer port number, baud rate, parity, number of stop bits, number of character bits, and type of form. Refer to the LaserJet Plus manual for specific setup instructions. If you're using a serial port, the settings are likely to be COM1 (for the port), 9600 baud, no parity, 1 stop bit, and 8 character bits. If you're using a parallel port, you need only indicate which port the printer is connected to. The final question in the series asks whether the paper feed is continuous, hand-fed, or sheet-fed. Type **1** for continuous. Although the LaserJet Plus uses a sheet feeder, the printer driver was written for form-feed paper. Using the sheet feeder option will cause the printer to shift your output about 4 inches to the right, resulting in useless copy.

Exit from the Select Printer menu by pressing **< F7 >** twice. (If you're using a floppy-based system, you can remove the printers disk from drive B: now.)

Any time you want to review the fonts in a particular printer driver, go to the Printer Control menu by pressing <Shift>-<F7> 4; then type 2 (for Display Printers and Fonts).

### All About Soft Fonts

Hewlett-Packard's soft fonts are available in two symbol sets: USASCII, which includes standard characters and numbers, and Roman 8, which contains foreign characters and math symbols in addition to the standard ASCII set. *WordPerfect* is configured for the USASCII set. However, you can modify *WordPerfect*'s PRINTER.EXE file to use Roman 8 (see the sidebar "When in Roman" for detailed instructions).

To create the document in Figure 1, you'll be using the Tms Rmn and Helv fonts, Hewlett-Packard's implementation of the popular Times Roman and Helvetica typefaces. The four-disk set of soft fonts offers the two type styles in 8-, 10-, 12-, 18-, and 24-point sizes in both portrait (vertical) and landscape (horizontal) orientations. The 8-point fonts are available in normal weight; the 10- and 12-point fonts in normal, bold, and italic weights; and the 18- and 24-point fonts in bold weight only. That's a total of 36 different fonts, each in a separate file.

The font files are named so that the various fonts are easy to distinguish. A 10-point italicized, proportionally spaced Helv font in portrait mode, for example, is called HV10I#US.SFP. The first two characters describe the style: *TR* for Tms Rmn, *HV* for Helv. The next two characters correspond to the type size in points: 08, 10, 12, 18, or 24. The fifth character represents the "weight" of the font: *R* for regular, *B* for bold, *I* for italic. Next comes an abbreviation for the pitch, or number of characters per inch: 0 for 10 pitch, 2 for 12, 6 for 16.66, and # for proportional. The seventh and eighth characters are an abbreviation for the symbol set: *US* stands for USASCII; *R8* denotes the Roman 8 extended character set. The file extension *.SFP* means soft font portrait; *.SFL* means soft font landscape.

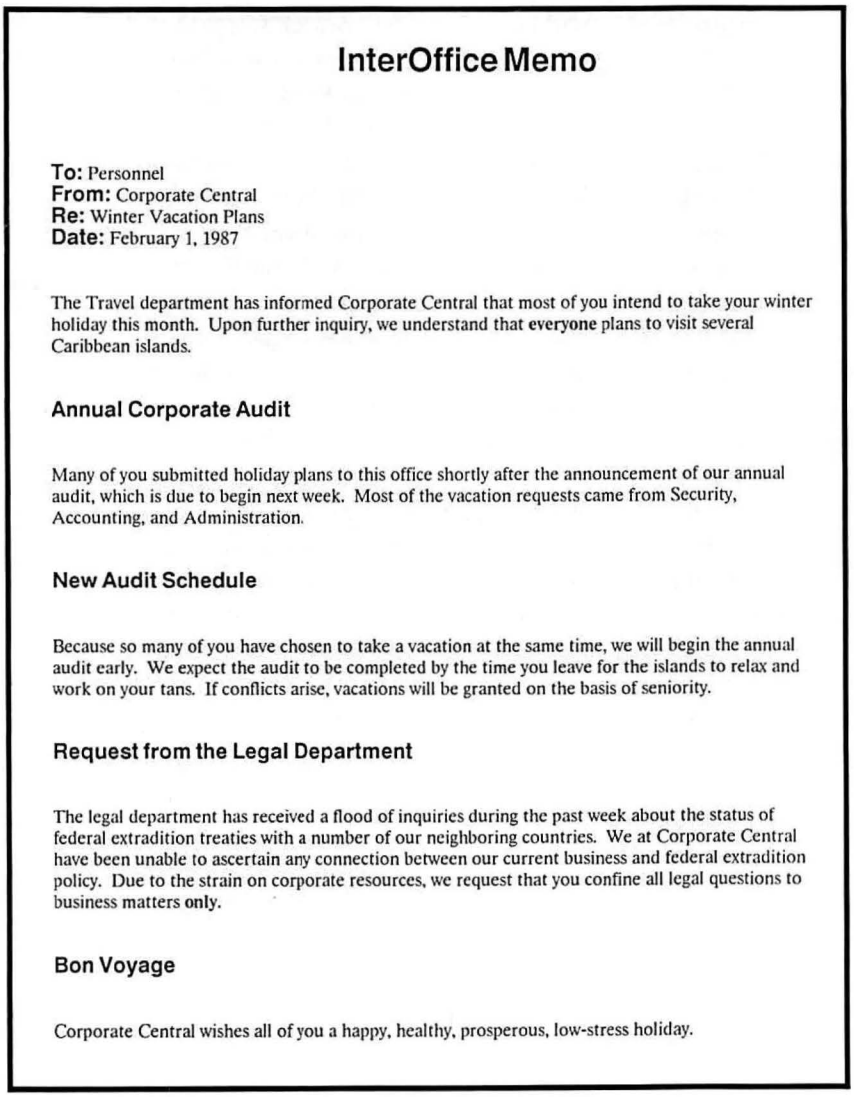
Note that the *WordPerfect* printer driver for Tms Rmn and Helv soft fonts defines only 8 of the 36 available fonts. The defined fonts are Tms Rmn in 10- and 12-point regular and italic, Tms Rmn in 10-point bold, and Helv in 12-, 18-, and 24-point bold—all in portrait mode. To create the sample document in Figure 1, you'll use 4 of these fonts. If you want to use

fonts not defined in the *WordPerfect* printer driver, you must use an escape code (a string of characters beginning with the ASCII character 27 that your printer recognizes as a command). Most PC printers use escape codes for such tasks as setting the number of lines per inch, changing the pitch, and switching fonts. Word processing programs generally insulate users from escape codes, passing them along to the printer when some special function is required. In *WordPerfect*, you can either enter escape codes manually or use the font-change command. Note, however, that you cannot mix the two forms of printer control within a single document.

The best way to load fonts into the LaserJet Plus is with the DOWNLOAD.BAT utility, which appears on font disk 1. DOWNLOAD.BAT calls a pair of BASIC programs, DOWNLOAD.BAS and PERMTEMP.BAS, which are also on disk 1. DOWNLOAD.BAT assumes that your interpreted BASIC is called BASIC.COM or BASIC.EXE. If your BASIC has a different name, you must retrieve the DOS text file DOWNLOAD.BAT with *WordPerfect*'s Text In/Out feature by pressing **< Ctrl > - < F5 > 2**; then change the two occurrences of 'BASIC' to the name of your interpreted BASIC. Finally, type **< Ctrl > - < F5 > 1** to save the file.

### Loading the Soft Fonts

If you haven't already done so, make a directory on your hard disk called \FONTS and copy disks 1 and 3 into that directory. Make sure that your hard disk system's PATH command includes a subdirectory containing BASIC.



**InterOffice Memo**

**To:** Personnel
**From:** Corporate Central
**Re:** Winter Vacation Plans
**Date:** February 1, 1987

The Travel department has informed Corporate Central that most of you intend to take your winter holiday this month. Upon further inquiry, we understand that **everyone** plans to visit several Caribbean islands.

**Annual Corporate Audit**

Many of you submitted holiday plans to this office shortly after the announcement of our annual audit, which is due to begin next week. Most of the vacation requests came from Security, Accounting, and Administration.

**New Audit Schedule**

Because so many of you have chosen to take a vacation at the same time, we will begin the annual audit early. We expect the audit to be completed by the time you leave for the islands to relax and work on your tans. If conflicts arise, vacations will be granted on the basis of seniority.

**Request from the Legal Department**

The legal department has received a flood of inquiries during the past week about the status of federal extradition treaties with a number of our neighboring countries. We at Corporate Central have been unable to ascertain any connection between our current business and federal extradition policy. Due to the strain on corporate resources, we request that you confine all legal questions to business matters **only**.

**Bon Voyage**

Corporate Central wishes all of you a happy, healthy, prosperous, low-stress holiday.

**Figure 1: All it takes to produce attractive documents using WordPerfect and the LaserJet Plus is a few font changes in the right places.**

# When in Roman

Using the Roman 8 soft font set with *WordPerfect* to create the document shown in Figure 1 requires a few adjustments. First, a general point: The names of your font files will differ slightly from the ones described in the article. For example, instead of using TR10R#*US*.SFP, the font for most of the text in Figure 1, you'll be using TR10R#*R8*.SFP. Wherever *US* occurs in a file name in the tutorial, substitute *R8*.

Now, a more specific point: You must make changes in *WordPerfect*'s PRINTER.EXE file to install printer drivers that work with the Roman 8 set. Copy PRINTER.EXE from the *WordPerfect* learning disk into the directory containing your *WordPerfect* files, including WPRINTER.FIL and WPFONT.FIL. (If you have a floppy-based system, insert your copy of the *WordPerfect* system disk into drive A: and copy WPRINTER.FIL and WPFONT.FIL onto a blank disk in drive B:. Then remove the *WordPerfect* system disk, insert the *WordPerfect* learning disk into drive A:, and copy PRINTER.EXE onto drive B:.)

Type PRINTER.EXE to run the program. (Floppy-system users should change to the B: drive; then type PRINTER.EXE.) When the program displays a list of options, type **3** for Printer Definitions. You'll see a list of the drivers you installed, and you'll have the choice of creating, editing, deleting, or renaming them. Type **B** to edit. You'll be asked which printer driver you want to edit; consult the displayed list, type the appropriate number, and press **< Enter >**.

The program will display 10 choices. You'll use numbers 8 and 9, Selecting Fonts (1-4) and Selecting Fonts (5-8), respectively. First type **8.** PRINTER.EXE will display the escape codes for each of the four fonts in the current driver. If your driver is defined for portrait mode, every string will start with '<27>&l0'. The next segment of the escape code will be '<27>(0U', which refers to the USASCII set. Type **1** at the Select Item Number prompt, and change the '0's that appear before the 'U's to 8s, using the cursor keys to move around. To return to the Select Item Number prompt, press **< Cursor Down >** **< Enter >**; then type **9.** At the Select Item Number prompt, type **1**, and change fonts 5 through 8 as described above. Exit from each of the menus as required; your work will be saved automatically. (If you have a floppy-based system, you must copy the new WPRINTER.FIL file onto your copy of the *WordPerfect* system disk.) Now you can return to *WordPerfect* and follow the directions in the rest of the article using your Roman 8 font files.
*–D. J. R.*

In a floppy-based system, your setup procedure will differ. Insert your DOS disk into drive A: and a blank disk into drive B:. Format the disk in drive B:, using **FORMAT B:/S** so that the system files are copied onto that disk. Repeat this procedure with a second blank disk. Then, copy your BASIC file(s) onto drive B:, and if your LaserJet Plus is connected to a serial port, type **COPY A:MODE.COM B:**. Next, remove the DOS disk, insert disk 1 of the soft fonts set into drive A:, and copy onto the disk in drive B: the following files: DOWNLOAD.BAT, DOWNLOAD.BAS, and PERMTEMP.BAS. Remove both disks; put the *WordPerfect* system disk into drive A: and the second disk you formatted (the blank one) into drive B:. Then type **COPY A:*.* B:**. (Roman 8 users, note that your WPRINTER.FIL file must contain the modifications described in the sidebar.) Then remove the *WordPerfect* system disk from drive A:, insert the disk containing the DOWNLOAD.BAT file and the BASIC file(s) into drive A:, and insert disk 1 of the soft fonts set into drive B:.

DOWNLOAD.BAT assumes your printer is connected to parallel port LPT1. If your LaserJet Plus is hooked up to one of your serial ports and you have a hard disk drive C:, your AUTOEXEC.BAT file may already redirect your output to a serial port. If not, change to your DOS directory; at C> (or A> if you're using a floppy-based system and need to redirect output to a serial port), type **MODE COM*x*: 96,n,8,1,p** (where *x* is the number of the serial port). That command sets the port's parameters. Next, type **MODE LPT1=COM*x*** (where *x* is the port number). This procedure redirects commands otherwise destined for LPT1 to your serial port.

To load the four fonts that you'll need to create the document in Figure 1, you must use DOWNLOAD.BAT. Make sure your LaserJet Plus is on; then, from your \FONTS directory, type **DOWNLOAD HV18B#US.SFP** and press **< Enter >**. (Floppy-based system users should type **DOWNLOAD B:HV18B#US.SFP** at A> and press **< Enter >**. You'll be prompted to assign a font ID—an integer from 0 to 32,767. If you ever use escape codes, these font ID numbers will save you a lot of labor. Once you've assigned the font ID and pressed <Enter>, the font will be downloaded and the ready light will flash on the LaserJet Plus. After a few moments, you'll be asked whether the font should be temporary or permanent. (A permanent font is erased only by a power stoppage, not by a reset.) Type **p** to specify a permanent font, and press **< Enter >**.

You'll also be asked if you want to see a print sample. If so, type **y**, specify the orientation, press **< Enter >**, and the LaserJet Plus will print out a page showing you what the font looks like (see Figure 2). It's a good idea to preview the font to make sure you've loaded the right one. If for some reason the font you specify isn't on your disk, you won't get an error message—the PC will simply download the last font loaded.

You must download each font separately. For Figure 1, you'll need to download three more fonts: HV12B#US.SFP, TR10R#US.SFP, and TR10B#US.SFP. Note that the Helv fonts are on disk 1 and the Tms Rmn fonts are on disk 3. (Floppy-based-system users must insert disk 3 of the soft font set into drive B: to download the Tms Rmn fonts.)

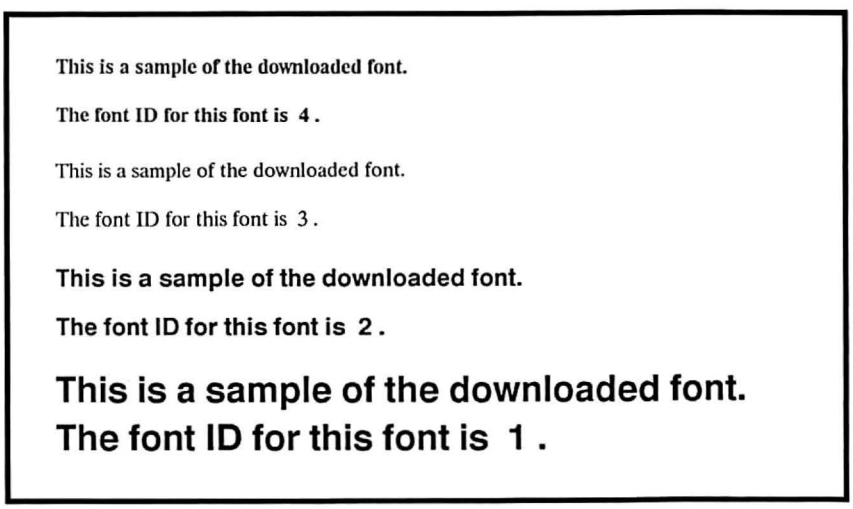



**Figure 2: For reference, you can have the LaserJet Plus print out samples of the fonts you've downloaded.**

There are other ways to download fonts, but you'd do best to avoid them. The *WordPerfect* manual describes how to load an entire font file as though it were an escape code, but the process is slow and the printer will eject a page each time you use this method, making it impossible to mix fonts on the same page. The Hewlett-Packard soft fonts manual describes how to copy fonts directly to the printer using COPY /B *fontname* COM1, assuming the printer is on COM1. But the /B switch performs a binary copy, ignoring any characters that would signal an end-of-file in an ASCII file. This approach permits access only to the last font loaded and is therefore inappropriate for documents that have several fonts.

You can also load the fonts by using *HP PCLPak*, a software utility for the LaserJet and LaserJet Plus. PCL (printer control language) is the page description language used by Hewlett-Packard laser printers. *HP PCLPak* provides an effective way to download fonts, but for *WordPerfect* users who want to create the sample document in Figure 1, the method is not as easy as the one described in this article. For more information on *HP PCLPak*, see "From Soft Fonts to Hard Copy," *PCW*, July 1986).

**Table 1: Converting soft fonts from point to pitch[1]**

| Point | Pitch |
|---|---|
| 24 | 5* |
| 18 | 8* or 9* |
| 12 | 11* |
| 10 | 15* |
| 8 | 17* or 20* |

[1]The asterisk indicates to WordPerfect that the font is proportionally spaced.

## Creating the Macros

Now that the basic setup work is done, change to your *WordPerfect* directory if you have a hard disk; floppy-based system users insert *WordPerfect* into drive A:. Then load *WordPerfect* and type in the text of the sample document shown in Figure 1 (don't worry about the margins; you'll reset them later). The next step is to create the macros, but first note these cautionary words: Hewlett-Packard packages fonts by point size; *WordPerfect* will prompt you for pitch. If Hewlett-Packard's fonts weren't proportional, entering the correct pitch would be no problem; remember that the fifth character of each font file name tells you the correct pitch setting. But proportional fonts, which vary pitch according to the width of each letter, require special treatment. WordPerfect Corporation has assembled a list of the most effective pitches for each font size (see Table 1). The asterisk is important; it tells the program that the font is proportional. When you create the macros, you'll have to use these codes to indicate the proper pitch.

You'll also have to specify the correct font number. *WordPerfect* assigns numbers to each of the fonts; unfortunately, these numbers have no relation to the font ID numbers you chose when downloading the fonts. To see a list of *WordPerfect*'s font numbers, go to the Display Printers and Fonts screen by pressing **< Shift > - < F7 > 4 2**. You'll note that the font number for 10-point regular Tms Rmn is 1, for 12-point Helv bold it's 5, and for 18-point Helv bold it's 6. You don't need a pitch number for 10-point bold Tms Rmn because you'll use that font only for highlighting words within your document, and *WordPerfect*'s default for bold text is 10-point Tms Rmn.

Now you have all the information you need to set up the macros. The first macro will be for the 10-point Tms Rmn; most of the text in Figure 1 is in this font. From your document file, press **< Ctrl > - < F10 >**; at the 'Define Macro' prompt, press **< Alt > -N** (for normal). 'Macro Def' will flash in the lower right corner of the screen. Begin entering font change commands by pressing **< Ctrl > - < F8 >**; then press **1**. Enter **15*** for pitch and **1** for font. Press **< Enter >** to leave the Print Format menu; then press **< Ctrl > - < F10 >** to stop recording the macro. *WordPerfect* will save the macro to disk as Altn.mac.

Note that if you make a mistake while entering information into the macro file, you'll have to start over. If you create macros frequently, you might consider purchasing the *WordPerfect Library*, which includes a macro editor (see *From the Software Shelf*, *PCW*, January 1987).

Next you will create a macro called <Alt>-H (for Heading); the section headings in Figure 1 are in 12-point Helv bold. (If you have the *WordPerfect Library*, you can use the macro editor to edit Altn.mac to create the heading macro.) Repeat the procedure described earlier: Press **< Ctrl > - < F10 >**, name the macro by pressing **< Alt > -H** at the 'Define Macro'

prompt, and press <Enter>. Then press <Ctrl>-<F8> 1 and enter 11* for the pitch and 5 for the font number. To return to the document, press <Enter>.

Define a third macro for the title, which uses 18-point bold Helv. Name this macro by pressing <Alt>-T (for Title); go to the Print Format menu by pressing <Ctrl>-<F8>; select 1, enter 8* for pitch, 6 for font, and press <Enter>.

## Setting the Margins

Now that you've created the macros, you must reset your document's margins so that they work well with the fonts you're using. The default 1-inch *WordPerfect* margin settings, 10 and 74, work well only when you use 10-pitch fonts. A 1-inch left margin for a 15-pitch font must be set at 15, not 10; a 1-inch right margin for the same font (7.5 inches from the left edge of the paper) will be set at about 112 (15 times 7.5).

In the example in Figure 1, the body of the text is in 10-point regular Tms Rmn. Table 1 indicates that the appropriate pitch for this typeface is 15*. Set the margins by pressing <Shift>-<F8>; then type 3. When the program prompts you for the left margin, type 15 <Enter>; for the right margin, type 112 <Enter>. Turn off right justification by typing <Ctrl>-<F8> 3 <Enter>.

## Labeling the Text

All you have to do now is label the text. Begin with the words 'Interoffice Memo'. Center this title by pressing <Shift>-<F6>. Position the cursor under the *I* in 'Interoffice', then call up the macro for the title by pressing <Alt>-T.

You should always change back to the default font immediately after you've finished using a different font. Why? Because if you retain the 18-point font, spaces will all be 8 pitch. This document's margins are set for 15-pitch spaces; any extraneous 18-point type will ruin the margins. So move the cursor to the space after the *o* in 'Memo' and press <Alt>-N.

At the next boldface word in the document, 'To:', press <Alt>-H to change to the heading font. After the colon in 'To:', change the typeface back to the default font by pressing <Alt>-N. At the *F* in 'From:', change to the heading typeface by pressing <Alt>-H. After the colon in 'From:', return to the default font by pressing <Alt>-N. Similarly, you should insert the remaining font-change codes around the designated text as follows:

<Alt>-HRe: <Alt>-N
<Alt>-HDate: <Alt>-N
<Alt>-HAnnual Corporate Audit <Alt>-N
<Alt>-HNew Audit Schedule <Alt>-N
<Alt>-HRequest from the Legal Department <Alt>-N
<Alt>-HBon Voyage <Alt>-N

Two words in the text appear in bold type: 'everyone' and 'only'. This bold type is your fourth font, TR10B#US.SFP. Because *WordPerfect* uses this font as a default font for bold text, you don't have to use the font change command. Simply place the cursor on the first letter of the word you want to highlight, press <Alt>-<F4> to mark a block, take the cursor to the end of the word, and then press <F6> (the bold command).

Finally, to check your work, press <Alt>-<F3>. *WordPerfect* will display the margin settings and all the codes and accept changes. To print out the document, press <Shift>-<F7> and type 1.

The process of downloading the soft fonts and creating the macros may seem arduous, but the results will be significant. The professional appearance of your printed words will lend them new force and more than compensate for the time you invest in making these powerful tools work together harmoniously.

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*LaserJet Plus Printer Soft Font*
*Hewlett-Packard*
*P.O. Box 3640*
*Sunnyvale, CA 94088*
*408/738-4133*
*List price: Tms Rmn and Helv set $330 (USASCII or Roman 8)*
*Requirements: 256K, two disk drives, DOS 2.00 or later version, LaserJet Plus printer*

# Custom LaserJet Forms

Laser printers have made their name creating fancy newsletters and reports, but their main impact on business may be their ability to generate forms. Here Polaris Forms teams up with an HP LaserJet Plus to create a custom invoice.

*Peter Neuhaus*

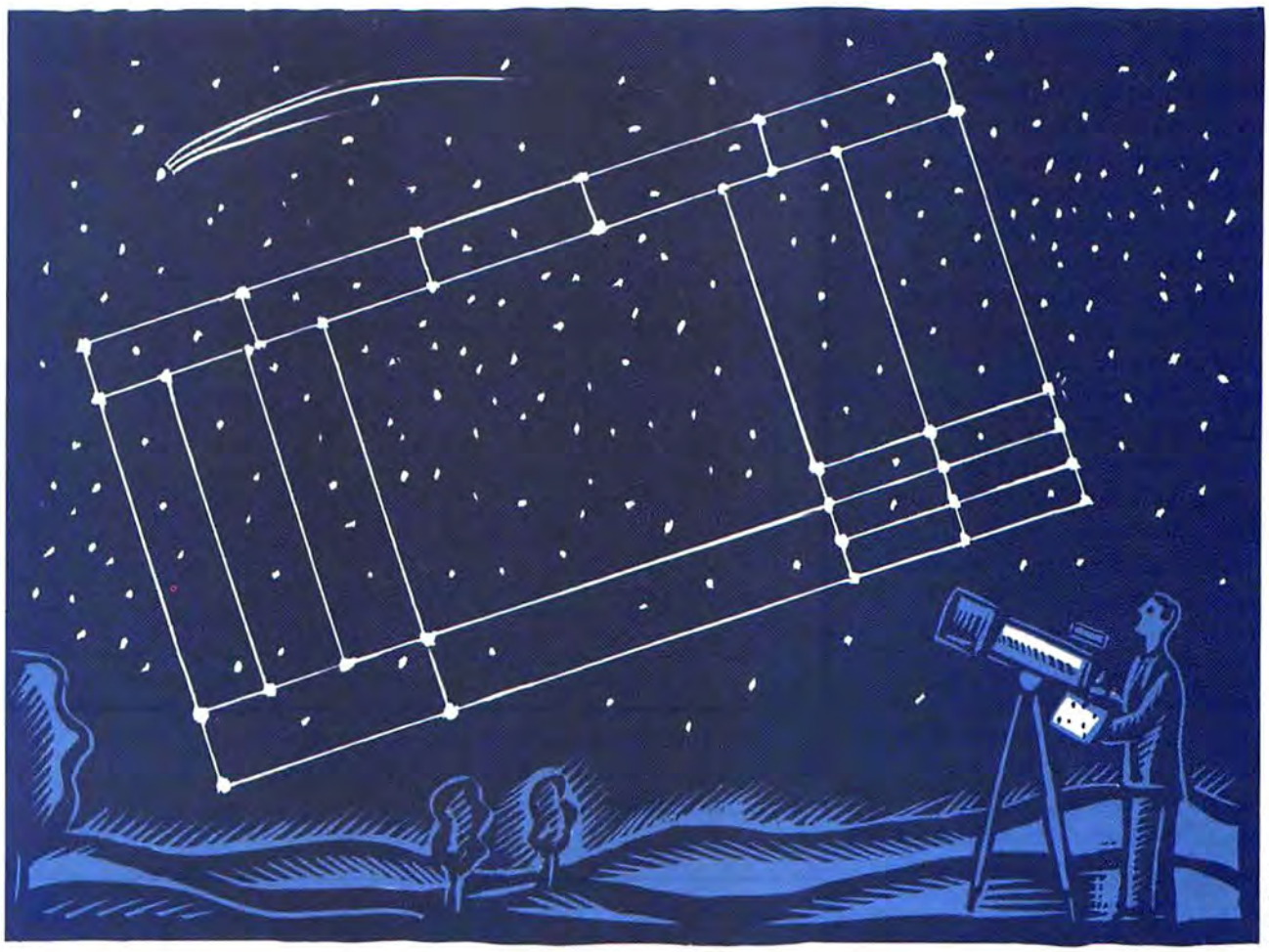
*Fearing that technology might pass you by, you've taken the plunge and traded in your faithful impact printer for the latest laser variety. After mastering the intricacies of this high-tech marvel, you're now churning out page after page of crisply printed documents. But now you want more—the salesperson who sold you the printer also tempted you with the prospect of creating your own customized forms, thereby reducing art costs and making future modifications easier. Where do you begin?*

*While you're pondering this dilemma, your forms vendor stops by to discuss your invoice form redesign. She estimates the artwork will run about $500. As you consider the effect of this expense on your bottom line, another printed page silently emerges from your laser printer.*

Laser printing was initially viewed primarily as a way to reduce the office noise level. Next came desktop publishing software, which took advantage of the laser printer's expertise in printing graphics and multiple fonts. Now laser printers are proving themselves competitive at a more mundane task: generating forms. Directed by form-printing software, a laser printer can print lines, boxes, and shaded areas concurrently with text. The principal function of the software is to spare users the pain of dealing with the mysterious escape sequences demanded by laser printers' complex command sets. How the program goes about doing this varies from program to program.

One obvious solution utilizes the PC's graphics capabilities plus its ability to accept input via a pointing device, such as a mouse. This combination permits the drawing of forms on the screen in a highly interactive fashion.

Another approach retains some of the first method's interactive nature, permitting the designer to



Anthony Russo

create elements of the form (lines, boxes, and text) by filling in menus that define their locations and attributes.

The third way to make forms—batch processing—requires some programming skill and is the least interactive of all these methods. But consider the advantages. While the idea of sending dot commands to the printer without the benefit of graphics or menus might seem intimidating, it is actually the most straightforward solution.

With the batch method you can use almost any word processor to create an ASCII file containing batch commands, and you need learn only a few commands to create most common forms. No graphics display or mouse is required. Unlike with graphics-oriented methods, the placement of elements can be specified to the maximum resolution of the printer. And with the batch technique, you can add comments to the input file, making modification easier at a future date.

At least two software packages offer a batch approach to forms creation: *FormSet* from Orbit Enterprises and *Polaris Forms* from Polaris Software. This article uses the Polaris program to create a simple invoice form on the Hewlett-Packard LaserJet Plus. Such forms can then be mass-produced and filled in with a typewriter, or they can be filled in from the PC keyboard and printed on the spot. You can even configure *Polaris Forms* to accept input from another application, such as a data base manager, or assign forms to macros stored on a LaserJet Plus.

### Planning on Paper

Designing new forms requires careful planning, especially when the layout must be compatible with typewriter spacing or printed computer output. A standard typewriter has a vertical line spacing of 6 lines per inch—that is, the lines are ⅙ inch (0.17 inches) apart. The LaserJet also uses this

spacing as its default value. Therefore, any form with fields vertically separated by a multiple of ⅙ inch can be filled in by either a laser printer or a typewriter.

Before using forms design software to create a new form, you must draw a sample to scale. If possible, obtain a printer-report layout sheet of the type frequently used in data processing departments. These grid forms contain 6 lines per inch vertically and 10 divisions per inch horizontally.

You will also need a ruler with inches divided into tenths (because you will need to specify measurements decimally, such as 3.25 inches) and a ruler with 6 divisions per inch for measuring vertical distances. Many data processing rulers and flowchart templates have these scales. With *Polaris Forms* you can also locate elements by means of rows and columns, but measurement in inches is much more accurate.

To check field placement on the form, print one page with 50 lines, each line containing the number of the line followed by 75 Xs. Aligning this page with your new form and holding it up to a light will reveal any misalignment.

You create the form in two steps: First design the line art defining the form (see Figure 1), then the text of the various fields and headings (see Figure 2). Designing forms on a laser printer is a trial-and-error process: You make adjustments until the form is perfected.

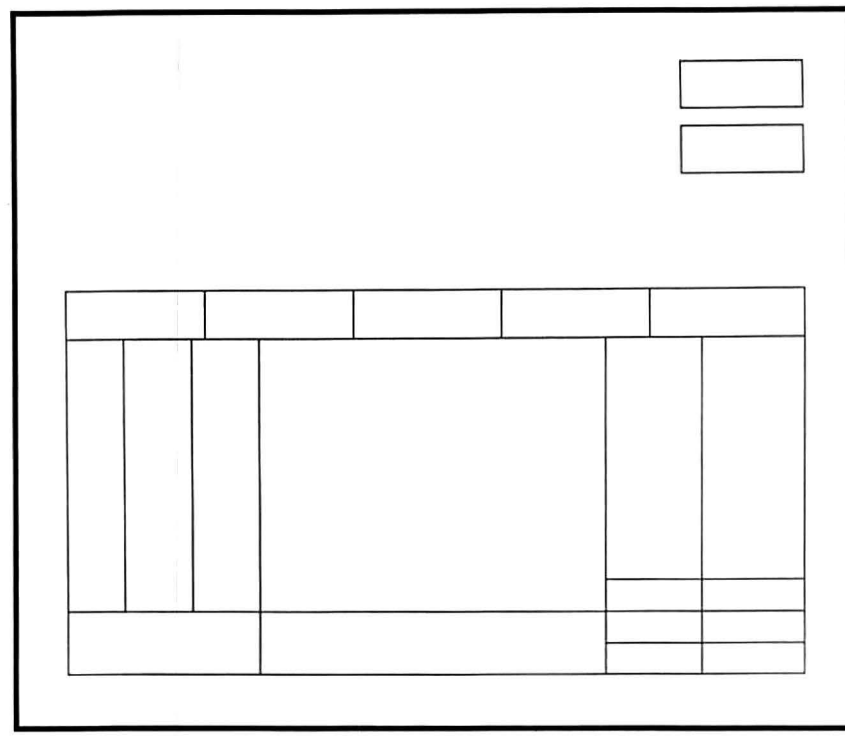


**Figure 1: You create a form in two steps: graphics, then text. Here's the invoice's artwork skeleton before the addition of text.**

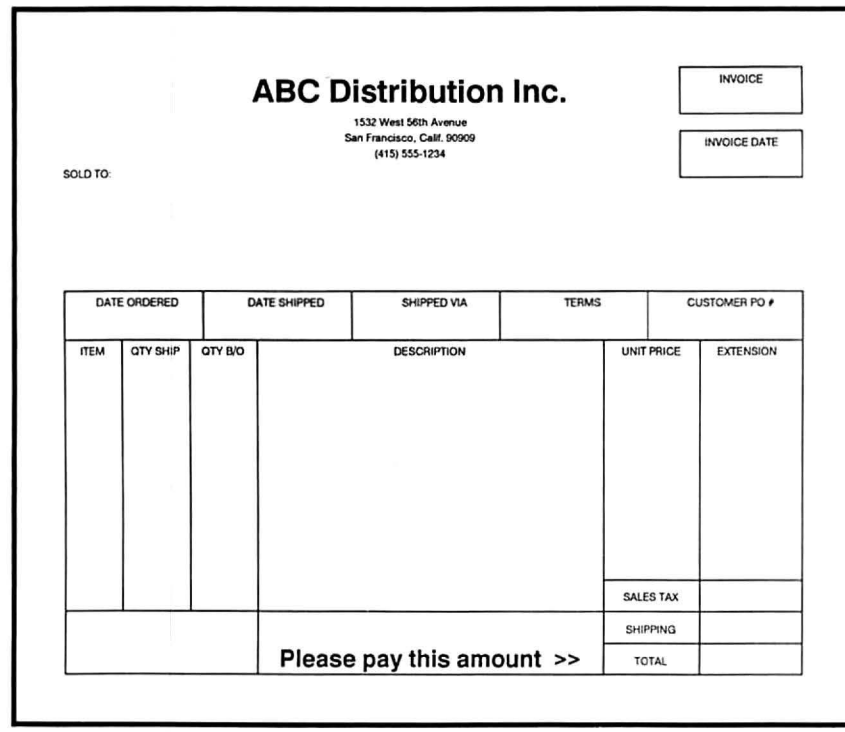



**Figure 2: The finished invoice. Polaris Forms lets you choose from a number of shadings and patterns.**

## Creating the Input File

Using *Polaris Forms*, you can create the invoice form shown in Figure 2 using variations on five commands (see Listing 1). Each command starts in column 1 with a period (for example, .BX for box) followed by parameters separated by commas. Comments have periods in the first two columns. Font-changing commands are bracketed by ampersands. The trick to using *Polaris Forms* is not in memorizing commands, but in making sure the measurements are correct and are listed in the right order.

Although *Polaris Forms* works with both the original LaserJet and the LaserJet Plus using internal fonts or a font cartridge, only the LaserJet Plus supports soft fonts. If you have a LaserJet Plus, it's best to purchase the disk-based Helv USASCII font set used in this article (see "From Soft Fonts to Hard Copy," *PCW*, July 1986, for more information on soft fonts). It should be noted that some *Polaris Forms* commands differ depending on which of the two LaserJet models you're using.

After you have installed *Polaris Forms* and turned on your LaserJet Plus, use a word processor to create a new ASCII file named INV1.FRM. Begin this file with a command that specifies that you will be using downloadable fonts:

**.FC * .**

Next, add commands to this file to create elements such as vertical lines, horizontal lines, and boxes. When specifying placement of elements in the form, two measurements are necessary. The first is the distance from the top of the page; the second is the distance from the left edge. For example, 1.0,2.5 specifies a location 1 inch from the top and 2½ inches from the left edge.

Because LaserJets leave a small unusable area around the periphery of the page, always allow top and bottom margins of 0.33 inch each and a margin of 0.4 inch on either side. The form in this example starts immediately below the top margin and uses the entire remaining page width. Designing the form so it extends to the side margins simplifies the placement of lines.

*You can even configure* Polaris Forms *to accept input merged from another application or assign forms to macros stored on a LaserJet Plus.*

In this example, you will be observing a vertical spacing guideline that aligns elements on ⅙-inch boundaries. Therefore, when you measure from your drawing, measure to the nearest ⅙ inch and use the corresponding fractional equivalent of 0.17, 0.33, 0.50, 0.67, or 0.83 inch. You enter the measurements into the input file in the following format: .BX *upper-left vertical, upper-left horizontal, lower-right vertical, lower-right horizontal,* where .BX signifies the command to build a box. These measurements can be followed by up to three shading specifiers, as illustrated below. Other commands follow a similar syntax.

First, create a small box that will contain the invoice number. The upper-left corner of the box is 0.33 inch from the top of the page and 6.8 inches from the left edge. The lower-right corner is 0.83 inch from the top and 8.1 inches from the left. Therefore, the second line of the input file is:

**.BX 0.33, 6.8, 0.83, 8.1, 1**

The 8.1 inches is the result of subtracting the 0.4-inch margin from the 8.5-inch page width. The 1 at the end of the command indicates that the line width of the box should be 1 laser dot wide.

To create the shaded area along the top of the box, make another smaller box inside the first and specify that it is to be shaded. Type:

**.BX 0.33, 6.8, 0.50, 8.1, 0, 1, 2**

The shaded box has the same upper-left corner (0.33, 6.8) as the first box, but its lower-right corner is closer to the top of the page. The 0,1,2 specifier designates the shading as light gray. (A total of 8 gray shades plus 6 line patterns can be chosen from the *Polaris Forms* manual.)

To create an identical box ⅔ inch below the first, repeat the last two .BX commands, adding 0.67 inch to the vertical measurements:

**.BX 1.00, 6.8, 1.50, 8.1, 1**

**.BX 1.00, 6.8, 1.17, 8.1, 0, 1, 2**

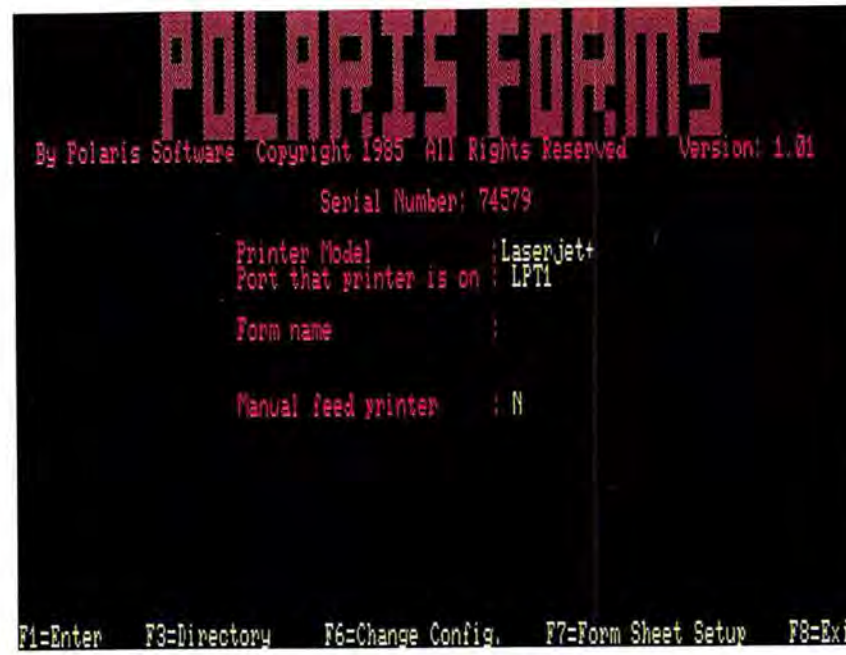
Next, draw a line around the main body of the form with the command:

**.BX 2.67, 0.4, 6.67, 8.1, 1**

## A Quick Proof With Polaris Forms

Before going any further, test your progress by printing the form. First, save the 6-line file as an ASCII file named INV1.FRM, and exit from your word processor. Copy the file to the disk or directory containing *Polaris Forms*, change to that directory, and enter **PF** to load the program. Once the opening screen appears, select 'Change Config' by pressing **< F6 >** (see Screen 1). The next menu defines function keys for selecting your configuration. You will have to select 'Change Config' twice, once to specify the printer port and once to select the LaserJet Plus.

After you have exited the program by pressing **< F8 >**, you are ready to print the beginning of the invoice form. At the DOS prompt type **PF INV1.FRM**. After a few moments, the LaserJet Plus will present you with the skeleton of your first form.




**Screen 1: Configuring your system from the Polaris Forms main menu. Polaris Forms translates an ASCII input file of batch commands created on any word processor into the escape sequences required by the LaserJet.**

## Back to the Input File

Return to your word processor to finish the rest of the form's line art. The next section consists of five fields in a horizontal bar across the main body of the form. You create the shaded portion along the top of the bar using the same .BX command that you used for the invoice box, namely:

**.BX 2.67, 0.4, 2.83, 8.1, 0, 1, 2**

Create the line forming the bottom of the fields with the .HL (horizontal line) command. This instruction prints a line defined by the location of the line's leftmost end (3.17, 0.4), the length of the line, and the line width. When using a LaserJet Plus, you specify this width in terms of print dots at 300 dots per inch. Therefore, you create the required horizontal line with the command:

**.HL 3.17, 0.4, 7.7, 1**

The 7.7-inch line length is the result of subtracting the location of the left margin (0.4 inch) from that of the right margin (8.1 inches).

To print the vertical line that separates the leftmost two fields, use the .VL (vertical line) command, which specifies the top of the line (2.67, 1.84), its length, and its width in dots. Type:

**.VL 2.67, 1.84, 0.50, 1**

The number 2.67 was copied from the vertical measurement in the .BX command that created the horizontal shaded bar. The 0.50 is simply the difference between this distance and the 3.17 number used in the horizontal line (.HL) instruction. (You don't need to actually measure any of the distances.)

Instead of adding four more .VL commands for the remaining vertical lines in this bar, you can use the .RP (repeat) command. By inserting the command

**.RP 4, 0.0, 1.54**

before the .VL command and a line containing only .RP after it, you tell the program to repeat the .VL command four more times, each time increasing the vertical measurement by 0 inch and the horizontal measurement by 1.54 inches.

You can complete the remaining line art in the invoice with the .BX, .HL, and .VL instructions. Type in the next 9 command lines in Listing 1, up to the 'Text sec-

tion' heading. You don't have to type in the comments, but they make future modification much easier. Resave the file as INV1-.FRM and print the form as before. The result should look like Figure 1. If not, return to the input file and recheck your entries.

## A Few Font Moments With Psetup

The only task remaining is to insert the field and column headings plus the company name. Two new commands are required to insert text elements: The first switches between available fonts, and the second specifies the text's location on the page.

If you use downloadable soft fonts on your LaserJet Plus, you should also purchase the *Psetup* utility from Polaris Software. Unless this program is used to define and download fonts, the lengthy downloading must be done by *Polaris Forms* each time the input file is processed. This is done by adding the following lines after the initial .FC command in the input file:

**.LF QA,,HV08R#US.SFP**
**.LF QB,,HV18B#US.SFP**
**.LF QC,,HV24B#US.SFP**

However, if you have *Psetup,* enter **Psetup** to load the program and select 'Setup Screens' ( **< F7 >** ) from the main menu (see Screen 2). When prompted, specify **1** as the setup screen number and press **< F1 >** to enter.

The next screen asks for the font file names. Each file name is associated with a two-letter font

```
.FC *
.. The first line must always be the FC command.
.. The * specifies that you are using soft fonts downloaded by
..   the Psetup utility.
.....................................................................
..    Invoice form using Polaris Forms  (complete form)    ..
..    Filename is INV2.FRM                                 ..
.....................................................................
..  INVOICE box: Outline, then fill top.
.BX 0.33, 6.8, 0.83, 8.1, 1
.BX 0.33, 6.8, 0.50, 8.1, 0, 1, 2
..  INVOICE DATE box: Outline, then fill top.
.BX 1.00, 6.8, 1.50, 8.1, 1
.BX 1.00, 6.8, 1.17, 8.1, 0, 1, 2
.....................................................................
..  Box around main body of form
.BX 2.67, 0.4, 6.67, 8.1, 1
.....................................................................
..  First shaded horizontal bar containing 5 fields
.BX 2.67, 0.4, 2.83, 8.1, 0, 1, 2
..  Horizontal line at bottom of fields
.HL 3.17, 0.4, 7.7, 1
..  Four vertical lines to create the 5 fields
.RP 4, 0.0, 1.54
.VL 2.67, 1.84, 0.50, 1
.RP
.....................................................................
..  Second shaded horizontal bar across top of columns
.BX 3.17, 0.4, 3.33, 8.1, 0, 1, 2
..  Horizontal line above SALES TAX field
.HL 5.67, 6.0, 2.1, 1
..  Horizontal line at the bottom of all columns
.HL 6.00, 0.4, 7.7, 1
..  Horizontal line above TOTAL field
.HL 6.33, 6.0, 2.1, 1
.....................................................................
..  Vertical lines to divide columns
.VL 3.17, 1.0, 2.83, 1
.VL 3.17, 1.7, 2.83, 1
.VL 3.17, 2.4, 3.50, 1
.VL 3.17, 6.0, 3.50, 1
.VL 3.17, 7.0, 3.50, 1
.....................................................................
..                    Text section                                 ..
.....................................................................
..The following soft fonts were loaded with the Polaris Psetup utility:
..
..     Helv 8 point regular    HV08R#US.SFP    QA
..     Helv 18 point bold      HV18B#US.SFP    QB
..     Helv 24 point bold      HV24B#US.SFP    QC
.....................................................................
..  Select Helv 24 point bold font for company name.
&QC&
.SC 0.70, 1.5, 5.0, C
ABC Distribution Inc.
.....................................................................
..  Select Helv 8-point bold font for company address and the rest
..    of the field names.
&QA&
.SC 0.95, 1.5, 5.0, C
1532 West 56th Avenue
San Francisco, Calif. 90909
(415) 555-1234
.....................................................................
.SC 0.50, 6.8, 1.3, C
INVOICE
.SC 1.17, 6.8, 1.3, C
INVOICE DATE
```

*(continues)*

**Listing 1: The completed INV2.FRM input file, which creates the invoice shown in Figure 2.**

identifier that is inserted in the input file to activate that font. For this invoice, assign QA to represent the 8-point Helvetica font. On the font screen, insert the font file name **HV08R#US.SPF** after the line labeled 'QA'. This font is activated by the &QA& command in the input file. Also ensure that **NONE** is in the cartridge field, and insert **QA** in the default font field (see Screen 3).

To make sure the customer gets the point of the invoice (Send us money!), you will be using a larger, 18-point Helvetica bold font for the 'Please pay this amount' caption and a very large 24-point Helvetica bold for the company name. Specify these as fonts QB with filename **HV18B#-US.SFP** and QC with **HV24B#US.SFP**. Return to the main menu screen by pressing **< F8 >** to exit.

To set up and download the fonts, type **1** as the screen setup number and press **< F1 >**. After completion, press **< F8 >** to terminate *Psetup*. Note that the font files must be contained in the same subdirectory as the *Psetup* program. If you were creating a number of forms using different fonts, you could assign a different setup screen number for each combination.

```
.SC 1.50, 0.4
SOLD TO:
.SC 3.00, 0.40, 1.54, C
.....................................................................
.. Labels for first shaded bar
.SC 2.83, 0.40, 1.54, C
DATE ORDERED
.SC 2.83, 1.94, 1.54, C
DATE SHIPPED
.SC 2.83, 3.48, 1.54, C
SHIPPED VIA
.SC 2.83, 5.02, 1.54, C
TERMS
.SC 2.83, 6.56, 1.54, C
CUSTOMER PO #
.....................................................................
.. Labels for second shaded bar
.SC 3.33, 0.4, 0.6, C
ITEM
.SC 3.33, 1.0, 0.7, C
QTY SHIP
.SC 3.33, 1.7, 0.7, C
QTY B/O
.SC 3.33, 2.4, 3.6, C
DESCRIPTION
.SC 3.33, 6.0, 1.0, C
UNIT PRICE
.SC 3.33, 7.0, 1.0, C
EXTENSION
.....................................................................
.. Labels at bottom of form (adjusted down by .06)
.SC 5.89, 6.0, 1.0, C
SALES TAX
.SC 6.23, 6.0, 1.0, C
SHIPPING
.SC 6.56, 6.0, 1.0, C
TOTAL
&QB&
.SC 6.58, 2.4, 3.6, C
Please pay this amount  >>
```

**Listing 1** ***(continued)***

## Time for the Text

Return to the input file on your word processor to append the text commands to the end of the existing file. To print the company name in 24-point Helv, first add the **&QC&** command on its own line.

Next, use the .SC command to specify the location of the lower-left corner of the first character to be printed. If you want the text to be justified within a given horizontal area, add the width of that area as a third parameter, followed by a C for centering or an R for right justification. Therefore, typing

**.SC 0.70, 1.5, 5.0, C**

centers the text in an area 5 inches wide, with its lower-left corner 0.7 inch down from the top of the page and 1.5 inches from the left edge.

To insert the text, type it on the next line of the input file. *Polaris Forms* recognizes as text any line that does not begin with a period or an ampersand. All such text lines are printed with the current active font, and each new text line in the input file starts a new text line on the form.

After inserting the company name, enter the **&QA&** command on the next line to switch to the 8-point font. The company address and all the field headings can now be positioned using .SC commands preceding every text line. The placement measurements can be obtained from the first line-art section of the input file. (It is not necessary to measure these positions physically.)

The final line on the form is the 'Please pay this amount' line,

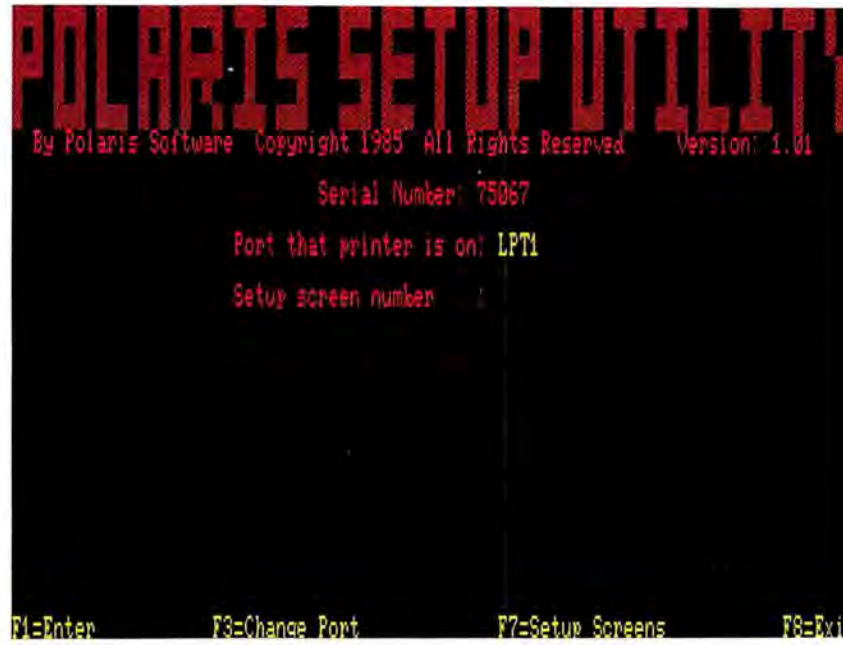
which is printed using the 18-point bold font identified by **&QB&**. After typing in the rest of the input file, save the file as INV2.FRM, exit your word processor, and print the form using the PF INV2.FRM command. The result should look like the finished form in Figure 2.

### Filling in the Form

Now that you have a completed invoice form, you have several options for filling it in. The simplest is to duplicate the form at a local print shop and fill it in with a typewriter. You have saved the expense of having the artwork created and are now able to modify the form easily and inexpensively.

Using *Polaris Forms*, you can also fill in the form from the keyboard and print each form individually. This is accomplished by inserting some .AV (Ask for Variable) commands at the beginning of the input file that prompt the user to enter the necessary data. The program then places the information in the proper location. When all the fields have been entered, the completed form and the inserted data go to the printer. Unless you're receiving your data straight off the telephone or entering it from handwritten notes, this method is not recommended because it reduces your PC to nothing more than a smart typewriter.

If the data to be entered already exists in another program (for example, an accounting or data management program) and if you can save that data in an ASCII file, then you can instruct *Polaris Forms* to merge this data and




Screen 2: Psetup main menu. Psetup is an inexpensive utility that streamlines the process of downloading software-based fonts to the LaserJet Plus.

Screen 3: Psetup's font selection screen. Here you enter the fonts you will use with a particular form. You can create a number of setup screens for various font combinations used on different forms.

place it in the correct form locations. The data fields in each file record must be separated by commas, and all records must have the fields in the same sequence. Because all the fields for a single page must be contained in one file record, this method often requires a very long record and is rather complicated.

### Macro Overlays

The most efficient data entry method is to make the invoice printing module of your accounting system compatible with the new invoice form. Using the LaserJet Plus's macro overlay feature, you can instruct the printer to overprint the invoice form on every invoice page. Although the original LaserJet does not have this capability, you can print blank invoices and then place them in the printer's input tray for a second round of printing.

To convert the invoice form to a macro, add the command **.SM 1,P** to the input file immediately before the first .BX command, then add a **.PA** command at the end of the file. All commands between these two commands are considered to be macro number 1 and will be stored in the printer as a "permanent" macro (which means that it remains in memory as long as the LaserJet is turned on, and won't disappear during a reset). Using your word processor, add these two commands to your INV2.FRM file and save it as INV3.FRM.

Now when you use *Polaris Forms* to process the INV3.FRM input file, the form is stored in the LaserJet Plus's memory rather than printed immediately. Once stored in the printer, the form prints on every page only when macro 1 is activated. The most straightforward way to activate this macro is to have your accounting print program send a short escape sequence to the printer at the start of a printing run. Alternatively, some printing programs have a customizable printer initialization string that it sends to the printer before printing begins.

To activate macro 1, use the escape sequence <esc>&f0y4X. The <esc> represents the escape character ASCII 27, and the digit before the lowercase y designates the macro number and is always one less than the number assigned in the .SM command.

If your print program does not support printer setup strings, you can create a file named MACRO.ON containing only the above escape sequence. With many word processors, such as *Microsoft Word* and *PC-Write,* you can enter the escape character by holding down the <Alt> key while typing 27 on the numeric pad.

To send the file to the printer, use the DOS command MACRO.ON COPY LPT1. To deactivate the same macro, create a file called MACRO.OFF that contains the escape sequence <esc>&f0y5X.

### Only the Beginning

To create this invoice, you used only a small subset of the features available in *Polaris Forms.* The program can also print multiple forms per page, number each form sequentially, merge images from graphics packages, and more. Using these advanced features, you can match most of the design capabilities of a graphic arts shop. No longer will you have to justify the expense of a laser printer; once you tap the LaserJet's ability to create forms, you've got a cost-efficient performer at your side.

*Peter Neuhaus is a freelance writer specializing in electronic publishing and computer graphics.*

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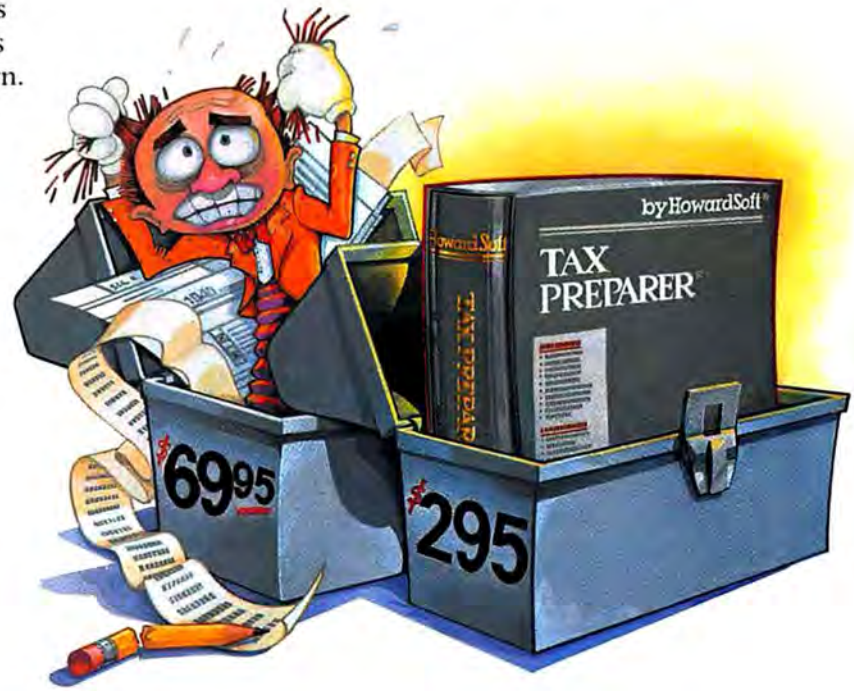


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# Password: Communicate

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This month: An inexpensive tool for technical analysis of stocks from an on-line data base, a free health and legal information service, and a Dialog search for artist Franz Marc

*Edited by Jeremy Joan Hewes*

## On Line

### *Cheap Charts for High Finance*

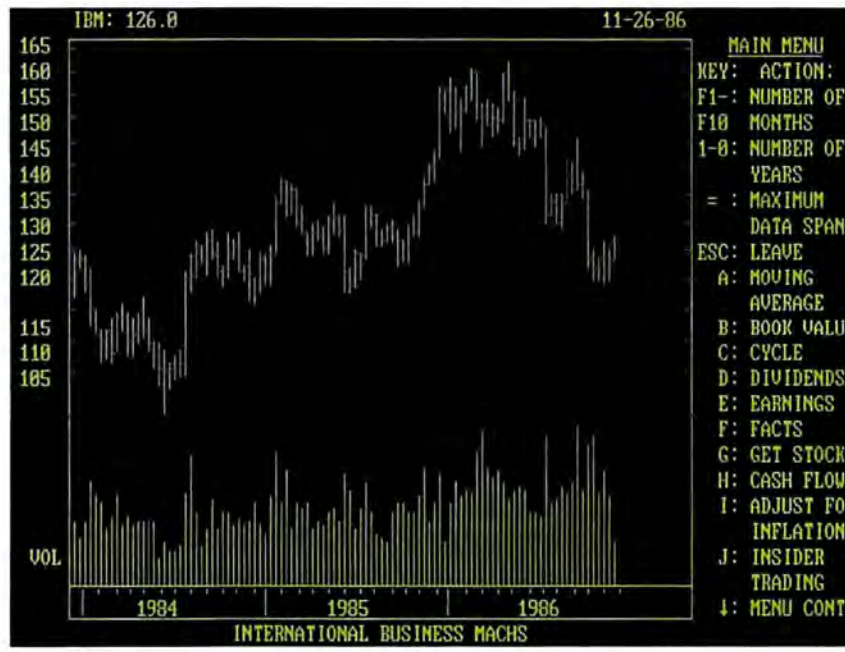
In the never-ending quest for a good investment, on-line data bases and specialized analysis software can help you map your strategy. I recently used both of these tools to investigate whether IBM stock—selling for about $120 a share at the time—was a bargain or a lead balloon. My technique was technical analysis, and my tools were the *Telescan Analyzer* program and its on-line financial data base, both produced by Telescan of Houston, Texas.

Technical analysis is a fairly complex science that uses a stock's historical price and volume performance and usually presents its results in graphs or charts (see Screen 1). The discipline has a small but dedicated following among financial experts, and some investors won't get out of bed in the morning unless the charts are favorable.

Even with a personal computer, technical analysis can be costly and time-consuming. You have to gather voluminous amounts of data (usually from an on-line data base such as Dow Jones News/Retrieval or Warner Computer Services) and master an often expensive technical analysis program. But if you want to analyze your data from every possible angle and have complete control over the charts, this is probably the method to use.

For those of us who don't need to control every facet of technical analysis, *Telescan Analyzer* provides a much simpler—and cheaper—solution. For a price you'll find hard to beat ($50), this

*(continues)*




**Screen 1: A technical analysis chart on the Telescan data base and the system's menu of analysis options**

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program turns PC charting on its head. Instead of downloading raw data and then performing the analysis with separate software on your PC, you simply log on to the Telescan data base, order the charts you want, and watch them appear on your screen.

The Telescan mainframe does all the work of analyzing the data, constructing the charts, and updating the data base daily—tasks it can perform far faster than a PC can. So the software you use can be relatively inexpensive, since its function is merely to connect to the data base and download what you wanted in the first place—a particular chart and the accompanying technical analysis. Although you pay modest connect charges while using the data base (a maximum of 50 cents per minute at 1200 bps or 75 cents at 2400 bps), the fact that the mainframe has the charts and analysis ready keeps your on-line time to a minimum.

The program's customizing function also limits connect time: Working off line, you can create a list of up to 500 stock charts for automatic retrieval and leave the entire process of updating the list to Telescan.

The first time you use *Telescan Analyzer*, you must call the Telescan offices during normal business hours and register your password. Thereafter, you use the program by selecting options from one of its two main menus: the Off-Line menu, for viewing previously downloaded graphs, developing the custom stock list, and performing file operations; and the Log-On menu, for connecting to the data base or changing communications parameters.

At log-on, the system's greeting appears. Pressing <Esc> clears the screen and brings up the On-Line menu. From this you choose one of the data base's two main components—Stock Graphs and Videotext—or the Auto-Run option, which automatically retrieves and saves the charts specified in your customized list.

Selecting Videotext gives you access to financial market news, world news, or information about your Telescan account. You can save this information in a disk file for later use.

When you pick Stock Graphs, the system prompts you to select a chart for one of the 8000 stocks, 2000 mutual funds, or 150 market indices stored in the data base. (Symbols for all items on the data base are listed in the Telescan manual. Stocks are indicated with standard exchange symbols, and the mainframe's software can usually find a stock if you type all or even part of the company's name.)

To investigate IBM's stock, type in those famous initials (which are also its stock symbol) to begin the technical analysis. A few moments later, IBM's chart appears on the screen (see Screen 1).

The menu on the right side of Screen 1 is displayed with all charts. It lets you change the chart's time span from the most recent month to the maximum available data span (back to January 1973). Then you can select any

*(continues)*

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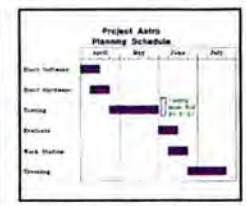

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**Screen 2: A chart combining fundamental indicators with stock price performance**

of the technical analysis methods listed in the menu and see a new chart that incorporates data for the stock and time period you indicated previously. You can save the chart currently displayed at any time by typing S.

The Telescan mainframe's software and data base produce new charts speedily (within about 30 seconds at 1200 bps during evenings and weekends) once you make a selection from the on-screen menu. The technical analysis options include Momentum, Moving Average, On-Balance Volume, and Relative Strength, all of which are standard components of the discipline.

One particularly useful Telescan option enables you to display fundamental indicators with your technical analysis in a chart that combines the stock's book value, dividends, earnings, sales, cash flow, and capital spending with its price performance (see Screen 2). You can also adjust figures for inflation to show price movements in constant dollars (a sobering display).

For my analysis of IBM's stock, I charted its relative strength (as compared with the Standard & Poor's 500), its price from 1973 to the present, and its price over the past two months.

In addition to viewing and printing charts, you can use *Telescan Analyzer* to perform some off-line technical analyses on charts you have saved. These operations include varying the time period of moving averages, calculating momentum indicators, and placing trend-line markers on your graphs.

*Telescan Analyzer* and the Telescan data base provide all the fundamental and technical indicators that an individual investor is likely to need for analyzing stocks or mutual funds. And the cost of these tools makes them a definite bargain (whether or not IBM's stock turns out to be one). For instance, if you create a customized list that specifies which charts you want for each stock and use the system's Auto-Run mode during evenings or weekends, you can download 100 charts per week for about $12.50 (at 1200 bps).

This is an excellent product at a good price, but don't take my word for it. Write to the manufacturer for a free demonstration disk.

Oh, yes. Is IBM a bargain at $120 a share? Based on Telescan charts from late October, my conclusion is cautious: Wait and see if IBM holds above 120. The charts show that IBM has been underperforming the market for the past several months, but 120 has been a support level for its price at various times in its history. If the price stays above that level, the stock could be a good buy.

Of course, by now, you have the advantage of hindsight. Check the morning paper and see where IBM is trading today.

*–Andrew T. Williams*

*Telescan Analyzer*
*Telescan, Inc.*
*2900 Wildcrest*
*Houston, TX 77042*
*713/952-1060*

*(continues)*

# Generate a full year's sales in minutes.

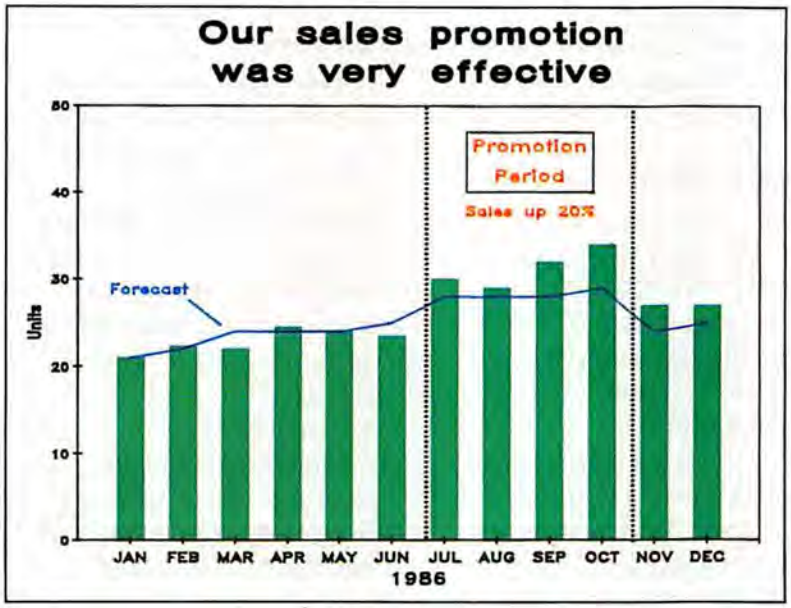


CHART-MASTER

Conventional wisdom says the way to make more impressive sales charts is to spend less time on the charts. And more time on the sales.

Precisely what CHART-MASTER® software lets you do.

For simple and complex line graphs, bar graphs, pie charts, scatter plots, area charts, even mixing styles on one chart, CHART-MASTER not only lets you generate professional-quality presentation graphics on your IBM® PC or 100% compatible, it lets you get it done at the last minute. Which, as we all know, is when it usually gets done anyhow.

Its surprising combination of power and ease-of-use, through its intuitive design and prompts, have made CHART-MASTER the number-one-selling graphic package.

Like the other MASTER GRAPHICS™ Series packages, from Ashton-Tate,® namely MAP-MASTER,™ DIAGRAM-MASTER™ and SIGN-MASTER,® it comes with a simple five-minute lesson that will have you, or your support staff, plotting impressive charts for overheads, slides and presentation books on the spot. In fact, it does so much for you, it's hard to make a bad chart with CHART-MASTER.

MAP-MASTER

SIGN-MASTER

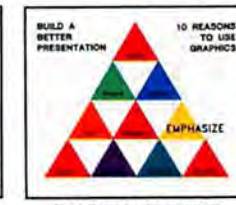


DIAGRAM-MASTER

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Circle 867 on reader service card

*List price: $49.95; connect charges at 1200 bps 50 cents per minute prime time and 25 cents per minute evenings and weekends, at 2400 bps 75 cents per minute prime time, and 37 cents per minute evenings and weekends; software maintenance program for high-volume users $300 (reduces connect charges to 17 cents per minute prime time and 8 cents per minute evenings and weekends and includes all software upgrades)*

*Requirements: 256K RAM, one disk drive, IBM Color/Graphics Adapter or Hercules Graphics Card, 1200- or 2400-bps Hayes-compatible modem*

## *Q&A for Free*

With the exception of local bulletin board systems, can you get free education and enjoyment through your modem? Case Western Reserve University (CWRU) in Cleveland, Ohio, has made a good start by founding the first free online question-and-answer service, Cleveland Free-Net. The service provides expert advice and information from professionals in law, medicine, natural history, education, and government.

Free-Net began in 1984 as an experiment in electronic distribution of medical information. Called St. Silicon Hospital and Informational Dispensary and sponsored by the Department of Family Medicine of the Medical School at CWRU, the venture was so successful that last year the Information Systems Division of AT&T provided major funding for the project. The system currently receives some 200 calls a day, and its services continue to grow in scope and popularity. To its stable of question-answering experts, Free-Net has added special interest groups (SIGs) devoted to various computers, science fiction, and veterinary medicine, as well as an electronic mail system.

You can use Free-Net as a visitor or as a registered user. Visitors can go anywhere and read any of the information on the system but cannot post their own questions or messages. Registered users can participate in all aspects of the system, such as sending and receiving electronic mail, making "speeches" to an electronic forum, joining a SIG, or posing questions to the experts.

Free-Net is completely menu-driven—it was designed for the convenience of first-time users and computer novices. Currently the system supports 300- and 1200-bps connections. Founder and SYSOP Tom Grundner anticipates that an additional grant will provide equipment for 2400-bps service in the near future.

After displaying a welcome screen, Free-Net asks if you are a visitor or a registered user. When you register, the service assigns you a user identification number and password. As a visitor, you're prompted to sign in to the system's Guest Book.

A couple of tips for your first log-on: If you're calling long distance, do so on a night or weekend; there's a lot to look at. Also, be prepared to download information to a disk file or printer, because you will probably want to save some of it.

Free-Net's main menu lists the major subdivisions of the system. The general-interest Q&A areas are called the Hospital, the Schoolhouse, and the Courthouse. Ohio residents can pose questions to elected officials through the Government House, and anyone can speak up or join a SIG in the Public Square.

Before you start exploring, go to the Administration Building. There you can sign up to have a registration kit mailed to you, or you can download it. Downloading takes a couple of minutes at 300 bps but makes for faster registration.

The registration form consists of three pages: an agreement to abide by the system's terms of participation; a general information form (name, address, and so on); and an optional personal information form for Free-Net to develop a user profile.

Free-Net's Q&A sections are the most popular attractions. Registered users post questions to attorneys in the Legal Clinic, to medical residents and medical school staff in the Family Medicine Clinic, to dental students under the supervision of dental school staff in the Dental Clinic, and to experts from the Cleveland Museum of Natural History in a section called Ask Dr. Dino. You'll find an answer waiting within 24 hours.

*(continues)*

# It took minutes to plot this strategy.

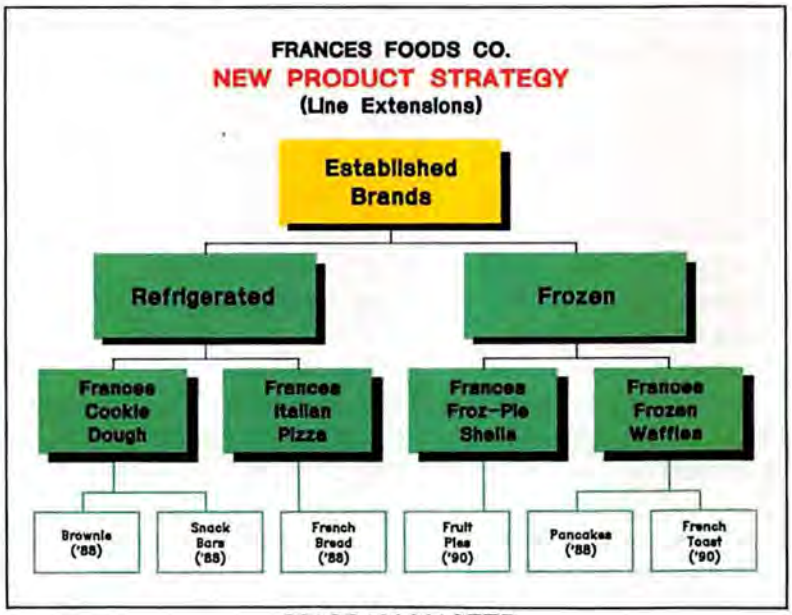


DIAGRAM-MASTER

While developing a new product strategy can be a long and painful process, making it look good on paper is a piece of cake. Provided you have the right piece of software.

DIAGRAM-MASTER™ from Ashton-Tate® is for generating organization charts and Gantt schedules. With a free-form drawing board that lets you visualize pretty much any situation you want.

It's fast. With 8 typefaces, 8 colors and a large library of business symbols and shapes. And the well-defined menus and programmed formats let non-technical business people build their diagrams right on the screen just by answering simple prompts.

Like all the other MASTER GRAPHICS™ packages: CHART-MASTER,® MAP-MASTER™ and SIGN-MASTER,® it comes with a simple five-minute lesson that will have you making charts like this in no time.

Since all this can be done in minutes on any IBM® PC or 100% compatible, you're free to spend your time planning your presentations instead of plotting charts.

MAP-MASTER

SIGN-MASTER

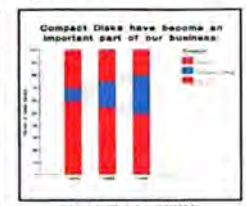


CHART-MASTER

Call us at (800) 437-4329, Ext. 2534* for a free demonstration diskette. See how it's done.

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Circle 867 on reader service card

The experts, who volunteer their time and knowledge, provide answers to on-line questions in plain English, which is great for those of us who don't understand the nuances of medicine, law, or natural history.

To demonstrate Free-Net's capabilities, I posted a simple, general-interest question in the Family Medicine Clinic: 'What is appendicitis and what are its symptoms?' When I logged on the next afternoon, the answer was ready. Compared to other questions on the system—on such topics as malignant hypertension, candidiasis, and macular edema—mine was rather tame. Dr. Robert Kelly, one of the system's volunteer physicians, offered this response: 'Appendicitis is an inflammation of the appendix—a small organ attached to the colon and about the size of a baby's finger. Symptoms would include abdominal pain (most often starting around the navel, then settling in the lower-right portion of the abdomen), fever, nausea, and vomiting. Since other problems can cause the same symptoms, it's best to let a physician evaluate any severe abdominal pain. If appendicitis is not treated in time, the appendix can rupture, causing an even more serious problem.'

Following every response in Q&A sections, this disclaimer appears: 'Please note: The information contained on this system is not intended to supplant individual professional consultation, but is offered as a community education service.'

The disclaimer is important, especially for medical or legal advice. In its professional Q&A sections, Free-Net offers just what it promises: education. This is a place to gather information, locate specialized help, or just learn more about a specific topic. It is not a place to seek help in a crisis. When necessary, Free-Net professionals suggest appropriate specialists to handle problems raised in the questions.

Navigating Free-Net is fairly simple. As noted, the system uses menus, and it has only a few commands. You cannot type ahead to avoid menus, however, and at some points you may see a burst of numbers on the screen if you enter a character that Free-Net does not recognize.

The system displays 20 lines of text and then stops, requesting 'Press <Return> to continue, Q to quit'. If you are reading from the screen, this pause is helpful; if you're downloading to disk, it's a nuisance. At any prompt you can move to the main menu by typing M or to a previous menu by typing P, or you can exit the system by typing X.

The work involved in maintaining such a comprehensive system is done by two paid staffers and a long list of volunteers. Anyone with expertise in a certain area is invited to propose a new section for the system through one of the menu options in the Administration Building.

In the hope of seeding similar information systems, Free-Net leases its software for $1 per year. The lease has certain conditions: The software must be used by an organization that can make a significant financial and time commitment, and it must be used to operate a system offering free public access.

Free-Net is like a great public library staffed by a diverse group of experts. You may use it the first time to find out something in particular, but eventually you'll go back just to browse.
*–Amy Roffmann New*

*Cleveland Free-Net*
*Case Western Reserve University*
*Cleveland, OH 44106*
*216/368-3888 (modem only; available 24 hours a day, 7 days a week, at 300 or 1200 bps)*

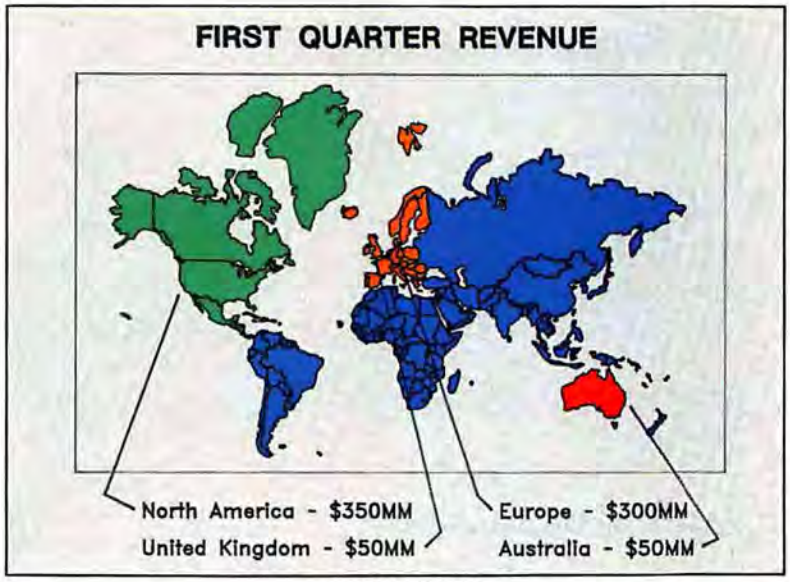
## *A Short Search on Dialog*

Serious information seekers should know about Dialog, a mammoth collection of 260 on-line data bases that offers sophisticated search capabilities and a variety of off-line services. Dialog's charges vary by data base, ranging from $15 per hour for its practice files to $300 per hour for a few patent data bases; the majority of files cost less than $100 per hour.

For all its apparent complexity and expense, Dialog can be easy to use. The following search illustrates a quick way to survey a vast amount of information and to pinpoint relevant items.

*(continues)*

# Create in minutes what once took 6 days.



MAP-MASTER

It used to take days to put together full-color map graphics for presentations. Which is why a lot of business people who could really use them, never even tried them.

But now, business people much like yourself, with no time, no budget, no artist portfolio and no degree in computer science, are cranking out professional-looking maps like there's no tomorrow. Which is often the case with presentations.

The reason for this is MAP-MASTER.™ It's just one of the MASTER GRAPHICS™ software packages from Ashton-Tate.® Like CHART-MASTER,® SIGN-MASTER,® and DIAGRAM-MASTER,™ it puts impressive graphic power into the hands of just about anyone with an IBM® PC or 100% compatible.

It comes with a simple five-minute lesson. All you do is work from the menu, answer a few simple prompts, and the world is yours. Or the fifty states. With options for counties, cities, zip codes or marketing areas. All in your choice of colors.

You can enter data yourself, or pull up files from dBASE III PLUS™ or Lotus® 1-2-3.® You change the data, MAP-MASTER will change the map.

DIAGRAM-MASTER

SIGN-MASTER

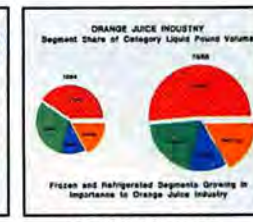


CHART-MASTER

See for yourself how good it is. Call us at (800) 437-4329, Ext. 2504* for a free demonstration diskette.

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**Circle 328 on reader service card**

```
        C:DIALOG.031  PAGE 2 LINE 35 COL 61  MAR REL  INSERT ON
191: ART LIT. INTL. (RILA) 1975-1985                              -
          575  FRANZ
          297  MARC
           33  FRANZ(W)MARC

 56: ART MODERN - 1974 THRU DEC 1985
          379  FRANZ
          349  MARC
           47  FRANZ(W)MARC

470: BOOKS IN PRINT - 1490-1986/SEP
          276  FRANZ
           81  MARC
            1  FRANZ(W)MARC

 47: MAGAZINE INDEX -1959-MARCH 1970, 1973-86/SEP
         1004  FRANZ
         1177  MARC
            1  FRANZ(W)MARC

647: MAGAZINE ASAP 83-86/SEP
-------------------------------------------------------------------------P
          370  FRANZ
          557  MARC
```

**Screen 3: Results of the DialIndex search**

You log on to Dialog through its Dialnet network or through Telenet or Tymnet. Once on line, you proceed to the system's index, DialIndex, by typing B 411 (*B* is an abbreviation of the Begin command and 411 is the number for DialIndex). Next you specify the group of data bases that you want to search by typing SF (Select Files) and their numbers.

Then you type your search topic in the Dialog format. My search focused on twentieth century German painter Franz Marc. To be sure that the search included both his first and last names, I typed in Franz(w)Marc. The (w) is Dialog's device for connecting words that ordinarily would have a space between them.

The DialIndex search covered five data bases (chosen from the service's printed catalog) and reported the number of hits (records containing the search term) in each. Screen 3 shows these results.

If you want to retrieve records from a data base, Dialog requires that you sign on to it. DialIndex is only a shortcut that tells you the number of references in a data base.

To enter one of the data bases, use the Begin command and the data base number. Then type your search term again, this time preceded by SS (Select Sets) so that Dialog will assign a set number to each term. Thereafter you can use the set number instead of retyping the search terms whenever you want to narrow or expand your search or see the records in a particular set. To see some or all of

*(continues)*

"First-Class"

—*Computerworld*

"IMPRESSIVE"

—*Personal Computing*

"*Faster*"

—*InfoWorld*

"MUSCULAR"

—*PC Magazine*

"*A Screamer*"

—*PC World*

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But now the trade press has helped us come up with an even stronger one. *PC World*, for example, says, "The APC IV is an AT-compatible, 80286-based screamer." *PC Magazine* adds, "It is muscular, stylish, very classy... everything an AT-class machine should be and then some." And in the opinion of *Personal Computing*, "The APC IV is an impressive-looking computer... with powerful expansion capabilities and a monitor you won't want to take your eyes off."

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C&C Computers and Communications

Circle 737 on reader service card

```
 3/5/33
 0003479     1 4052 (1975)
 Biblia Omnii: Timeliness and timelessness in the work of Franz Marc
  WOLF, Marion
  Art Journal, XXXIII/3, (spring 1974), 226-230 7 illustrations
  Document Type: analytic

 A refutation of Hilton Kramer's questioning of the inclusion of Franz
    Marc's The Unfortunate Land of Tyrol (New York, Solomon R. Guggenheim
    Museum) in a 1970 exhibition at the Guggenheim entitled Artists respond
    to crisis. Kramer saw no evidence that the canvas reflected a political
    awareness of the contemporary European situation. The author of this
    article, however, considers the elements of Marc's artistic development
    before 1913 and contrasts these with the marked stylistic and
    iconographic change seen between the initial sketch for this work made
    of a landscape near Meran and the finished canvas, which he views as
    Marc's prefiguration of World War I. (S. Hatfield)
 Descriptors: Kramer, Hilton, American critic, b.1928--on Marc; Marc,
    Franz, German painter, printmaker, 1888-1916--exhibitions; New York
    (NY, USA), Solomon R. Guggenheim Museum--exhibitions--Artists Respond
    to Crisis (1970)
 Section Heading(s): 79--NEO-CLASSICISM AND MODERN ART--artists,
    architects, photographers
?4_
Receiving C:DIALOG.030  (ALT-R to Terminate)
```

**Screen 4: A complete record from a Dialog data base**

the records in a set, you use the Type command (abbreviated T).

My initial search located a few dozen references to Franz Marc in data bases 191 and 56, so I had my choice. To view all records for Marc in data base 191 in their complete form, for example, I typed T 3/5/1-33: (3 is the set number, 5 is the format for a complete record, and 1-33 specifies all records located). Screen 4 shows one complete record from this search.

If you set up your communications program to store the Dialog session on disk or to print all the data received, you can examine the results of the search at your leisure.

Of course there are many other ways to search this data treasury, but you can find a lot of the information you need with a few simple commands–and for relatively little money. *–J. J. H.*

*Dialog Information Services, Inc.*
*3460 Hillview Ave.*
*Palo Alto, CA 94304*
*800/227-197, 415/858-3785*
*Cost: annual fee $25; data base charges $15 to $300 per hour plus small surcharges for displaying records in some data bases; network charges $6 per hour Dialnet, $10 per hour Telenet or Tymnet; additional services include low-cost Knowledge Index and specialized Business Connection; available 22 hours a day weekdays, about 20 hours total weekends*

*Andrew T. Williams is a Contributing Editor for* PC World *and the author of* Lotus 1-2-3 From A To Z *(Wiley Press, New York, 1985) and* Lotus 1-2-3 Release 2: ASAP *(Wiley Press, New York, 1986). Amy Roffmann New is a freelance writer who lives in Springfield, Illinois, with her husband and their five computers.*


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# PANASONIC® PRINTERS. THEY'RE GENERATING A LOT OF GOOD PRINT.

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> ...ly bad. Like their co...ition, the Panasonic machines are well made, sturdy printers that should serve well in the various applications for which they were designed. T... bold... letter-quality text. About the ...

**PC WEEK—JUNE 17, 1986**

So, whether your business is big, small or in-between, you'll find a printer with features to love every bit as much as the critics. Like—as one reviewer observed—extraordinary near-letter-quality on our dot matrix models. They also come standard with impressive high-resolution graphics capability. So you can add graphs, charts, illustrations—even your company's logo.

> with this little printer.
> As far as I'm concerned, the KX-P1091 produces not near letter quality but rather true letter quality in this mode. You'd really have to strain to distinguish it from typewriter quality. Knowing that the ... the company produced fast, courteous, and knowledgeable answers. ...

**PC—SEPT. 17, 1985**

Not to be outdone, all our daisy wheel printers give you sophisticated advances like boldface, shadow and underline.

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**PC PRODUCTS—APRIL, 1985**

Finally, just when you thought all this would be hard to top, there's more: all our printers are backed with an unprecedented two-year limited warranty.

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- **New Network Commands**
- **New NETBIOS**
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- **Easy to operate**
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- **Performs in the background**

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

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

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

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**NEW VERSION 3.0 COMMANDS EXPAND NETWORK FLEXIBILITY**

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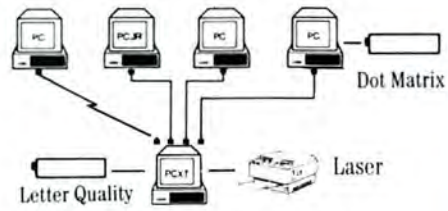


***EasyLAN* Office Network**

### *EasyLAN* SPECIFICATIONS

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

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

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**TODAY'S NEWS** for broadcasting messages, notices or announcements across the network.

**MENU INTERFACE** for easy set-up and use.

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*Karl Koessel*

***A Program by Any Other Color***

*Q. After reading "The Wonderful World of Color"* (The Help Screen, PCW, *August 1986), I immediately changed my DOS screen's default color to amber. I now program at the DOS level for hours without any eye fatigue. How can I get* 1-2-3 *release 2 to display worksheets in amber on my IBM AT's Enhanced Color Display driven by an STB EGA? My eyes can't take much more black and white!*

*Gregory Michaels*
*Elyria, Ohio*

**A.** As you well know, many, if not most, programs set their own screen colors; the color(s) chosen for DOS are set aside while the programs are running. To change a program's colors requires either a built-in color-setting utility, source code that you can modify, known addresses to patch, or another program that can change the first program's colors for you.

The last of these choices is usually the most desirable. The Binary Workshop in Champaign, Illinois, has a utility called *Easy Color for 1-2-3* that sets the colors for releases 1A and 2. The utility *is* easy to use, and it's extremely powerful. Here are the colors you can change:

- the text and background of the unprotected cells and their pointer (that's four separate colors);
- the text and background of the control panel (protected cells use these same settings);
- the text and background of the frame containing the row numbers and column letters (which also sets the colors of the pointer of the control panel, the pointer of the protected cells, and the status indicators);
- the text and background of the WAIT mode indicator;
- the text, background, and A, B, C, D, E, and F ranges of graphs.

***Second-Level Prompting***

*Q. I am developing a menu system that uses a second copy of COMMAND.COM, the DOS command processor, for commands not listed in the menu. Although implementing the menu system is clearly outlined in "BASICally Better Menus,"* [ PCW, *October 1986], I would like the two-line DOS prompt shown in Figure 1.*

*Can you show me how this is done?*

*John McGee*
*Oklahoma City, Oklahoma*

**A.** Just change the prompt before you call the copy of COMMAND.COM. The prompt of the second COMMAND.COM will automatically match this latest

*(continues)*

```
Type EXIT and press <Enter> to return to menu.
C:\MENU>_
```

**Figure 1: A two-line DOS prompt for a secondary command processor reminds users how to get back to the menu.**

```
prompt Type EXIT and press $LEnter$G to return to the menu.$_$p$g
cls
command
prompt $p$g
e:menu
```

**Listing 1: This batch file creates the DOS prompt shown in Figure 1.**

```
defint a-z : dim default(15),linear(63),range$(3)
screen 9 : cls   '4/16-color, 640-by-350-graphics mode only for EGA with ECD
for attribute=0 to 7                    'Build an array containing 0
    default(attribute)=attribute        '  through 5, 20, 7, and 56
next : default(6)=20                    '  through 63--the numbers of
for attribute=8 to 15                   '  the colors assigned by default
    default(attribute)=attribute+48     '  to the attributes 0 through 15
next
for colornumber=0 to 63                             'Linear array of color
    linear(colornumber)=colornumber                 '  values from 0 to 63
next
range$(0)="0-15" : range$(1)="16-31" : range$(2)="32-47" : range$(3)="48-63"
text=15 : bold=2 : inputkey=14 : messagebox=9       'Special color constants

gosub text                      'Print headings, messages, and instructions
gosub default                                       'Display default colors

getkey:
keyin$=input$(1) : if keyin$=chr$(27) then cls : palette : end
keyin$=chr$(asc(keyin$) or &h20)        'Convert input to lowercase
on instr("0123dc",keyin$) gosub linear,linear,linear,linear,default,change
goto getkey

text:
gosub headings                                      'Print headings
gosub messages                                      'Print messages
gosub instructions                                  'Print instructions
return

default:
palette                                 'Reset default color assignments
for attribute=0 to 15                   'For each attribute,
    gosub boxes                         '  draw a box full of color and
    colornumber=default(attribute)      '
    gosub numbers                       '  print attribute and color numbers
next
return

linear:
set=val(keyin$) : start=set*16          'Find element that starts color set
palette using linear(start)             'Assign 16 colors from an array
for attribute=0 to 15                   'For each attribute,
    gosub boxes                         '  print a box full of color and
```

*(continues)*

**Listing 2: EGACOLOR.BAS displays the 64 colors available with a 128K or 256K EGA and an ECD.**

prompt with that of the previous COMMAND.COM. When you exit the second command processor, have the prompt change back to its original form.

For example, to do this for :CHOICE6 of MENU.BAT (Listing 2 of "BASICally Better Menus"), replace the last two ECHO commands with the lines shown here in Listing 1. The first PROMPT command effects your desired prompt. (The $_ breaks the prompt into two lines; the $P$G causes the prompt to display the current drive and directory, followed by the greater-than character.) The next two lines clear the screen (CLS) and execute a copy of COMMAND.COM. When the user types EXIT and presses <Enter>, the remaining commands reset the prompt (PROMPT $P$G) and call the menu (E:MENU).

Although this technique solves your problem as stated, I must caution you against using a second copy of COMMAND.COM to enable users of your system to execute commands that are not on the menu. Installing memory-resident programs under a second command processor can cause undesirable results. Your system would be less susceptible to problems if, like :CHOICE6 in Listing 2 of "BASICally Better Menus," you simply let the user out of the menu system when there's a need to execute a command that is not in your menu.

*(continues)*

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```
    colornumber=linear(start+attribute)  '
    gosub numbers                        '  print attribute and color numbers
next
return

boxes:
top=attribute*14+28 : bottom=top+13              'Set scan line values
line (36,top)-(376,bottom),attribute,bf          'Draw box full of color
return

numbers:
locate 3+attribute,1 : print attribute;          'Print attribute number
locate 3+attribute,49 : print colornumber        'Print color number
return

headings:
locate 1,12 : color 10                           'Print the title
print "The Colors of Screen Mode 9 on the Enhanced Color Display"
locate 2,1 : color 12 : print "Attribute Number" 'Print headings in
locate 2,41 : print "Color Number"               '  color and then
line (0,26)-(127,26),messagebox                  '  underline both
line (320,26)-(415,26),messagebox                '  of them
color text                                       'Back to simple text color
return

messages:
line (440,39)-(632,114),messagebox,b               'Box following message
locate 4,57 : color bold : print "Screen Mode 9 "; 'Bold this information
color text : print "is valid"                      'Back to simple text color
locate 5,57 : print "only for an Enhanced"
locate 6,57 : print "Graphics Adapter ";
color bold : print "(EGA)";                        'Bold this information
locate 7,57 : color text : print "driving an Enhanced"    'Back to simple text
locate  8,57 : print "Color Display ";                    '  color
color bold : print "(ECD)";                        'Bold this information
color text : print "." :                           'Back to simple text color
line (440,123)-(632,184),messagebox,b              'Box following message
locate 10,57 : print "Any of the ";
color bold : print "16 ";                          'Bold this information
color text : print "colors"                        'Back to simple text color
locate 11,57 : print "of a ";
color bold : print "64K ";                         'Bold this information
color text : print "EGA can be"                   'Back to simple text color
locate 12,57 : print "assigned to any of the"
locate 13,57 : color bold : print "4 ";            'Bold this information
color text : print "first attributes."            'Back to simple text color
line (440,193)-(632,254),messagebox,b              'Box following message
locate 15,57 : print "Any of the ";
color bold : print "64 ";                          'Bold this information
color text : print "colors"                        'Back to simple text color
locate 16,57 : print "of a ";
color bold : print "128K or 256K ";                'Bold this information
color text : print "EGA"                           'Back to simple text color
locate 17,57 : print "can be assigned to any"
locate 18,57 : print "of the ";
color bold : print "16 ";                          'Bold this information
color text : print "attributes."                   'Back to simple text color
return

instructions:
gosub clearwindow                        'Clear instructions/change window
locate 20,1 : print "Press... ";
color inputkey : print "0 ";                       'Color valid response key
color text : print "to view the ";                 'Back to simple text color
color bold : print "default ";                     'Bold this information
color text : print "color assignments."            'Back to simple text color
for set=0 to 3
    locate 21+set,9 : color inputkey : print set;  'Color valid response key
    color text : print "to assign colors ";        'Back to simple text color
```

*(continues)*

**Listing 2** ***(continued)***

However, your idea of having the prompt tell the user how to return to the menu is commendable. Why not just change the first ECHO command of :CHOICE6 to 'PROMPT Type E:MENU and press $LEnter$G to return to the menu.$_$P$G'?

### *A Word on Tandy Color Colors Word on a Tandy*

*Q. I have a Tandy 3000 with a Tandy High Resolution Color Monitor CM-1. In the past, a few of the color graphics programs I tried to run on the Tandy would not even load. But, explaining to myself that the Tandy is not 100 percent IBM compatible, I would calmly set the program aside (and put my fist through the wall).*

*Recently I discovered that* Microsoft Word's *Window Options command lets me choose any of 16 colors for the background. Although you cannot change the foreground color (text remains white), I find that a blue background offers soothing relief from the high contrast produced by a black background. Through trial and error I have figured out that I must use the command* WORD /C *to be able to change the background color—without the /C, the only "choice" of backgound color is black. However, unless I also run a certain color graphics program just before calling* Word, *black remains the only choice. What does the color graphics program do that enables me to choose a background color for* Word?

*(continues)*

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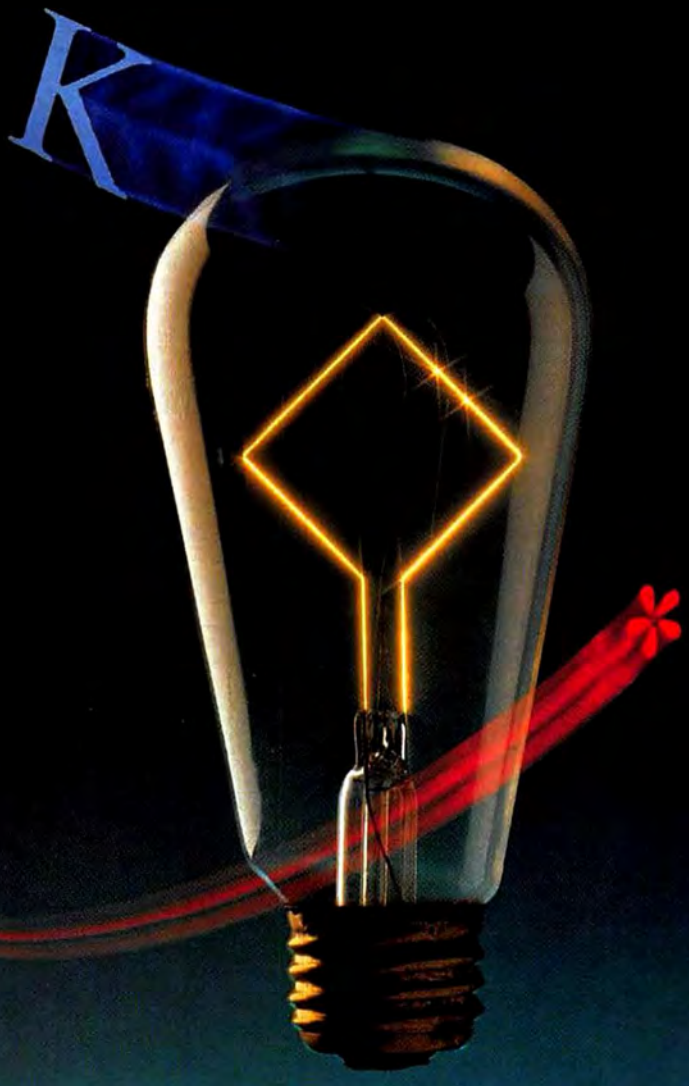

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```
    color bold : print range$(set);                    'Bold this information
    color text : print " to attributes ";              'Back to simple text color
    color bold : print "0-15.";                        'Bold this information
next
locate 25,10 : color inputkey : : print "C ";          'Color valid response key
color text : print "to ";                              'Back to simple text color
color bold : print "change ";                          'Bold this information
color text : print "an attribute's assigned color.";'Back to simple text color
line (480,277)-(568,324),messagebox,b                  'Box following message
locate 21,62 : print "Press the"
locate 22,62 : color inputkey : print "<Esc> ";        'Color valid response key
color text : print "key"                               'Back to simple text color
locate 23,62 : print "to quit"
return

change:
gosub clearwindow                          'Clear instructions/change window
locate 21,1
print "Enter the number of the attribute ";          'Prompt for input
color inputkey : print "(0-15) ";                    'Color valid response keys
color text : input "to be changed: ", attribute      'Back to simple text color
if attribute<0 or attribute>15 goto change           'Invalid input; ask again

assign:
gosub clearwindow                          'Clear instructions/change window
locate 23,1 : print "Enter the color number ";       'Prompt for input
color inputkey : print "(0-63) ";                    'Color valid response keys
color text : print "to assign to attribute";         'Back to simple text color
color bold : print str$(attribute);                  'Bold this information
color text : input ": ", colornumber                 'Back to simple text color
if colornumber<0 or colornumber>63 goto assign       'Invalid input; ask again
palette attribute, colornumber                       'Assign attribute a color
gosub numbers                                        'Print new color number
gosub instructions                                   'Reprint instructions
return

clearwindow:
line (0,266)-(639,349),0,bf                'Clear instructions/change window
return
```

**Listing 2** ***(continued)***

*And why does that color graphics program run, while others do not?*

*Bruce Cleveland*
*Belleville, Pennsylvania*

**A.** Both color and graphics programs can be problematic on the Tandy 3000 if they fail to set the screen mode that the programs require. However, a simple MODE command (from your DOS disk) should do the trick. (Look up the MODE command in your DOS manual to learn more about screen modes.)

In *Word*'s case, the color graphics program you run first sets the screen mode required to run *Word* with a color background. If you execute the command MODE CO80 before calling *Word* (with the /C parameter), you will be able to change the background color.

### *Minature Golf's Major Goof*

***Q.*** *I recently purchased* Mean 18, *a golf simulation program marketed by Accolade Software. The package depicts several screen images the way they appear on a PCjr. I use a Zenith 150 with a color monitor and adapter and thought I would at least get a similar graphic representation.*

*However, when I select the four-color option from the opening menu, the Zenith doesn't display all 16 colors that my screen can produce. The result is that sand traps, clouds, and the golf ball—which are white on the PCjr—are brown on my display. Most of the subtlety of the trees and bushes is lost among massive blocks of brown.*

*I called Accolade and spoke to their customer service representative, who advised me that because I have a color graphics adapter, there was nothing he could do to help. Still, I'm sure there must be a patch that would let me see all of my screen's colors.*

*I'm left with a program that has the potential for 16 colors, but the only way to run the simulation with any degree of enjoyment is to tell the program that I have a black-and-white monitor.*

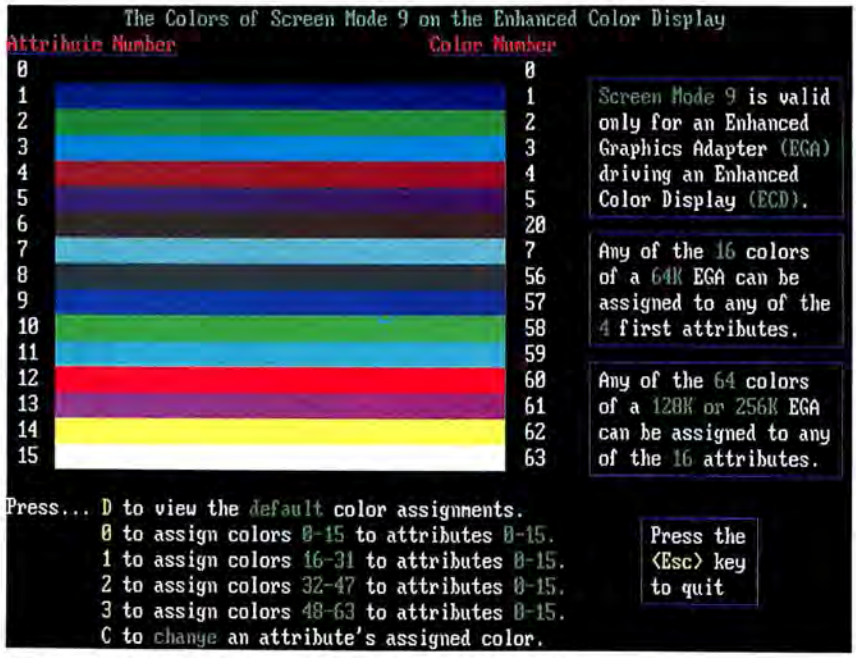
*Can you help me access more than four colors?*

*Russell Fields*
*Canoga Park, California*

**A.** I'm afraid you're out of luck. Unfortunately, the color graphics adapter will display only 4 colors in its color graphics mode. (Your system displays 16 colors only when in *text* mode.) With a lot of trouble, it may be possible to change which 4 colors appear on screen, but you're still left with only 4.

Because the color graphics adapter is so limited, many graphics companies snapped up the opportunity to write software for the

*(continues)*




**Screen 1: EGACOLOR.BAS (Listing 2) initially displays the EGA's default color assignments.**

PCjr's more capable video modes. Those modes are not possible on the color graphics adapter because it has only 16K of video memory, compared to the 32K that the PCjr uses to support 16-color graphics. Therefore, patches that would produce 16 colors are not possible for your system.

If it's any consolation, the price of the enhanced graphics adapter continues to fall, and as EGAs become more prevalent, graphics firms will supply software that takes advantage of the EGA's 16-color capability. And at a resolution of 640 pixels by 350 lines, you'll see simulation software that's much more enticing than the PCjr's 320-pixel-by-200-line images.

### *Programming the EGA*

*Q. The enhanced graphics adapter is a major improvement over the standard PC video offerings. It produces sharp text and, at the same time, supports graphics at a resolution of 640 pixels by 350 lines in 16 colors. Add dithering techniques and the images it can produce are astounding.*

*By nature, however, software lags behind hardware. I'm not talking just about application software, but also about development software. I'd love to be able to write my own applications for the EGA, but who has a high-level language that addresses the EGA's capabilities? I want to be able to choose which colors I use instead of acquiescing to defaults. I want to be able to draw lines and circles below scan line 199 (the syntactical limit imposed by CGA-based versions of current high-level languages.) What can I do?*

*Alex Ruskin*
*Boston, Massachusetts*

**A.** Microsoft QuickBASIC 2.0 is a BASIC editor and compiler-development environment that not only addresses the EGA but is fast, friendly, and fun to use. (Take a look at the review of QB2 in this month's *From the Software Shelf.*)

Listing 2, EGACOLOR.BAS, is a fairly simple QuickBASIC program that demonstrates screen mode 9, the 640-by-350-resolution, color-graphics EGA mode. Mode 9 requires an enhanced color display; with 128K or more video RAM on the EGA, the ECD sports 16 on-screen colors, which can be any of 64 different choices. A 64K EGA will display 4 colors from a palette of 16 colors.

EGACOLOR.BAS begins by displaying the 16 colors assigned by default to the 16 color-attribute numbers (see Screen 1). The colors assigned are not the colors 0 through 15; the default assignments for attributes 0 through 15 are, respectively, the colors 0 through 5, 20, 7, and 56 through 63. You can then choose to see the colors 0 through 15, 16 through 31, 32 through 47, or 48 through 63. And the program enables you to assign any of the 64 colors to any of the 16 attribute numbers so

*(continues)*

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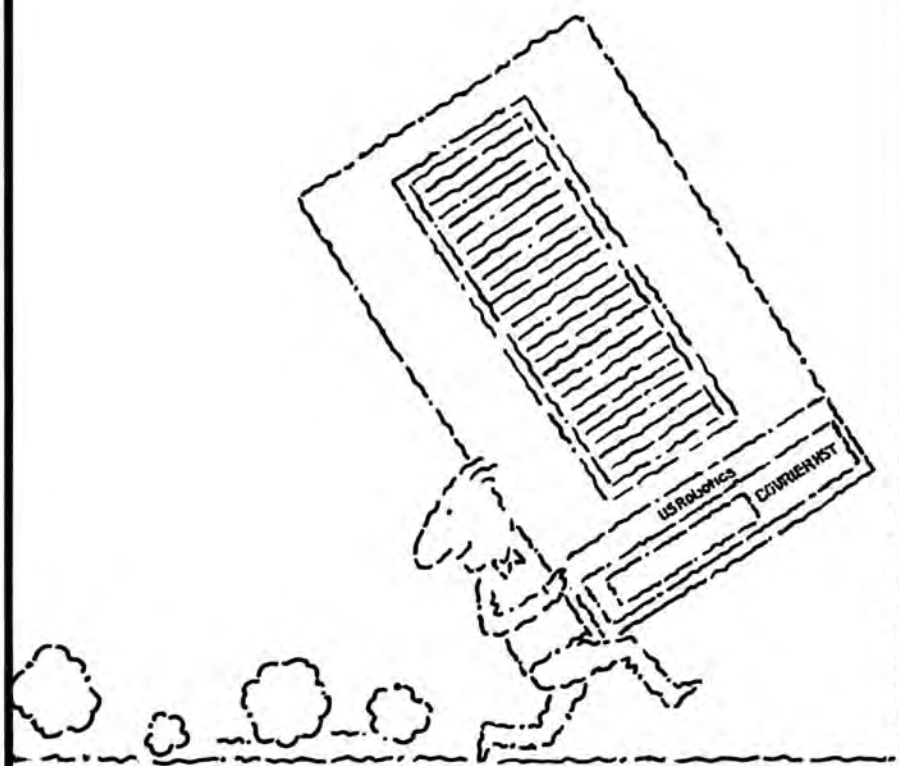


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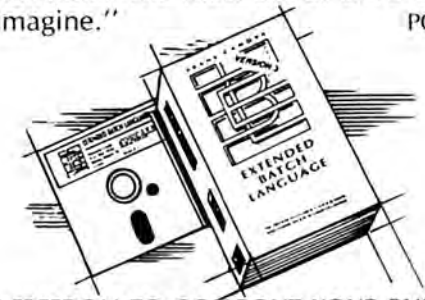


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I am unaware of any high-level language other than QB2 that currently offers built-in support of the EGA. By the time you read this, however, Borland's Turbo BASIC will be available—take a look at it.

Another route you can take is to use device-independent graphics subroutine primitives that you bind to a high-level language. *Halo* from Media Cybernetics of Takoma Park, Maryland, and *Graphics Development Toolkit* from Graphic Software Systems in Beaverton, Oregon, are some of the development tool kits that have drivers that address not only the EGA, but laser printers, film recorders, and 1024-by-1024-resolution video boards such as the Revolution 1024x8 from Number Nine Computer of Cambridge, Massachusetts. This approach also frees you from writing device-specific code.

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Dot matrix printer with near letter quality printing at a home budget price. 100cps draft speed, 80 column.
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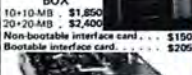

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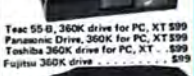

**$105 ea.** 360K DRIVE FOR IBM-AT

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Cards for IBM PC and XT w/Free SIDEKICK & DESQ VIEW SOFTWARE

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6-PAK PREMIUM CARDS with Parallel & Serial Ports
512K —— $369 1-MB —— $455
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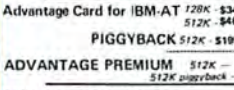

Fully compatible with IBM-PC and XT. Comes with Ram disk and print spooler softwa.e.

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FOR IBM-PC/XT

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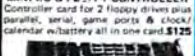

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Controller card for 2 floppy drives plus parallel, serial, game ports & clock/calendar w/battery all in one card.$125

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- Fully IBM PC/XT Compatible
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- Parallel Port included
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- Clock/Calendar w/battery
- Floppy Disk Controller
- Compatible w/EGA Color Card & Net working systems
- Made in U.S.A.

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## ENTERPRISE AT (6-8 MHZ)

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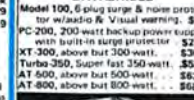

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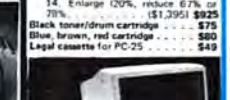

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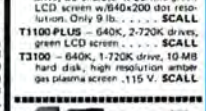

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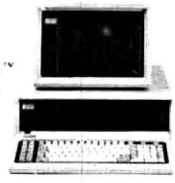

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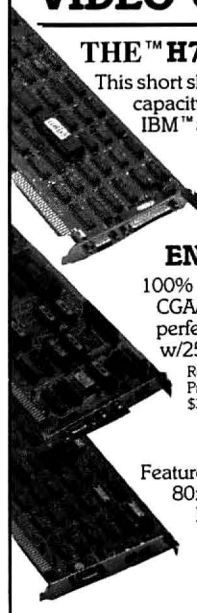

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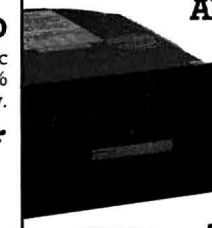

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### Typo Trapper

Many readers have trouble using program listings designed to work with X-MAKER.BAS, *Star-Dot-Star*'s program-creating program. Most problems are the result of simple transcription errors—typing the letter *O* when a zero is required, the letter *l* instead of the number *1*, periods in place of commas, and so on. Worse still, fingers may have gone astray while entering X-MAKER itself. If you can't get any of the DATA listings published in *.* to work, chances are your X-MAKER.BAS contains an error. Before you shoot off a query to this department, make sure that you have entered both the DATA listing and X-MAKER.BAS correctly. If you write to *.* about a problem, please include printouts of *all* pertinent error messages, program listings (including X-MAKER), and a stamped, self-addressed envelope.

As you may have surmised, there is a way around typo trouble. X-MAKER was designed to be as brief as possible to save typing time. This conciseness limits the amount of error checking X-MAKER can perform, but for most people the trade-off is acceptable. If you have difficulty using X-MAKER, you may want to try the X-TYPER.BAS program presented here (see Listing 1).

X-TYPER.BAS goes a long way toward preventing the transcription errors that can crop up when entering DATA listings. The program knows which characters are valid at each point in the process and accepts only those characters.

For example, numerals 0 through 9, letters *A* through *F*, the asterisk, and the hyphen are accepted at any time—with some conditions attached. If you type an asterisk, it must be the first character of a value and be followed by no more than 3 digits. If you type a minus sign, it must also be the first character of a value and be followed by the numeral 1, a comma, and the correct checksum value. All other values must be two hexadecimal digits long.

For speedier typing, pressing the <Space> bar or <Enter> key inserts a comma. If you make a mistake, pressing <Backspace> erases it. For big errors, press <Esc> to erase an entire line.

When you enter a line correctly, the values are stored in the disk file named at the beginning of the session. (X-TYPER adds the .COM extension to the file unless you specify otherwise—some programs require an .EXE extension.) You can also send the lines to a .DAT file that can be used later with X-MAKER.BAS. In that case, you needn't type the DATA *filename* statement at the beginning of an X-MAKER.DAT listing—the line is automatically generated when you first enter the program name.

Of course, if you make an error transcribing X-TYPER.BAS, it won't function properly. So be particularly careful, and your programs may never be plagued by typos again.

### Batch File Bonanza

DOS lacks an input command that can accept and pass a user's response to other DOS commands. If this capability were available, a batch file could ask the operator if a particular command should exercise a given option during execution.

*(continues)*

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And if your budget's even less than a shoe-string, the new Brother M-1109 is for you. Its standard features include both a friction-feed platen and a built-in tractor feed. Like the M-1509, it has dual interfaces and a spectrum of print options. All of which adds up to big system advantages at a small system price.

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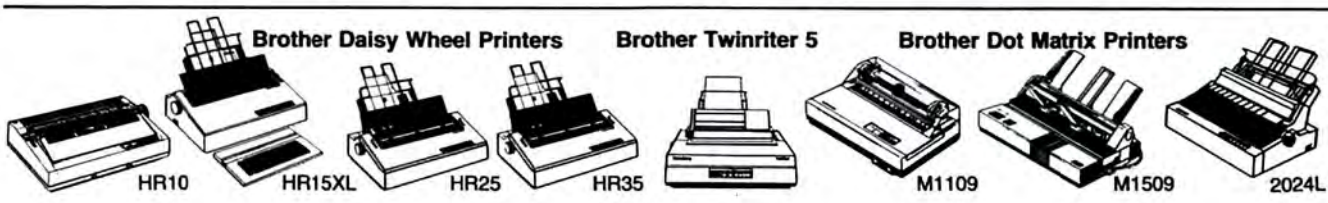


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```
1000 DEFINT A-Z
1010 DIM ITEM$(18),MSG$(6)
1020 DEF FNHEX(X$)=VAL("&h"+X$)
1030 FALSE=0:TRUE=NOT FALSE
1040 '
1050 NUM$="0123456789"        'valid numeric digits
1060 HX$="ABCDEFabcdef"       'valid hexadecimal characters
1070 OTH$="-*"                'other valid characters
1080 CM$=CHR$(44)             'comma
1090 CR$=CHR$(13)             'carriage return
1100 SEP$=CR$+CM$+SPACE$(1) 'valid separators between bytes
1110 ESC$=CHR$(27)            'escape key
1120 BKSP$=CHR$(8)            'backspace key
1130 '
1140 MSG$(1)="Invalid Character"
1150 MSG$(2)="Separator Character Required"
1160 MSG$(3)="Nothing to Delete"
1170 MSG$(4)="At Least 2 Characters Required"
1180 MSG$(5)="Checksum error - Check all values"
1190 MSG$(6)="File(s) created.  Press any key..."
1200 '
1210 CLS:KEY OFF:PRINT "X-TYPER"
1220 LOCATE 5,1:INPUT "Name of program to create (.COM): ",PROGNAME$
1230 IF LEN(PROGNAME$)=0 THEN END
1240 IF INSTR(PROGNAME$,".")=0 THEN PROGNAME$=PROGNAME$+".COM"
1250 '
1260 LOCATE 7,1:INPUT "Do you wany to create a .DAT file, too (Y/N)";ANS$
1270 IF ANS$="n" OR ANS$="N" THEN DATFILE=FALSE:GOTO 1340
1280 IF ANS$<>"y" AND ANS$<>"Y" THEN 1260
1290 DATFILE$=LEFT$(PROGNAME$,INSTR(PROGNAME$,"."))+"DAT"
1300 DATFILE=TRUE:OPEN DATFILE$ FOR OUTPUT AS #1
1310 PRINT #1,STR$(1000)+" data ";
1320 WRITE #1,PROGNAME$
1330 '
1340 OPEN PROGNAME$ AS #2 LEN=1
1350 FIELD 2,1 AS BYTE$
1360 '
1370 LNUM=0
1380 LNUM=LNUM+1 'Enter data one line at a time
1390 ITEM=0 :CHECK=FALSE
1400 LOCATE 20,1:PRINT SPACE$(80)
1410 LOCATE 9,1:PRINT SPACE$(80) 'erase data entry line
1420 LNUM$=STR$(LNUM*10+1000)+" data"+STR$(LNUM)+CM$
1430 '
1440 ITEM=ITEM+1:ENTRY$="":MAXLEN=2 'up to 16 items per line, plus cksum
1450 VALID$=NUM$+HX$+OTH$:IF ITEM<17 THEN 1480
1460 IF CHECK THEN VALID$=NUM$+HX$ ELSE VALID$="-"
1470 '
1480 LOCATE 9,1,0:PRINT LNUM$; 'display current line of data
1490 FOR I=1 TO ITEM-1
1500 PRINT ITEM$(I);CM$;
1510 IF ITEM$(I)="-1" THEN CHECK=TRUE
1520 NEXT:PRINT ENTRY$;SPACE$(2);
1530 LOCATE ,POS(0)-2,1
1540 '
1550 CHAR$=INPUT$(1) 'process keyboard input
1560 IF CHAR$=ESC$ THEN 1390
1570 IF CHAR$=BKSP$ THEN 1760
1580 '
1590 IF INSTR(SEP$,CHAR$)>0 THEN 1820 'did user type a separator?
1600 '
1610 ' Test for a valid entry
1620 IF INSTR(VALID$,CHAR$)=0 THEN MSG=1:GOSUB 2110:GOTO 1480
1630 '
1640 IF CHAR$<>"*" THEN 1680
1650 IF ENTRY$="" THEN MAXLEN=4:VALID$=NUM$:GOTO 1740
1660 MSG=1:GOSUB 2110:GOTO 1480
1670 '
```

*(continues)*

Listing 1: X-TYPER.BAS accepts valid X-MAKER.BAS data only.

*(continues)*

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For example, the DIR command can be issued with the /P or /W option. With an input command, a batch file could ask if the directory listing should pause when the screen fills or be displayed in wide format. Once the batch file received a response, the DIR command would execute.

A DOS input command would also be handy in a batch-file-driven menu system. A batch file could display a menu and rely on the input command to accept and execute the user's choice.

Until Microsoft includes such a command in its next version of DOS, you can achieve the same result—capturing user input—with the COPY command. MENU.BAT is an example of how the technique could be applied to a menu system (see Listing 2).

MENU.BAT begins by changing the DOS prompt to:
Enter A:MENU to display menu A>

The program then tests for a parameter and checks whether it's valid or not. When you call the batch file without a parameter (by simply typing **MENU <Enter>**), the first IF test branches execution to the label :getinput. The following lines save the current DOS prompt in a DOS variable called TEMP; use PROMPT to command ANSI.SYS to redefine the <Enter> key as <Ctrl>-Z <Enter> and remove the DOS prompt; clear the screen; and use ECHO commands to display the menu. (Note that the ANSI.SYS command uses a lowercase *p*.)

```
1680 IF CHAR$<>"-" THEN 1720
1690 IF ENTRY$="" THEN VALID$="1":GOTO 1740
1700 MSG=1:GOSUB 2110:GOTO 1480
1710 '
1720 IF LEN(ENTRY$)=MAXLEN THEN MSG=2:GOSUB 2110:GOTO 1480
1730 '
1740 PRINT CHAR$;:ENTRY$=ENTRY$+CHAR$:GOTO 1550 'display valid character
1750 '
1760 IF ENTRY$="" THEN 1790 'delete one character from current entry
1770 IF ENTRY$="-" THEN CHECK=FALSE
1780 ENTRY$=LEFT$(ENTRY$,LEN(ENTRY$)-1):GOTO 1450
1790 IF ITEM=1 THEN MSG=3:GOSUB 2110:GOTO 1450 'or from prior entry
1800 ITEM=ITEM-1:ENTRY$=ITEM$(ITEM):GOTO 1450
1810 '
1820 IF LEN(ENTRY$)<2 THEN MSG=4:GOSUB 2110:GOTO 1480 'error if too short
1830 ITEM$(ITEM)=ENTRY$:IF CHECK THEN 1890 'add to input line.
1840 IF ENTRY$<>"-1" THEN 1440 ' branch if checksum or to get next entry
1850 '
1860 IF ITEM=1 THEN 2140 'user entered -1; no more lines if the first item
1870 CHECK=TRUE:GOTO 1440 'otherwise, require user to enter the checksum
1880 '
1890 SUM=0 'calculate a checksum and compare with entered value
1900 FOR I=1 TO ITEM-2 'omit the -1 marker and checksum
1910 IF LEFT$(ITEM$(I),1)="*" THEN GOSUB 1950 :GOTO 1930
1920 SUM=(SUM+FNHEX(ITEM$(I)))*2:SUM=(SUM\256)+(SUM MOD 256)
1930 NEXT:IF FNHEX(ENTRY$)=SUM THEN 1990
1940 MSG=5:GOSUB 2110:GOTO 1480 'error if not equal
1950 FOR J=1 TO VAL(MID$(ITEM$(I),2)) 'process compressed zeros
1960    SUM=SUM*2:SUM=(SUM\256)+(SUM MOD 256)
1970 NEXT:RETURN
1980 '
1990 IF NOT DATFILE THEN 2030 'send line of data to .DAT file?
2000 PRINT #1,LNUM$;
2010 FOR I=1 TO ITEM-1:PRINT #1,ITEM$(I);CM$;:NEXT:PRINT #1,ITEM$(ITEM)
2020 '
2030 FOR I=1 TO ITEM-2 'send the bytes to the program file
2040 IF LEFT$(ITEM$(I),1)="*" THEN GOSUB 2070:GOTO 2060
2050 LSET BYTE$=CHR$(FNHEX(ITEM$(I))):PUT #2
2060 NEXT:GOTO 1380
2070 FOR J=1 TO VAL(MID$(ITEM$(I),2)) 'uncompress and send zeros
2080 LSET BYTE$=CHR$(0):PUT #2
2090 NEXT:RETURN
2100 '
2110 BEEP:LOCATE 20,1:PRINT MSG$(MSG)+SPACE$(80):RETURN 'error messages
2120 '
2130 ' All lines have been entered, close file(s)
2140 IF DATFILE THEN PRINT #1,STR$(LNUM*10+1000)+" data -1"
2150 CLOSE:MSG=6:GOSUB 2110:ANS$=INPUT$(1):GOTO 1210 'close & restart
```

**Listing 1** ***(continued)***

COPY CON:RESPONSE.DAT creates a file called RESPONSE.DAT containing the user's response entered from the keyboard. (<Ctrl>-Z <Enter> must be used to inform the COPY command that the response is complete—hence the redefined <Enter> key.) >NUL suppresses the message '1 file(s) copied' by redirecting it to the nul (nonexistent) device.

The next COPY command concatenates COMMAND.DAT and RESPONSE.DAT, creating the file CONTINUE.BAT. COMMAND.DAT simply contains the word MENU followed by a space. Before you run MENU.BAT, create COMMAND.DAT in the default drive by typing **COPY CON:COMMAND.DAT <Enter> MENU**

*(continues)*

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and a single space. Finish up by typing <Ctrl>-Z and <Enter>.

With CONTINUE.BAT in place, MENU.BAT uses PROMPT to restore the <Enter> key's original value, then removes the variable TEMP from the DOS environment, clears the screen, and calls the file CONTINUE.BAT, which it just created.

CONTINUE.BAT issues MENU, along with the user response stored in RESPONSE.DAT. MENU.BAT runs anew, and because a parameter is supplied this time, the first IF test is negative and execution falls to the next IF test. When a match is finally found, execution branches to the appropriate label and the desired menu item is executed. If there is no match, MENU.BAT displays the message 'Invalid response'. Press a key and the menu reappears, ready for input.

*Douglas J. McCann*
*Halifax, Nova Scotia*
*Canada*

*Editor's note: You must install the ANSI.SYS driver in your system's CONFIG.SYS file before the PROMPT command can redefine the keyboard. You'll need to install ANSI.SYS before using the following item, too.*

```
echo off
prompt Enter A:MENU to display menu $_$n$g
cls
if %1!==!    goto getinput
if %1!==1!   goto 1
if %1!==2!   goto 2
if %1!==3!   goto 3
echo Invalid response
pause
:getinput
set temp=%prompt%
prompt $e[13;13;26;13p
echo on
echo off
cls
echo Enter your choice:
echo -
echo 1 for Microsoft Word
echo 2 for Lotus 123
echo 3 for dBASE III
copy con:response.dat >nul
copy command.dat+response.dat continue.bat >nul
prompt $e[13;13p
echo on
echo off
prompt %temp%
set temp=
cls
continue
:1
word
:2
123
:3
dbase
```

**Listing 2: MENU.BAT demonstrates user response techniques.**

**Fast Screen Colors**

I recently received a copy of *The Fully Powered PC;* the book has some good suggestions for customizing the PC for easier and more efficient operations. One particularly useful program is SCREEN.BAT, which enables you to set screen colors at the DOS level. However, the authors wrongly contend that IF comparisons in batch files are slower than GOTO statements.

My SCREEN.BAT program uses 16 IFs (and no GOTOs) to accomplish the same end, and it runs in about 3 seconds—twice as fast as the SCREEN.BAT program presented in the book (see Listing 3). GOTO statements slow batch file execution because the command processor always starts at the beginning of the batch file when searching for a label.

*Ronald Dorchester*
*San Antonio, Texas*

**Batch Subroutines**

I was disappointed to learn that DOS does not support batch file subroutines—in other words, when one batch file calls another, DOS cannot return control to the first batch file after the second one ends.

However, you can overcome this limitation by loading a second copy of COMMAND.COM, the DOS command processor, to execute the second batch file. When the second batch file ends, the secondary command processor returns control to the first. Execution resumes immediately

*(continues)*

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after the line in the first batch file that invoked the second COMMAND.COM.

This technique is illustrated by CALLBAT.BAT (see Listing 4). The first few lines display a message, then COMMAND/C SUB1.BAT executes the batch file SUB1.BAT (see Listing 5). The /C parameter forces DOS to terminate COMMAND.COM when the named batch file ends. (If you omit the /C switch, the last line of SUB1.BAT must be EXIT so that execution can be returned to the primary command processor; otherwise, commands continue to be processed by the secondary command processor.) When SUB1.BAT ends, execution continues at the fifth line of CALLBAT.BAT, more messages are displayed and SUB2.BAT is executed in the same manner (see Listing 6). When SUB2.BAT finishes, control returns to CALLBAT.BAT, which then ends.

This technique can be extended—a second batch file calling a third, a third a fourth, and so on—as long as memory is available and a copy of COMMAND.COM is loaded for each batch file. Because every copy of COMMAND.COM creates a new environment, information such as ECHO status or DOS errorlevel value cannot be passed between batch files.

*Raymond T. Brown*
*Sewell, New Jersey*

*Editor's note: By using DOS redirection, a second copy of COMMAND.COM (and any program run by it) can receive input from a disk file instead of from the keyboard. This feature makes it possible to automate virtually any operation using batch files.*

### FORTRAN Function

I wrote the assembly language program TIMER.ASM to measure execution times of compiled Microsoft FORTRAN programs within 1/100 second (see Listing 7). It's also a useful general-purpose timing routine for a variety of FORTRAN applications.

*(continues)*

```
echo off
cls
set temp=%prompt%
echo Changing colors....
set fgc=7
if %1!==black!   set fgc=0
if %1!==red!     set fgc=1
if %1!==green!   set fgc=2
if %1!==yellow!  set fgc=3
if %1!==blue!    set fgc=4
if %1!==magenta! set fgc=5
if %1!==cyan!    set fgc=6
if %1!==white!   set fgc=7
set bgc=0
if %2!==black!   set bgc=0
if %2!==red!     set bgc=1
if %2!==green!   set bgc=2
if %2!==yellow!  set bgc=3
if %2!==blue!    set bgc=4
if %2!==magenta! set bgc=5
if %2!==cyan!    set bgc=6
if %2!==white!   set bgc=7
prompt $e[3%fgc%;4%bgc%m
echo on
echo off
cls
prompt %temp%
echo New colors now in effect
set fgc=
set bgc=
set temp=
```

**Listing 3: A better SCREEN.BAT allows you to change screen colors twice as fast.**

```
echo off
echo This is the first batch file
echo Ready to execute the first subroutine
command/c sub1.bat
echo Now back to the main batch file
echo Transferring control to the second subroutine
command/c sub2.bat
echo Now back to the main batch file again
```

**Listing 4: CALLBAT.BAT demonstrates batch file subroutines.**

```
echo This is the FIRST subroutine batch file
pause
```

**Listing 5: SUB1.BAT, a sample batch file subroutine**

```
echo This is the SECOND subroutine batch file
pause
```

**Listing 6: SUB2.BAT, another sample batch file subroutine**

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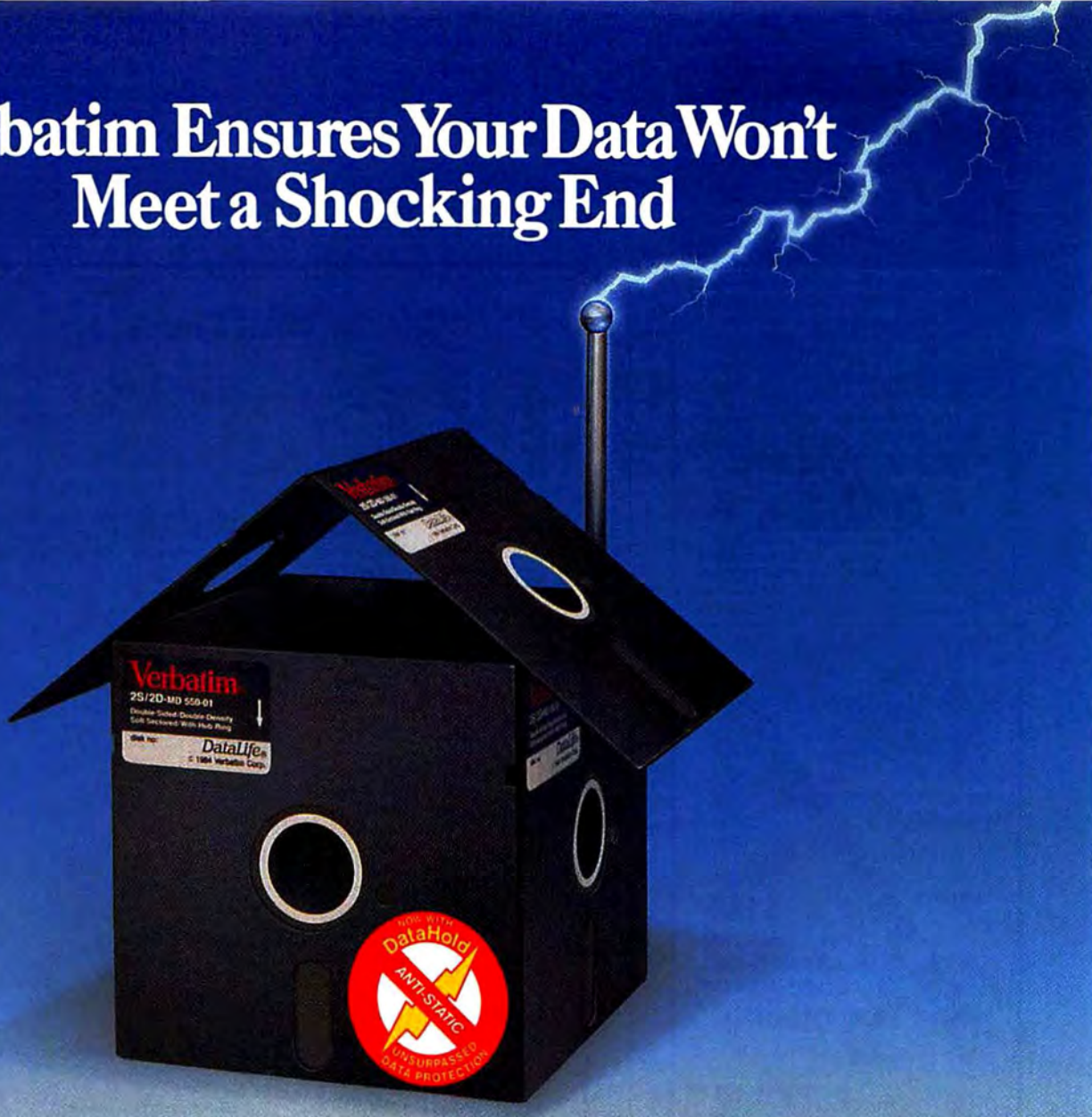


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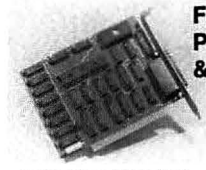

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```
CSEG    SEGMENT PARA    PUBLIC 'CODE'
        ASSUME  CS:CSEG, DS:CSEG, SS:CSEG
        PUBLIC  TIMER
TIMER   PROC    FAR
        PUSH    BP
        MOV     BP,SP
        PUSH    DS
        PUSH    ES
        MOV     AX,CS
        MOV     DS,AX
        MOV     AX,2C00H
        INT     21H             ;get current time from DOS
        MOV     ES,[BP+8]       ;get address of 1st argument
        MOV     BX,[BP+6]       ;get value of LSW of 1st arg.
        MOV     AX,ES:[BX]
        CMP     AX,00
        JE      save            ;initialization call
        CMP     CL,SAVECL
        JNB     min
        ADD     CL,60
min:    SUB     CL,SAVECL
        CMP     DH,SAVEDH
        JNB     sec
        ADD     DH,60
        DEC     CL
sec:    SUB     DH,SAVEDH
        CMP     DL,SAVEDL
        JNB     hun
        ADD     DL,100
        DEC     DH
hun:    SUB     DL,SAVEDL
        XOR     BX,BX
        MOV     BL,DL
        MOV     AX,60
        MUL     CL
        MOV     DL,DH
        MOV     DH,00
        ADD     AX,DX
        XOR     DX,DX
        MOV     CX,100
        MUL     CX              ;convert into hundreths of seconds
        ADD     AX,BX
        ADC     DL,BH
        MOV     MSW,DX          ;save computed value
        MOV     LSW,AX
        MOV     AX,2C00H        ;get current time and save it
save:   MOV     SAVECL,CL       ;minutes
        MOV     SAVEDH,DH       ;seconds
        MOV     SAVEDL,DL       ;hundreths
        MOV     AX,LSW
        MOV     DX,MSW          ;return elapsed time in DX,AX
        POP     ES
        POP     DS
        POP     BP              ;restore calling environment
        RET     4               ;and return 4-byte integer value
SAVECL  DB      0
SAVEDH  DB      0
SAVEDL  DB      0
LSW     DW      0
MSW     DW      0
TIMER   ENDP
CSEG    ENDS
        END
```

**Listing 7: TIMER.ASM, an assembly language FORTRAN timer subroutine**

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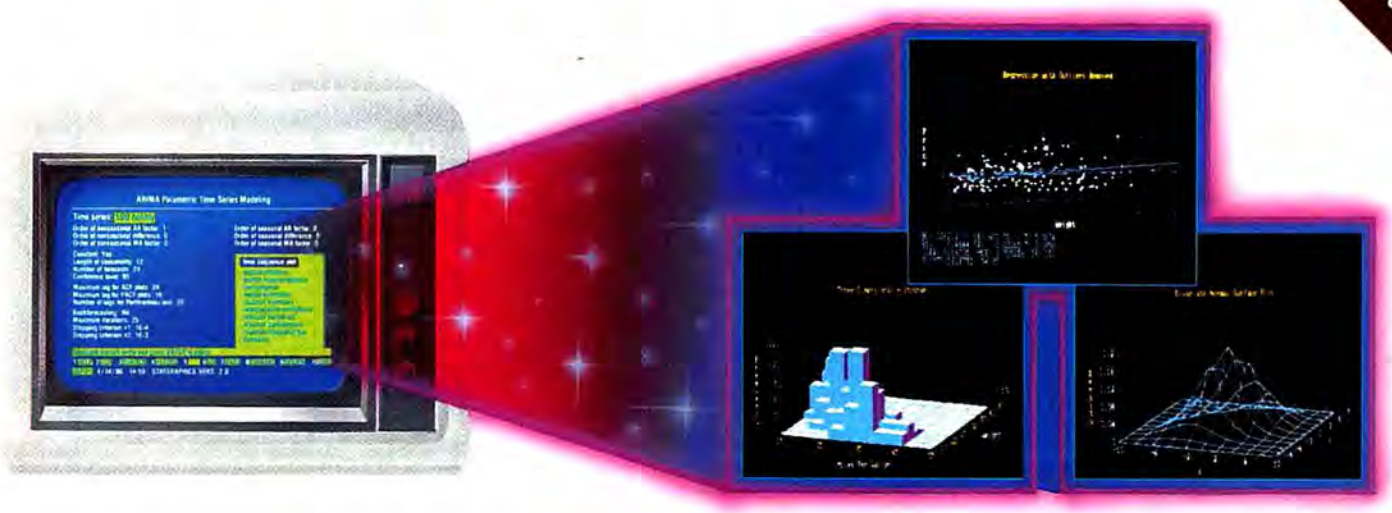

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If you have an assembler, type in and assemble the TIMER.ASM listing. Otherwise, use the lines in TIMER.DAT with X-MAKER-.BAS or X-TYPER.BAS to generate the equivalent .OBJ file (see Listing 8). The .OBJ file must be linked with any FORTRAN program that calls it, a process described in the FORTRAN and DOS manuals.

To use the routine, simply include the statement INTEGER TIMER in your FORTRAN program. You can initialize and start the timer by calling the TIMER function with an argument of zero, that is, I=TIMER(0). Any subsequent call with an argument greater than zero returns the time (in hundredths of seconds) elapsed since the previous call. The program FORTIMER.FOR demonstrates how the routine can be used (see Listing 9).

*Volker Peterson*
*Ames, Iowa*

```
1000 DATA "TIMER.OBJ"
1010 DATA 1,80,03,00,01,41,3B,96,0C,*2,04,43,4F,44,45,04,-1,20
1020 DATA 2,43,53,45,47,19,98,07,00,68,8B,00,03,02,01,68,A0,-1,33
1030 DATA 3,8F,00,01,*2,55,8B,EC,1E,06,8C,C8,8E,D8,B8,00,2C,-1,3D
1040 DATA 4,CD,21,8E,46,08,8B,5E,06,26,8B,07,3D,*2,74,4F,-1,F2
1050 DATA 5,3A,0E,*2,73,03,80,C1,3C,2A,0E,*2,3A,36,*2,73,-1,3D
1060 DATA 6,05,80,C6,3C,FE,C9,2A,36,*2,3A,16,*2,73,05,-1,FA
1070 DATA 7,80,C2,64,FE,CE,2A,16,*2,33,DB,8A,DA,B8,3C,00,F6,-1,5D
1080 DATA 8,E1,8A,D6,B6,00,03,C2,33,D2,B9,64,00,F7,E1,03,C3,-1,28
1090 DATA 9,12,D7,89,16,*2,A3,*2,B8,00,2C,88,0E,*2,88,-1,2A
1100 DATA 10,36,*2,88,16,*2,A1,*2,8B,16,*2,07,1F,-1,EB
1110 DATA 11,5D,CA,04,*8,E7,9C,5C,00,C4,-1,F6
1120 DATA 12,1E,00,01,01,84,00,C4,27,00,01,01,84,00,C4,2B,00,01,-1,9A
1130 DATA 13,01,85,00,C4,36,00,01,01,85,00,C4,3A,00,01,01,86,-1,DC
1140 DATA 14,00,C4,45,00,01,01,86,00,C4,63,00,01,01,89,00,C4,-1,62
1150 DATA 15,66,00,01,01,87,00,C4,6D,00,01,01,84,00,C4,71,00,01,-1,D6
1160 DATA 16,01,85,00,C4,75,00,01,01,86,00,C4,78,00,01,01,87,-1,9B
1170 DATA 17,00,C4,7C,00,01,01,89,00,F8,90,0C,*2,01,05,54,-1,C8
1180 DATA 18,49,4D,45,52,*3,DD,8A,02,*2,74,-1,43,-1
```

**Listing 8: TIMER.DAT. Use these lines: with X-MAKER.BAS or X-TYPER.BAS to create the FORTRAN timer subroutine.**

```
      INTEGER TIMER
      IO = 0
      A = 1.0
      I = TIMER(0)
      DO 10 J = 1 , 1000
            A = A * 7.0
            A = A / 7.0
10    CONTINUE
      I = TIMER(1)
      ERROR = 1.0 - A
      WRITE(IO,1000) I, ERROR
      STOP
1000  FORMAT(//6X,'Elapsed time (1/100 SEC) = ',I8,/,6X,
     1 'Error = ',E18.9,//)
      END
```

**Listing 9. FORTIMER.FOR demonstrates how to use the timer subroutine in a FORTRAN program.**

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*(Turn to page 362 for February's Softstrips)*

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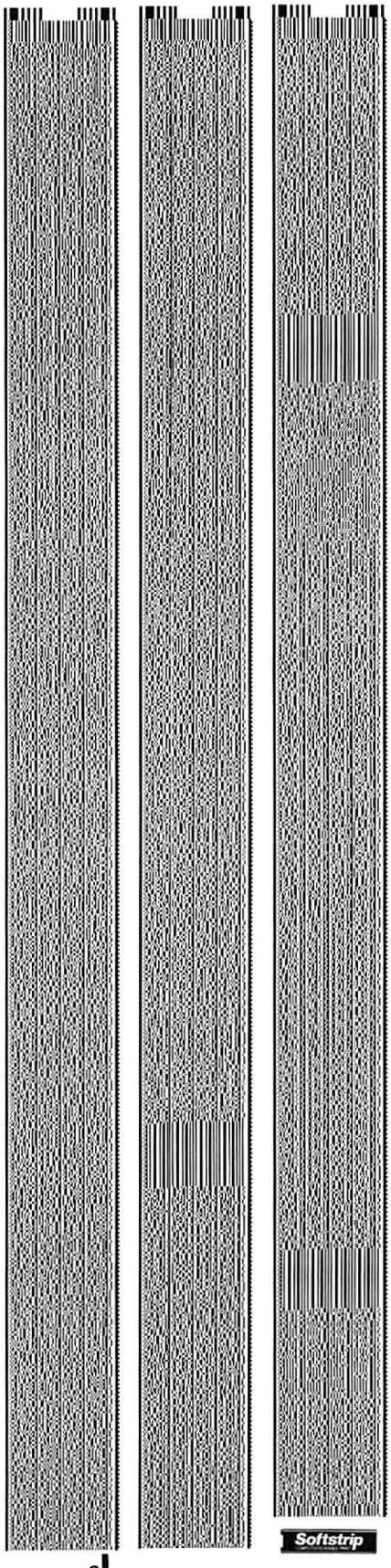



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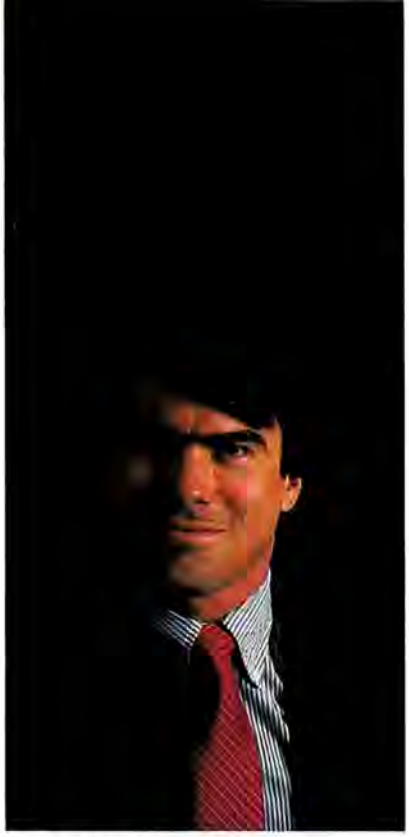

Kevin Strehlo

# A Week in the Life

As Japanese and Americans swap diaries electronically, an experiment in international networking highlights cultural differences and produces some unexpected twists.

The on-line discussion has drifted to the economic competition between Japan and the U.S., and several Americans weigh in with protectionist sentiments. Japan is still attacking the U.S., they claim, this time with economic instead of conventional weapons. The ultimate consequence: a lower standard of living for Americans.

It is an unexpected direction for the trans-Pacific on-line conference dubbed "A Week in the Life." The experiment, which involves the exchange of on-line diaries kept by avid information services users in both countries, was supposed to foster greater understanding and harmony between the people of the two countries—not highlight their squabbles.

The conference is part of the Tama Renaissance Symposium, a meeting on regional development sponsored by academic and civic groups in Japan's equivalent of Silicon Valley—the banks of the Tama River near Tokyo. Technical support comes from Participate conferencing software, developed by Participation Systems of Winchester, Massachusetts. When a diary entry is made on either local Parti conference, the experiment's organizers translate and port it to information services and bulletin boards across the ocean. The results have been eye-opening.

As the ghost of Pearl Harbor surfaces on the Japanese boards, a former American journalist living in Japan comes on line to restore some balance. The Japanese understand the U.S. far better than Americans understand Japan, he writes. Our only glimpses of Japan come from journalists who hang out at the Foreign Correspondents Club in Tokyo and who don't even bother to conduct interviews in Japanese, he admonishes.

"Unless Americans look beyond their own biased and rather uninformed media, they will never understand Japan," he writes. "Foreigners just don't break through the myths that everyone seems to accept so easily."

*(continues)*

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Koji is a salesman for a Tama Valley construction company. If it doesn't rain, it takes him 45 minutes by bicycle, train, and subway to get from his company dormitory to the office. He's not good at lots of things, he says, including dealing with women. His motto: Be nothing special.

Koji goes on line regularly and participates in a large number of ongoing discussions, but he finds time to make only a single diary entry for "Week in the Life." He is a typical Japanese bachelor/networker, he says; he has no real "life." He lives to get home from work, plop down in front of his computer and hit the networks. "The rest is spent working to cover the telephone costs!" he writes.

Terri is an administrator living in Virginia. She notes in her online diary that she would like some insight into how Japanese women handle the problem of their standing in Japanese society.

"I have heard that women are sometimes sexually harrassed when riding on the subway system in Japan. A Japanese 'gentleman' once pinched my former boss on the behind. When she turned around, he realized she was an American and apologized. If she had been a Japanese woman, would this behavior have been acceptable?"

Terri doesn't get an answer. None of the diary entries come from Japanese women.

Doug, an American who lives in Japan, tries to capture the working conditions at large Tokyo companies. The best adjective, he decides, is "medieval."

"Imagine a huge office the size of the entire floor of a building," he writes. "Desks are crammed next to each other with no space even for bookshelves. There is no privacy, no quiet place to think.


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Doug earns good pay as a graphics programmer for Fujitsu. But his diary suggests that the chance to create complex animation sequences on some of the world's fastest supercomputers is more important to him than either money or living conditions.

As the manager of Publishing Services at The Source, Ellen writes and rewrites lists of things she needs to do. "Does that sound crazy?" her diary asks. Ellen has heard a lot about Japanese management techniques and work habits. Do Tokyo managers write lists? she wonders.

If they do, they aren't telling. Her Japanese counterparts answer by merely reciting all the things they accomplished that day.

Ellen's weekend project is to refinish an antique trunk that will help her use the limited space in her home. She wonders if the Japanese diarists living in crowded Tokyo would find her three-bedroom condo as cramped as she does.

It's nearly 1 in the morning when freelance writer and entrepreneur Izumi Azui sits down to make his diary entry. Sunday was a busy day: He spent the morning logged on to the telecommunications networks, catching up with several ongoing discussions, and then hurried off for lunch with a former colleague and his fiancée. They'd asked Izumi to be the master of ceremonies at their wedding, which was only a week away.

Japanese weddings feature a lot of speeches, and the main ones are given by executives from the bride's and groom's companies. "Very official," comments Izumi, "and usually very boring."

A week later, Izumi begins his final diary entry at the stroke of midnight. Another busy day. It took him an hour and a half on the train to get to the city of Zushi, where he appeared before

*(continues)*


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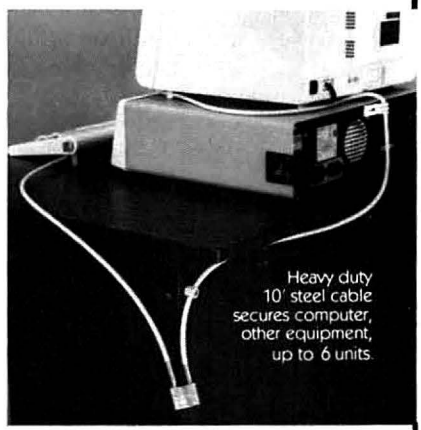

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the city's committee on the development of a local information network.

During the afternoon, Izumi visited a large software company to discuss changes in a new telecommunications package. At 6 p.m., he arrived at his consulting firm, met with two of his partners for about half an hour, then at 7 p.m. still had time for business calls.

When he finally hits the networks, Izumi reads a discussion about the on-line hunt for Angela, a child who disappeared in June. Her father, a bulletin board operator, has enlisted the resources of the networking community across the United States to help find her. Izumi thinks the search will make quite a story, and he has many questions. He composes a letter to Angela's father, finishes up a magazine article, and finally heads home.

Izumi worries that he may be talking more to on-line listeners than to his family, his diary reveals. So he tries to get his children interested in the "Week in the Life" project. Ten-year-old Miho, his second oldest daughter, agrees to join in.

Miho writes about getting a big role in her school play. Students had to learn their parts overnight; Miho did and still managed to make a diary entry. The rehearsal went well.

The following day is a holiday, and Miho spends a good part of it fixing dinner for her family. Her final diary entry, with a parenthetical explanation by her father, reads: "Gee, I felt tired. But tomorrow is Miho's birthday!! Fight!! [Japanese way of encouraging oneself.]"

To his dismay, Professor Shumpei Kumon of Tokyo University realizes he has been hooked up to The Source for 30 prime-time minutes, downloading several items, including the lengthy text of the United States's Electronic Privacy Act of 1986. "I

*(continues)*

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| Resort 460 files by EXT and be ready for next command | 1.3 | 117.2 | 2.2 | 5.2 | 8.2 | 3.9 | 120.1 |
| Find file on disk – worst time | 5.2 | 192.8 (C) | N/A | N/A (D) | 30.1 | 33.5 | 106.1 |
| Display directory map of drive C -Normal time | 0.6 | N/A | 28.0 | N/A | N/A | 0.8 | 24.7 |
| -Worst time | 5.5 | N/A | 28.0 | N/A | N/A | 31.9 | 24.7 |
| Return to directory list after running another program | 0.1 | N/A | 29.9 | 4.2 | 3.0 | 3.0 | 26.8 |
| See files on drive A, then return to map of drive C – worst time | 7.2 | N/A | 31.1 | N/A | N/A | 34.7 | 27.6 |
| Edit ANY file (up to 60K) in either normal or HEX mode? | YES! | NO | NO | NO (E) | YES | NO (E) | NO (E) |
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don't want to look at my phone bill!" he writes.

How Shumpei finds time to get on line at all, much less during prime time, isn't clear. Councils, government ministry discussions, and foundation board meetings take up a good deal of his time. He also teaches an average of one and a half courses per term and conducts three seminars. Fortunately, students are on break between terms, and Shumpei manages a lengthy diary entry for each of the conference's seven days.

After his expensive visit to The Source, Shumpei tries to log on to the Beeline conference of the Japanese information service TWICS (Two-Way Information and Communication System) but gets no response. He thinks it strange, but soon moves on to something else.

At noon he leaves home to attend the funeral of a friend's wife. It is raining hard, and Shumpei can't get a taxi. Two hours later, "wet to the bones," he arrives at the funeral.

"After seeing the remains off to the crematory," he writes, "I came to my office at the university, where I spent the late afternoon reading Professor Han's paper on Korea's value-added tax." After an informal meeting of the government tax commission and the Ministry of Finance about tax reforms, he arrives home at 10, completely exhausted.

Next morning, Shumpei again calls TWICS and succeeds in getting to the log-on sequence, but the system doesn't recognize him. After logging on as a stranger, he discovers all the many conferences he had been participating in have disappeared—even the conference for complaints! In a panic, he mails three messages in a row to the system operator.

Only then does he enter the one remaining conference and discover that the system has crashed. Via a

*(continues)*

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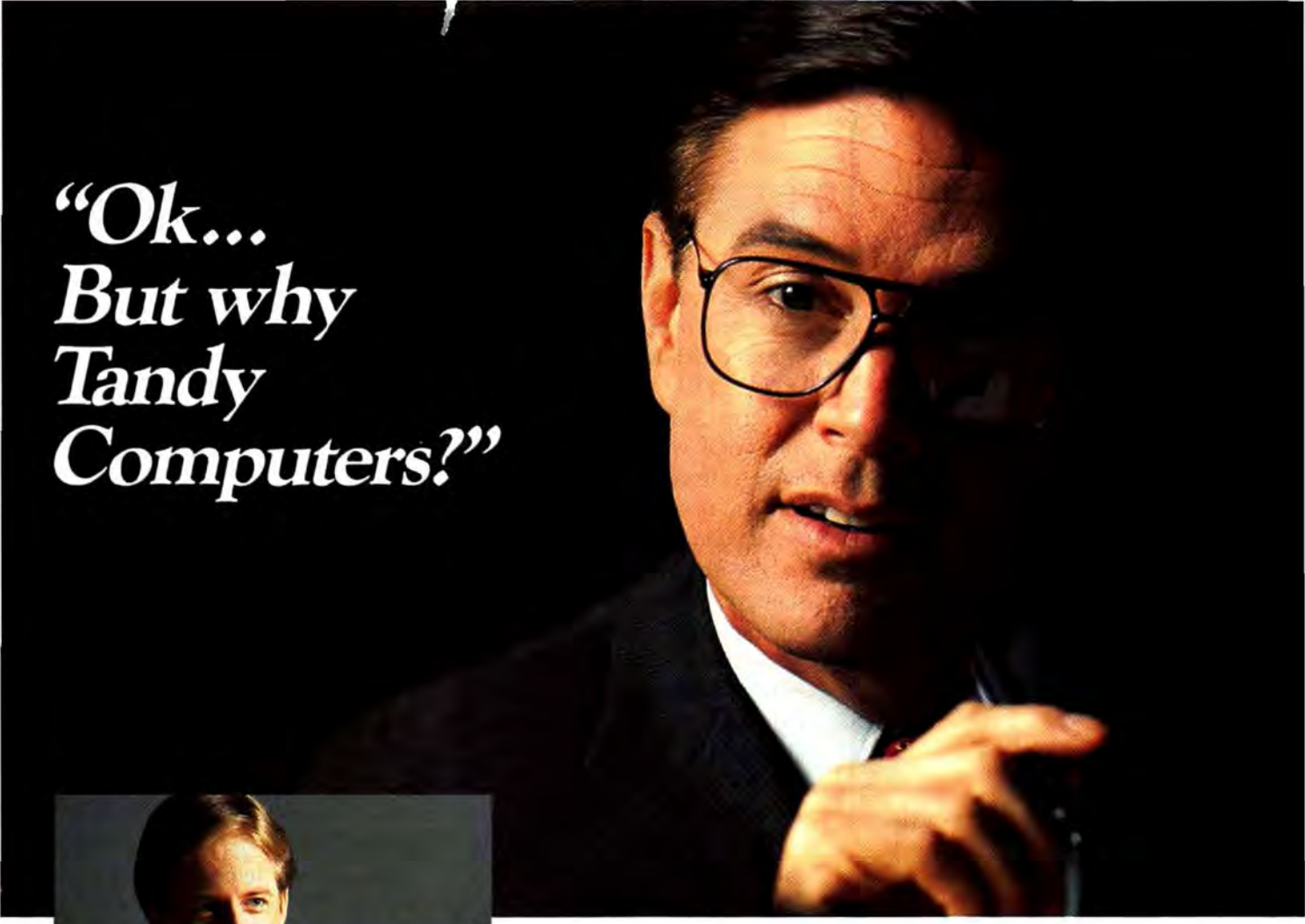

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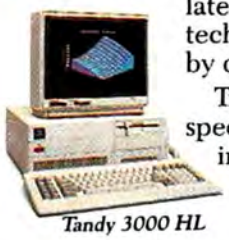

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complicated Japanese play on words, the discussion compares the system operator to the captain of a ship weathering a typhoon.

"I blushed with shame," Shumpei writes, when he realized that the SYSOP was making superhuman efforts to restore the system and that other friends had gathered around him electronically with encouragement and support. Shumpei sends notes of apology and "rejoins this wonderful electronic community."

The following day, a journalist writing about office work and management asks Shumpei how electronic networking will alter work relations. "I emphasized the necessity of forming club-like organizations for workers," Shumpei reports later, "which they can join as associates and receive advice and services concerning childbearing, education, vocational training, employment, health, marriage, and travel.

"In the future information society, producers and sellers will play quite different roles from what they play now. Rather than acting as independent corporations and trying to make business in the market, they will be directly, though loosely, connected to those club-like associations of citizen-workers and provide services on special contracts."

Shumpei spends the afternoon at a symposium on citizens' culture and corporate culture. Afterwards, the forum members decide to set up a working group on culture and information, which Shumpei agrees to chair. He asks his on-line friend Izumi Azui to serve as a member.

This is the day Toshihiro Tsubo has opened the phone lines to Japan's first Kanji-based conferencing system. But his diary entry, as well as all others transmitted by Japanese participants in "A Week in the Life," is made on a system that employs Kana, a phonetic representation of Japanese in the Roman alphabet.

"Kanji is the Japanese variation on Chinese characters and is one of the big hurdles in processing the Japanese language," Toshi explains. "We have 2965 Kanji characters in the first JIS [Japanese Industrial Standard characters] category and 3384 Kanji characters in the second category. How big an amount in comparison with 26 characters of the [Kana] alphabet!"

He spends part of the day with two recruits who form a conference for "networkers who enjoy alternative life-styles." They seem unsure about what they're getting into, so Toshi does some cheerleading on the huge potential of on-line communications.

That afternoon, Toshi walks to the bank of the Tama River and lets the sun shine on his face as he reads a Raymond Chandler novel. He looks across to the district of Shinmaruko where Professor Shumpei, his friend from TWICS, lives. "We've never met face to face," he writes, "but we know each other well. I ask myself, 'Where are we headed going the networking way?'" ●

*Kevin Strehlo hunts for PC tales from an office overlooking Silicon Valley.*

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| 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 |
| 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 |
| 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 |
| 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 |
| 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 |
| 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 |
| 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 |
| 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 |
| 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 |
| 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 |
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| 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 |
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| 997 | 998 | 999 | | | | | | | | | |

***1. Your primary job function:***
a. Corporate or general manager
b. Department manager
c. MIS manager
d. Professional
e. Other

***2. Number of employees in your company:***
1. 25 or fewer
2. 26-99
3. 100-499
4. 500-999
5. 1000 or more

***3. Plan to buy:***
a. Now
b. In 4-6 months
c. In 7-12 months
d. More than 12 months from now
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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
| 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 |
| 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 |
| 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 |
| 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 |
| 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 |
| 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 |
| 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 |
| 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 |
| 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 |
| 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 |
| 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 |
| 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 |
| 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 |
| 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 |
| 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 |
| 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 |
| 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 |
| 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 |
| 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 |
| 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 |
| 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 |
| 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 |
| 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 |
| 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 |
| 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 |
| 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 |
| 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 |
| 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 |
| 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 |
| 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 |
| 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 |
| 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 |
| 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 |
| 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 |
| 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 |
| 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 |
| 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 |
| 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 |
| 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 |
| 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 |
| 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 |
| 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 |
| 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 |
| 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 |
| 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 |
| 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 |
| 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 |
| 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 |
| 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 |
| 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 |
| 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 |
| 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 |
| 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 |
| 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 |
| 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 |
| 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 |
| 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 |
| 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 |
| 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 |
| 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 |
| 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 |
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| 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 |
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| 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 |
| 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 |
| 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 |
| 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 |
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# Advertiser Index


| Reader Service Number | |
|---|---|
| | AST Research, 8-9 |
| 433 | AT&T, 172 |
| 964 | Abaton Technology Corp., 180 |
| 944 | Advanced Digital Corp., 19 |
| 929 | Aicon Systems, 100 |
| 978 | Aldus, 44-45 |
| 593 | Amazing Things, Inc., 11 |
| 770 | American Computer & Peripheral, 142 |
| 771 | American Computer & Peripheral, 142 |
| 203 | American Micro Technology, 72 |
| 916 | American Programmers Guild Ltd., 18 |
| 543 | American Small Business Computers, 33 |
| 846 | American Technologies, Inc., 71 |
| — | Anthro Corp., 26 |
| 10 | Apparat, 350 |
| 754 | Application Techniques, 90 |
| 825 | Arlington Computer Products, 334-335 |
| 867 | Ashton-Tate, 307, 309, 311, 313 |
| — | Autodesk, Inc., 54 |
| 17 | Avery Int'l., 68 |
| 783 | BIT Software, 28 |
| 372 | BarComp, 132 |
| 317 | Barr Systems, 130 |
| 504 | Barrington Systems, Inc., 99 |
| 845 | Bible Research, 132 |
| 481 | Borland Int'l., IFC-1 |
| 984 | Broderbund, 101 |
| 705 | Brooks Power Systems, 368 |
| 808 | Brother, 349 |
| 865 | Bulldog Computer Products, 302-303 |
| 452 | Catamount Corp., 316 |
| 154 | Cauzin, 186 |
| 904 | Chicago Computer Connection, 339 |
| 60 | ChipSoft, 188 |
| 871 | ChipSoft, 188 |
| — | Citibank, 161-162 |
| 999 | Citizen, 86 |
| 879 | Command Technology, 48 |
| 416 | CompuCover, 376 |
| 856 | CompuServe, 370 |
| 90 | Compuclassics, 340 |
| 823 | Computer Associates, 39 |
| 91 | Computer Discount Warehouse, 336 |
| 677 | Computervision Corp., 191 |
| 747 | Concentric Data Systems, 173 |
| 276 | Contemporary Computerwear, 376 |
| 346 | Cordata, 138 |
| 695 | Cottage Industries, 146 |
| 275 | Crosstalk, 348 |
| — | Curtis, IBC |
| 534 | DCA, 164-165 |
| 602 | DEST Corp., 124-125 |
| 33 | Dac Software, 47 |
| 969 | Dac Software, 49 |
| 691 | Diskette Connection, 330 |
| 288 | Ditron, 358 |
| — | Dresselhaus Computer Products, 102 |
| 510 | Eastern Enterprises, 338 |
| 292 | Eastman Kodak, 51 |
| 817 | Electric Software Corp., 63 |
| — | Epson, 76-77 |
| 773 | Fifth Generation Systems, 154 |
| 775 | Fifth Generation Systems, 154 |
| 913 | Filtrex Research, 128 |
| 71 | Fox & Geller, 27 |
| — | GE Information Services, 67 |
| 927 | GSI, 85 |
| 755 | Gazelle Systems, 372 |
| 5 | General Information Technology, 106 |
| 877 | General Parametrics Corp., 59 |
| 952 | Generic Software, 58 |
| 78 | Genest Technologies, Inc., 22 |
| 972 | Genicom, 66 |
| 819 | Global Computer Supply, 306 |
| 637 | Golden Bow Systems, 350 |
| 563 | Grafpoint, 314 |
| 891 | H & E Computronics, 150 |
| 442 | HDG Software, 30 |
| 489 | Haventree Software Ltd., 52 |
| 77 | Hercules, 325 |
| 240 | Hersey Micro Consulting, 350 |
| 394 | Houston Instrument, 31 |
| — | HowardSoft, 301 |
| 355 | Hyper-Micro, 358 |
| 796 | IDEAssociates, 184-185 |
| 795 | IDEAssociates, 187 |
| — | Indian Ridge Enterprises, 139 |
| — | Infinity Computer Products, 320 |
| 756 | Int'l. Battery Corp., 97 |
| 300 | Intel, 24-25 |
| 995 | Intellisoft, 103 |
| 1 | Intuit, 367 |
| — | Kensington, 168 |
| 577 | Keytronic, 181 |
| — | Keyword, 374 |
| 733 | Lionheart, 358 |
| 467 | Logicsoft, 145 |
| 459 | Logicsoft, 147 |
| 463 | Logicsoft, 149 |
| 461 | Logicsoft, 151 |
| 468 | Logicsoft, 153 |
| 469 | Logicsoft, 155 |
| 598 | Logitech, 137 |
| — | Lotus Development Corp., 16-17, 74-75, 116-117, 276-277 |
| 942 | Lyben Computer Systems, 68 |
| 253 | Macola, 167 |
| — | Magnavox, 40 |
| — | Maxell, 42 |
| 98 | Maynard, 5 |
| — | McGraw Hill, 81 |
| — | Megahertz Corp., 60 |
| 639 | Merritt Computer Products, 306 |
| 632 | Micro Computer Business Services, 373 |
| — | Micro Logic Corp., 105 |
| 739 | MicroCom Systems, 88 |
| 302 | MicroComputer Accessories, 176 |
| 26 | MicroComputer Accessories, 176 |
| 560 | MicroStar, 346 |
| 718 | Micrografx, 23 |
| 103 | Microprocessors Unltd., 194 |
| — | Microsoft, 61 |
| 908 | Migent Software, 364 |
| 813 | Mylex, 177 |
| 14 | NEC Home Electronics, 158-159 |
| 194 | NEC Home Electronics, 193 |
| 909 | NEC Home Electronics, 195 |
| 124 | NEC Information Systems, 10 |
| 758 | NEC Information Systems, 190 |
| 737 | NEC Information Systems, 315 |
| 12 | New England Software, 41 |
| 434 | Nitro Micro, 333 |
| 533 | Office Solutions, 183 |
| 133 | Orchid, 14 |
| 742 | PC American, 98 |
| — | PC Connection, 226-229 |
| 525 | PC Mart, 196-197 |
| 460 | PC Network, 342-345 |
| 293 | PC-SIG, 128 |
| 588 | Panasonic, 317 |
| 229 | Paperback Software Int'l., 368 |
| 475 | Paperback Software Int'l., 369 |
| 496 | Paperback Software Int'l., 371 |
| 388 | Patton & Patton, 194 |
| 614 | Paul Mace Software, 92 |
| 674 | Peachtree Software, 107 |
| 960 | Peripheral Mktg., 190 |
| 238 | Perry Computer, 46 |
| 236 | Personal Computer Support Group, 189 |
| 604 | Personal Computer Support Group, 96 |
| 628 | Peter Norton Computing, 64 |
| 777 | Pick Systems, 62 |
| 359 | Polaris Software, 146, 152 |
| 241 | Polaroid, 95 |
| — | Prentice-Hall, 129 |
| 296 | Princeton Graphics Systems, 304 |
| 306 | Princeton Graphics Systems, 69 |
| 881 | Q.W. Page Associates, 70 |
| 983 | QIC Research, 38 |
| 616 | Quadram, 87 |
| 475 | Qualstar Corp., 314 |
| — | Quill Corp., 65 |
| 937 | Racore Computer Products, 144 |
| 371 | Radio Shack, 375 |
| 328 | Rainbow Technologies, 314 |
| 297 | Rolodex Corp., 143 |
| 926 | Royal American Technologies, 123 |
| 431 | SBT, 361 |
| 844 | SPSS, Inc., 331 |
| 618 | STSC, 359 |
| — | Safeware, 56 |
| 425 | Seagate, 169 |
| 4 | Seaware Corp., 330 |
| 886 | Secure-It, 369 |
| 457 | Server Technology, 319 |
| 380 | Silicon Express, 337 |
| 850 | Soft/Plus Research, 128 |
| 648 | SoftCraft, Inc., 131 |
| 559 | SoftLogic Solutions, 89 |
| 447 | SoftLogic Solutions, 91 |
| 744 | SoftLogic Solutions, 93 |
| 711 | Softklone, 56 |
| 874 | Software Directions, 79 |
| 8 | Software Link, The, 29 |
| 9 | Software Link, The, 34 |
| — | Software Publishing Corp., 20-21, 127, 133, 141, 171 |
| 301 | Software Solutions, 134-135 |
| — | Software Studios, 102 |
| 449 | SourceMate, 192 |
| 748 | Springboard, 175 |
| 319 | Star Micronics, 94 |
| 497 | StatSoft, 92 |
| 308 | SubLogic Corp., 318 |
| 139 | SubLogic Corp., 6 |
| 790 | Symantec, 156 |
| — | Sysgen, Inc., 55 |
| 970 | Sytek, 104 |
| 454 | Tandon, 355 |
| 329 | Tech PC, 36-37 |
| 331 | Tech PC, 36-37 |
| 859 | Technoland, 341 |
| 701 | TeleVideo, 12 |
| — | Telemart, 323 |
| — | Texas Instruments, 82-83 |
| 213 | Timeworks, 13 |
| — | Toshiba, 57, 120-121, 362-363 |
| 405 | USRobotics, 329 |
| 21 | Uptime, 7 |
| — | VLM Computer Electronics, 306 |
| 193 | Ven-Tel, BC |
| 584 | Verbatim, 357 |
| 152 | Victor Technologies, 351 |
| 681 | Video Seven, Inc., 78 |
| 220 | Warehouse Data Products, 366 |
| 486 | Wells American, 53 |
| 165 | WordPerfect Corp., 275 |
| 2 | Wordtech Systems, 353 |
| 312 | Worthington Data, 371 |
| 278 | Xidex Corp., 194 |
| 182 | Z-Soft, 50 |

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# March Preview

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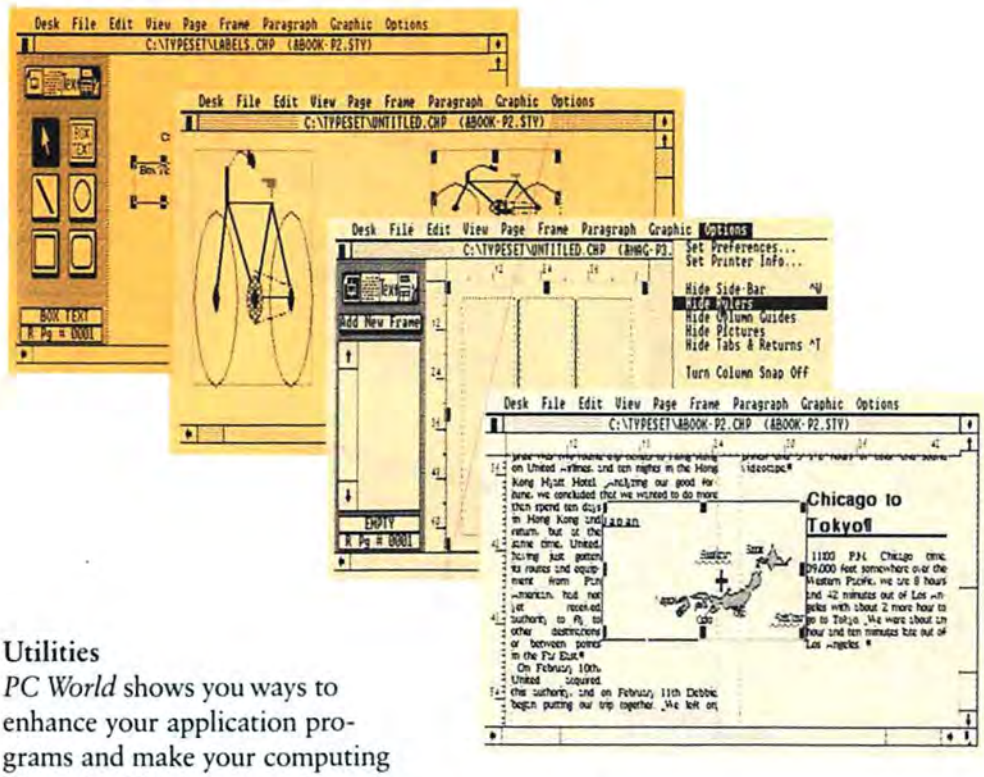


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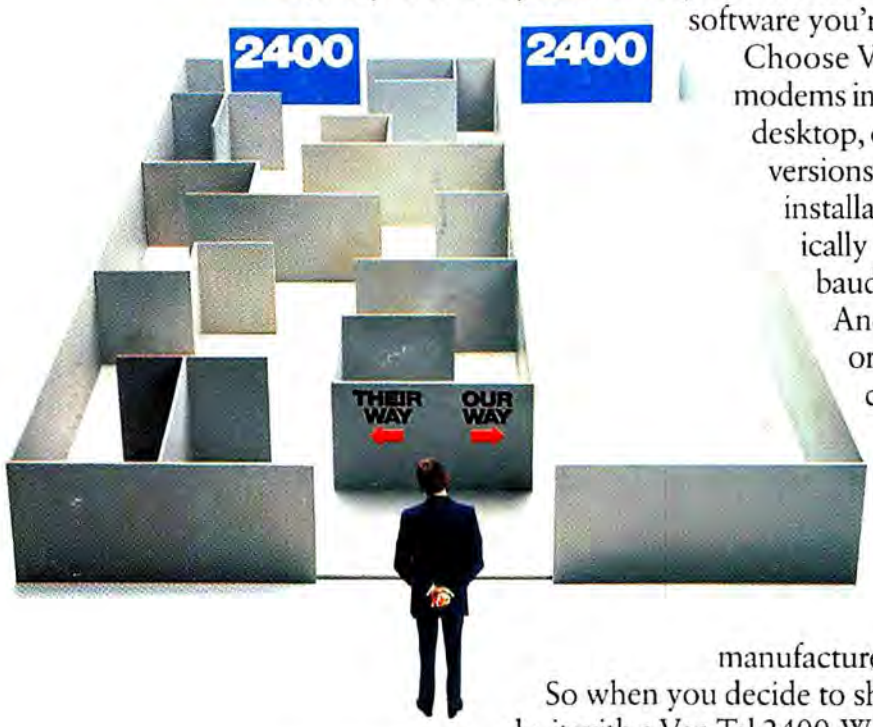


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