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PC WORLD

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*The Comprehensive Guide to
IBM Personal Computers and Compatibles*

Annual Review

Pacesetters for '86

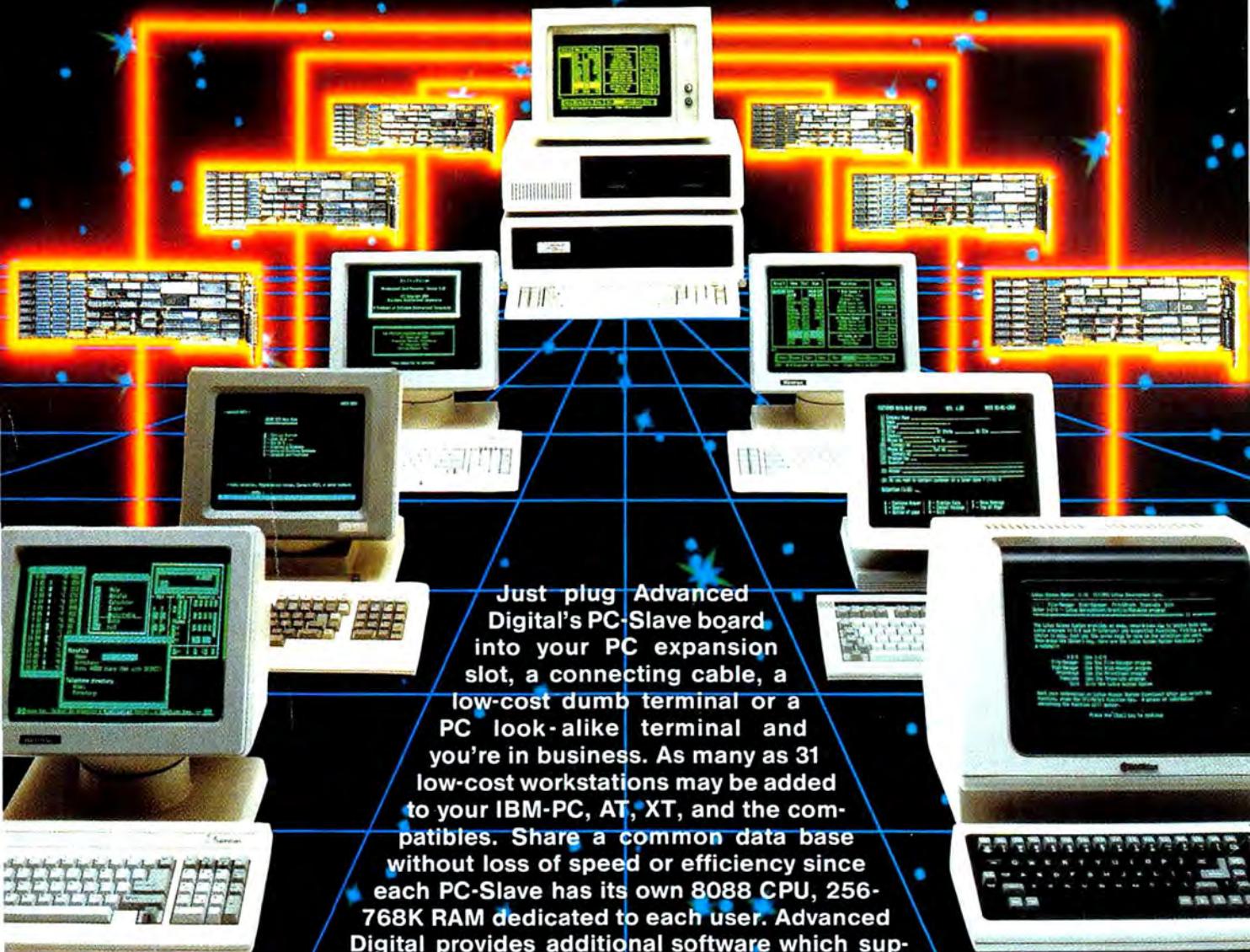
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PC WORLD

The Comprehensive Guide to IBM Personal Computers and Compatibles
December 1985

Annual Review



Talk of the Times

106 A handful of the computer industry's best and brightest gathered for the first *PC World Forum*—and, despite recent pronouncements of gloom, came to praise the state of personal computing, not to bury it.

■ PC World Forum

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■ Word Processing

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Take your pick, Goldilocks. This year it's different keystrokes for different folks as word processing vendors hawk programs for every bear in the forest.

■ Printers

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Daisy wheels wilted, dot matrix printers flourished, and lasers began to bloom as 1985 saw the printer marketplace change from the Garden of Eden to the Jungle of Survival.

■ Spreadsheets

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While spreadsheets from the simple to the sophisticated stuck close to a popular interface, it was also a year of major facelifts and a few new faces.

■ Integration

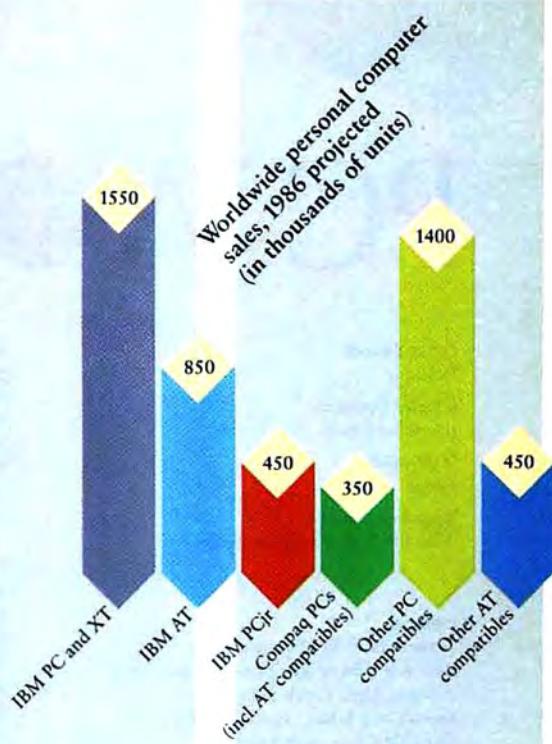
224 *Environmental Impact, Darcy DiNucci*

This year the integration crown passed from multifunction packages and product families to the integrating environment. IBM's *TopView* jostled with *Microsoft Windows*, and the future of integration emerged.

Systems

232 Committed to Memory, *Ken Greenberg*

As power users called the shots, computer builders and board makers pulled out the stops—including the “impenetrable” 640K barrier.



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Speedy modems and complex software are expanding telecommunications, but it's not getting any easier to log on.

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270 Net Results, *Steven Cook*

When IBM and Microsoft talked, local area network vendors listened—but users, finally sensing order in the marketplace, proved the year's real winners.

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Data management programs carefully mixed simplicity and power this year. File management programs added musculature, established heavyweights put on kid gloves, and a new breed of mid-range programs struck a cautious balance in between.

Storage

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Drive C; or Bust! was the rallying cry in 1985 as hard disk companies rushed to fill empty slots in the XT, the AT, and a passel of clones. While a boon for buyers, 'twas a fool's gold rush for vendors who discovered the laws of supply and demand too late.

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PC WORLD

December 1985
Volume 3, Number 12

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PC World™ (ISSN 0737-8939) is published monthly at \$23.75 for one year (12 issues), \$42.75 for two years (24 issues), \$57.75 for three years (36 issues) by PC World Communications, Inc., 555 De Haro St., San Francisco, CA 94107. Foreign orders must be prepaid in U.S. funds with additional postage. Add \$12 per year from Canada and Mexico; add \$25 per year for surface mail or \$110 per year for airmail from all other countries. For subscriber service questions call toll-free 800/525-0643 (in Colorado 303/447-9330) or write: Subscriber Services, P.O. Box 55029, Boulder, CO 80322-5029. To place new orders call 800/628-2900 (in Nebraska 402/895-7284). Second-class postage paid at San Francisco, POSTMASTER: Send address changes to PC World, Subscription Dept., P.O. Box 55029, Boulder, CO 80323-5029. Editorial and Business offices: 555 De Haro St., San Francisco, CA 94107, 415/861-3861. CompuServe 74055,412 The Source STE908

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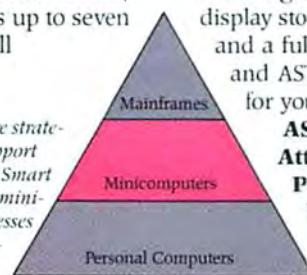
AST's family of smart connections are strategically focused and developed to support and evolve in concert with the IBM Smart Office architecture. Highlighting the minicomputer group here, AST also addresses connectivity in mainframe and personal workstation environments.

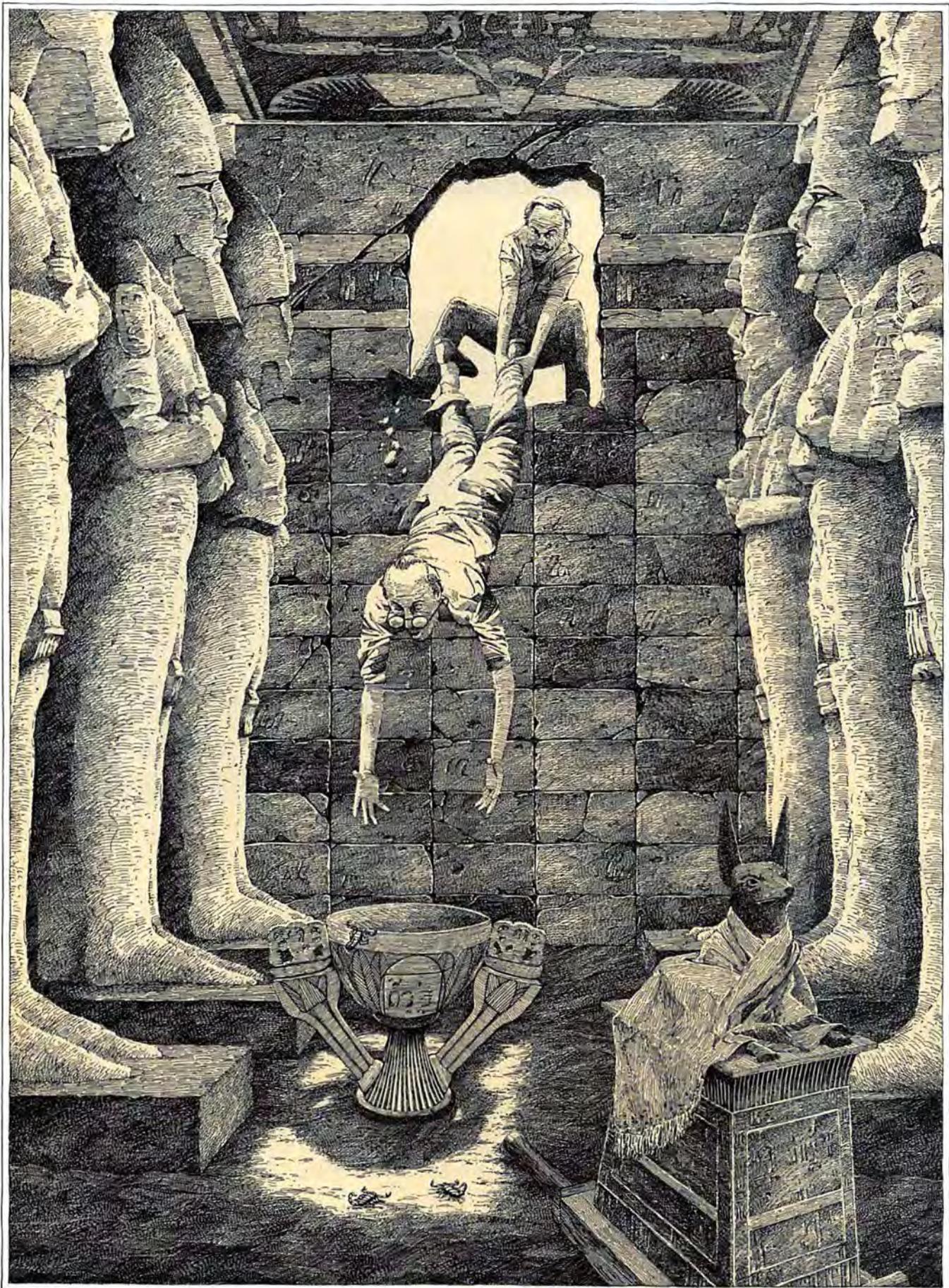
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—Alvin Toffler

A technological revolution is supposed to happen overnight, but it usually evolves at a snail's pace until it suddenly becomes a fait accompli. For instance, automobiles, televisions, and even VCRs experienced slow starts; then, voilà! they were everywhere.

Telecommunications is no exception to this pattern. Marcia Kelly, president of Electronic Services Unlimited, a telecommunications consulting group, estimates that over five million people now telecommunicate to work—at least part time. Over 100,000 are participating in formal telecommuting programs in some 400 companies, including giants such as Pacific Bell, IBM, ComputerLand, and Hewlett-Packard.

In 1973, when Jack Nilles of the University of Southern California's Center for New Futures Research coined the term *telecommunications*, a new chapter was added to Sir Thomas More's *Utopia*. Predictions abounded that soon we'd all be sitting out in the sun and fresh air, reading our office mail and doing our business

plans via telephone links to the company's central computer.

The dream is coming true, and people are telecommuting—but from cars, hotel rooms, and satellite offices. When implemented correctly, telecommunications cuts costs and increases productivity. Employees eliminate commuting time and expenses, and they work more efficiently without the countless interruptions that inevitably occur in the office. Companies experimenting with telecommuting experience less turnover and find that their employees are healthier. These corporations are also able to hire disabled or housebound people without having to expand or customize office space.

Despite all its virtues, telecommunications isn't for everyone. Some people just aren't self-starters and require the motivation of the office environment to work. Others fear they might lose track of company politics and thus opportunities for advancement. To

(continues)

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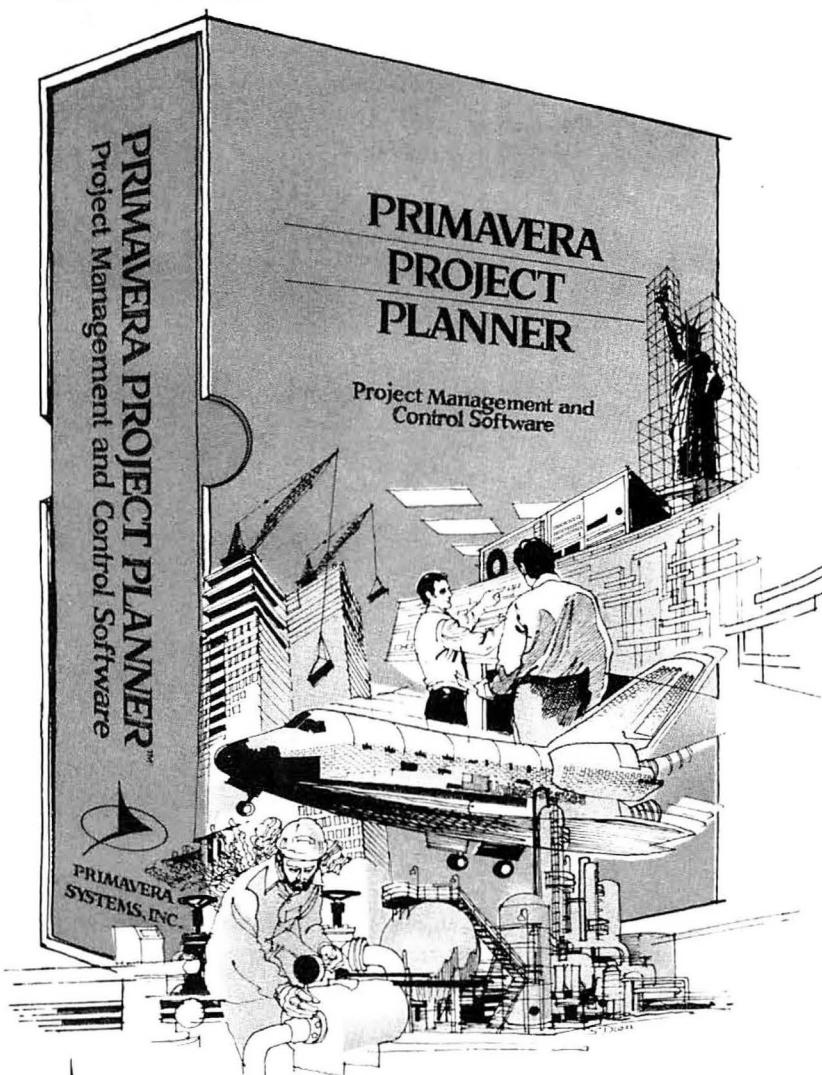
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compensate for such alienation and isolation, Electronic Services Unlimited recommends that all employees go into the office once or twice a week.

The luxury of going to the office, however, isn't always possible. I recently had the opportunity to put hard-core telecommuting to the test when I went on an 11-day business trip to Miami, Washington, D.C., and New York. My staff in San Francisco had received several test subscriptions to AppleLink, the on-line network that Apple Computer developed with General Electric's GEISCO for Apple dealers. We were curious to see how well we could communicate without resorting to Federal Express. Since my Macintosh is much easier to tote around than my Compaq Deskpro, I packed up my Mac and a Hayes 1200B modem and hit the road.

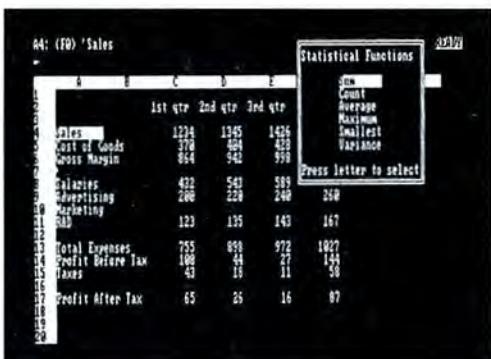
After arriving in Miami for an electronics conference, I encountered my first problem: the phone in my hotel room didn't have a modular jack. I couldn't connect my modem. Although convinced that the concierge wouldn't know what I was talking about, I rang the front desk. To my surprise he said, "One moment, sir, I'll connect you to the telephone department."

After speaking with the telephone manager, who assured me that a new jack would be installed

(continues)

You're just \$89.95 away from making your \$500 software work.

Your \$500 software isn't worth two cents if it's not working as hard as it should. That's why there's the \$89.95 Keyworks™ keyboard macro. With Keyworks, getting the most from your software is easy, because Keyworks lets you customize virtually any PC software to meet your needs.



Design your own menus

All keyboard macro programs let you record long sequences of key-strokes and then play them back with a single key. But Keyworks takes the simplicity of macro programs a giant step further. With Keyworks, you can actually design your own menus and pop them onto the screen whenever you need them. Commands are never overly complex or confusing, because Keyworks lets you simplify them.

DOS Functions

Keyworks also offers you access to all common DOS functions from within your program. Imagine being able to format a disk or check a directory without having to exit from the program you're working in!

Of course Keyworks is packed with other convenient features like a full screen editor so that you can instantly

change your macros, a file encryption feature to keep your sensitive files secret, a screen saver to protect your monitor and text-only macros that let you design helpful prompts. With its unique "context sensitive

menus" and extensive on-line help,

Keyworks is not only the most powerful keyboard macro, it's also the easiest. Keyworks is the one PC Week called "miles ahead of the competition."

If you're in Lotus 1-2-3, you could pop up a menu, select Count and your macro would play back, typing out @ COUNT().



Press F1 to get a list of all the pop-down menus

Or you could simplify your WordStar control codes by designing your own menus.

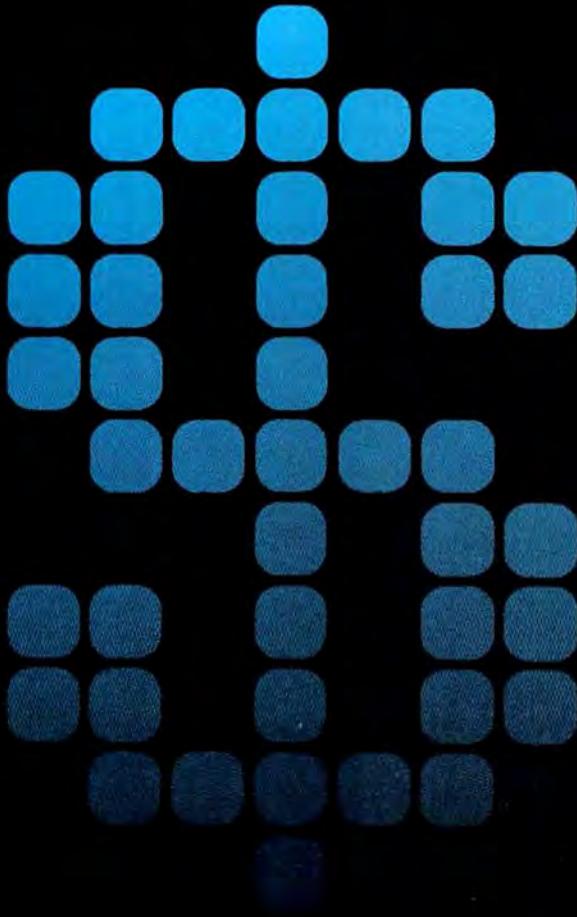
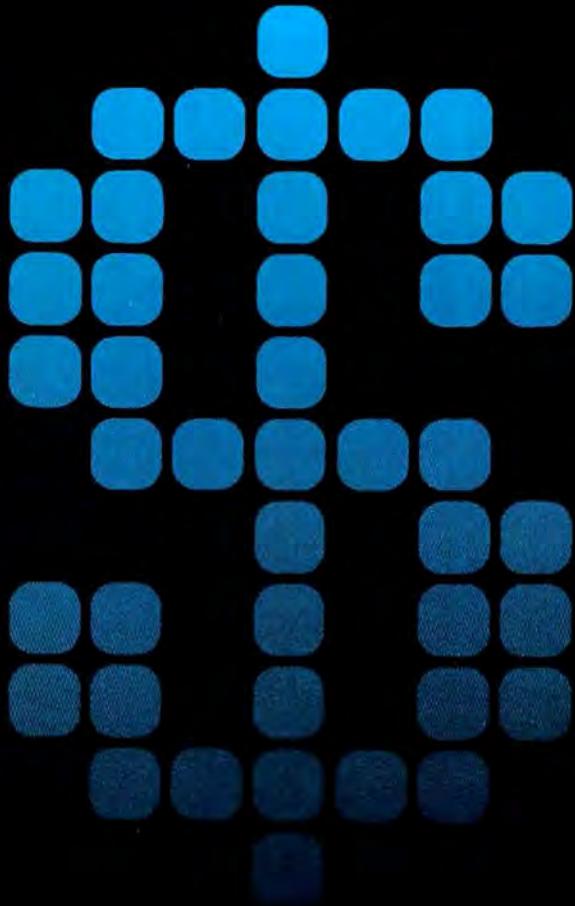
Money-back guarantee We're so sure you'll love Keyworks that we give you a sixty day money-back guarantee. So now don't you think you and your \$500 software deserve the simplicity and power of the \$89.95 Keyworks keyboard macro?



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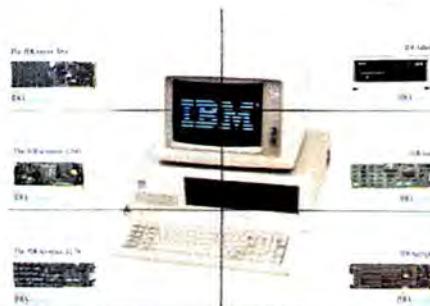
Like every IDEAbord, the Supermax comes with our free library of software, including IDEAmenu, RAMfloppy, Printer Spooler, Diagnostics, Clock Routine, and more.

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At last! - Fast, On-screen

FLOWCHARTS

And Organization Charts

Finally! An on-screen flowchart processor that knows about flowcharts and organization charts - not just another "screen draw" program that makes you do most of the work.

Interactive EasyFlow is a powerful full-screen graphics program dedicated to flowcharts and organization charts. With this program you can quickly compose charts on the screen. More important, you can easily modify charts so they are always up to date.

Features: • Text is automatically centered, character by character, within shapes as you type it. • Lines are created by specifying the starting and ending points - the program automatically generates the route. • Powerful editing facilities allow shapes and even entire rows and columns of shapes to be inserted or deleted; lines are automatically re-routed as necessary. • Large chart size (up to 16 shapes wide by 16 shapes high) allows very large flowcharts and organization charts to be handled with ease. • Charts can be larger than the screen - the window into the chart scrolls both horizontally and vertically as necessary. • Flexible printer interface allows it to work with all printers, not just

dot matrix printers. Wide charts can be printed in strips. Also works with Hewlett-Packard (and compatible) plotters. • Eighteen standard flowcharting shapes included. • User defined shapes can be added to the shape library. • The manual is extensive (125 pages) and includes many examples. • On-line "help" facility provides immediate assistance at any time. • Any number of titles can be placed on a chart. • Commentary text blocks can be placed anywhere in the chart. • Plus many more features than we can mention here.

Requires an MSDOS or PCDOS machine equipped with an IBM color/graphics compatible adapter and at least 256K of memory. Runs under DOS 1; contains full support for DOS 2.

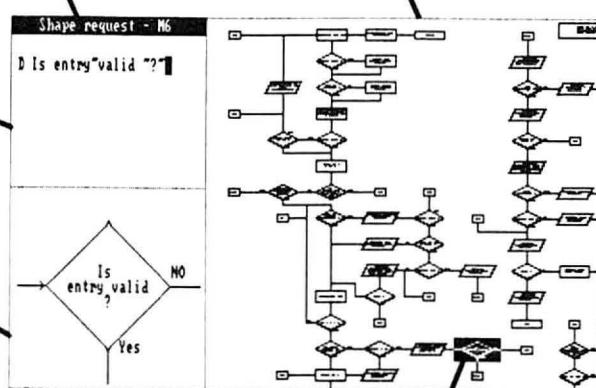
Only \$149.95 + \$2.00 S&H (USA/Canada), \$10.00 (foreign). Payment by MO, check, VISA, COD or Company PO.

The sample screen display shown below is typical of what you see while editing a chart. Other screen displays are provided for entering titles, changing options, getting "help" and so on.

STATUS BAR (not to be confused with a wet bar) tells you what Interactive EasyFlow is doing at all times.

CHART WINDOW gives an overview of your chart; this example shows the "normal" view. "Close-up" view shows a smaller part of the chart in more detail. "Wide-angle" view shows a larger part of the chart at reduced size.

TEXT/MESSAGE WINDOW used to enter user text and to display messages from Interactive EasyFlow.



HavenTree Software Limited
P.O. Box 1093-M
Thousand Island Park, NY 13692
(613) 542-7270 ext 47

Circle 348 on reader service card

immediately, I left to attend a 2-hour seminar. When I returned, the modular jack was in place.

With the deliberation of a surgeon about to make the first cut, I assembled my tools. My Mac running, modem connected, and software loaded, I clicked the phone icon. The reassuring sound of the Hayes dialing the local AppleLink access number soothed my nerves. One ring, click, and static—the sound of two computers shaking hands. I was connected. There was mail in my in-basket. I was in tele-communicator's heaven.

The honeymoon lasted for the three days that I was in Miami. I had it all. The swimming pool, the sunshine, the golf course, and telecommuting. I could send mail to anyone in the home office, read messages, and even transmit and receive files. One of my contractors sent a *ThinkTank* outline that I was able to download and review. We even used a combination of the AppleLink system and our Tymshare network to convert a *WordStar* file to *MacWrite*. At one point, I communicated with an associate also away on business. Neither of us knew where the other was, and had we been at home, we probably wouldn't have connected—but on line we made a great team.

The bubble burst when I left Miami. I called the hotel in Washington, D.C., to verify that the rooms had modular jacks, but

(continues)

"Dac-Easy Accounting is a genuinely amazing deal."

PC Magazine, October 15, 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.

"Amazing". "Incredible". "Unbelievable". That's how the industry's most important reviewers describe Dac-Easy Accounting—Dac Software's feature-packed, fully integrated accounting package priced at only \$69.95. They compare it favorably to accounting packages (sold module by module) costing up to five thousand dollars!



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"Dac-Easy is remarkable, amazing, revolutionary, sensational..."

Computer Buyer's Guide & Handbook
September 1985

PARTIAL LIST OF FEATURES

General Information

- Menu driven
- Password protection
- File capacity limited only by disk space
- Support contract available

General Ledger

- Unlimited multi-level accounts
- Three-year account history for CRT inquiry
- Pencil and pen feature to correct mistakes
- Unique budgeting routine
- CRT transaction inquiry
- Activity report, trial balance, financial statements, unlimited departments and journals

Accounts Receivable

- Open invoice or balance forward
- Customized aging report
- Unlimited number of customers
- Flexible mailing labels and directories
- Supports partial payments & finance charges
- Three-year customer history for number of invoices, sales, costs, and profits
- Customized statements
- Cash flow analysis/sales analysis
- Automatic sales forecasting

Accounts Payable

- Check printing with multiple invoices and cash available routines
- Aging reports with seven customized columns
- Unlimited number of vendors
- Flexible mailing labels and directories
- Three year vendor history
- Unlimited allocations per invoice

Inventory

- Supports average, last purchase, and standard costing methods
- Powerful physical inventory routines
- Accepts any unit of measure
- Three-year product history in units, dollars, cost, and profits
- Automatic forecast of product sales
- Automatic pricing assignments
- Alert and activity reports with 11 sorts
- CRT shows on-hand/on-order/committed sales/cost/profit/turns/GROI

Purchase Order

- Inventory and non-inventory items
- Allows up to 99 lines per P.O.
- Per line discount in %
- P.O. accepts generic discounts/freight/taxes/insurance
- P.O. accepts back orders and returns
- Purchase journal

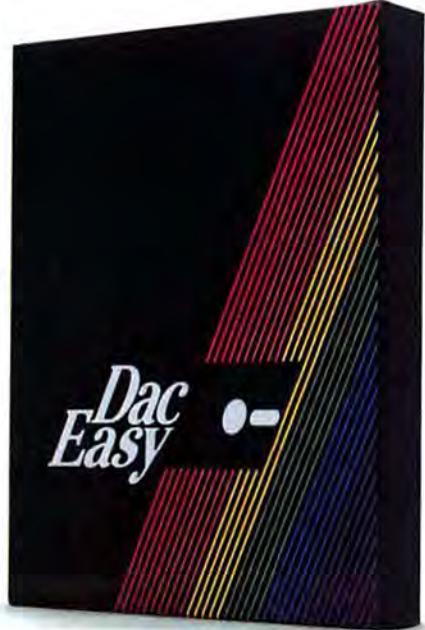
Billing

- Service or Inventory invoicing on plain or preprinted forms with remarks
- Prints sales journal
- Allows return credit memo

Forecasting

Unique program that automatically forecasts using your three-year history:

- Revenue and expense accounts
- Vendor purchases
- Customer sales, cost, and profit
- Inventory item usage
- Forecast by same as last year, or % base from last year, or trend, or least square trend line analysis method



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Minimum Hardware Requirements:
IBM (PC, XT, or AT)¹ or other compatibles. 128K memory, one 5 1/4 DSDD floppy disk, 132 column printer in compressed mode, 80X24 CRT, MS-DOS², PC DOS¹ 2.0 or later.

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Dac-Easy Accounting

312A

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

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

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Now there's the LA210™ Letterprinter, compact and flexible enough to do the job of 2 printers. Or 3. Or 4. Because the LA210 gives you a serial interface to match Digital's own complete line of systems, and an available parallel interface for the IBM personal computer and compatibles. You can even order plug-in cartridges that emulate three of the most popular IBM compatible printers.

Which means, quite simply, you can expand your computing capabilities any way you see fit. For word processing, data processing, bit map or mosaic graphics. For VAX™,

PDP-11™ or any other Digital system, as well as the IBM environment, too.

And you don't need to worry about spending a lot of money for a new printer for each system.

THE LA210 DELIVERS WHAT YOU NEED WHERE YOU NEED IT.

The LA210's system inde-

pendence is rivalled only by its general versatility.

For applications with reams of output, like business accounting or complex scientific programming, the LA210's 9x7 dot matrix printhead will print up to 240 characters per second, or a full double-spaced page every 10 seconds.

But when your needs

change, so can the LA210.

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

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

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



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

Plug-in cartridges also allow the LA210 to emulate three of the most popular IBM compatible printers - the IBM Graphics Printer, the Epson MX80™ with

mosaic graphics, and the MX80 with Graftrax™ bit map graphics. So you can produce charts and graphs with all the resolution and professional look of bit map graphics. Yet still retain complete compatibility with software that generates mosaics.

All without a hitch. All without compromising a bit of the power of the software you're using.

STANDARD EQUIPMENT THAT OTHERS CALL OPTIONS. AND OPTIONS OTHERS CAN'T MATCH.

It wouldn't make sense for a printer this versatile to lack any of the features you really need.

So standard equipment includes a 2k buffer and adjustable forms tractor with acoustic cover. Making the LA210 one of the quietest printers in its class as well as one of the fastest.

Add the optional bi-directional tractor, and you can easily handle superscripting and subscripting and full page reverse for multiple column printing.

There's even a cut sheet



feeder to speed up correspondence on your letterhead.

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

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No matter what your office needs may be, Digital has you covered with the new LA210.

You can work with systems within Digital's broad line of personal computers, within any of our larger systems - all the way up to the largest VAXcluster™ systems - or within the IBM PC environment.

You can handle mountains of throughput at draft speed, or print professional looking letters with near-letter quality. You can print bit map or mosaic graphics.

You can even customize documents - word by word or letter by letter if need be - with a broad range of type faces and special effects.

All with a single printer.

So whether you already have a number of different systems in place and want the economies of a single printer that can handle them all, or you just want the added flexibility for future expansion, no single printer handles all your problems like the LA210 from Digital.

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LETRIX resides in memory between your software and printer, responding automatically to justification, spacing, paging, margins, **boldfacing**, underlining, italics, subscripts and superscripts. You just print as you would normally from within your word-processor.

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Circle 495 on reader service card

when I checked in and set up my instant office, I couldn't connect with the AppleLink network. Every time I dialed the access number, the phone went dead after the connect signal.

I was devastated. The thought of having to rely once again on the telephone and Federal Express was truly depressing. I never did manage to log on during my sojourn at the nation's capital.

In New York, my room didn't have a modular jack, and the hotel manager was less helpful than the one in Miami. I finally managed to get a new jack installed—only to find that the line went dead as it had in Washington. Desperate for one more hit of telecommunications, I played my last card: I had the hotel install a dedicated line in my room—for a mere \$125—on the chance that the switchboard was causing the problem.

It didn't work.

Back in San Francisco, I relayed my tale of three cities to my colleagues. The consensus was that hotel telephone lines are too weak to sustain telecommunications. As the "dedicated line" in New York still went through the hotel switchboard, the theory made sense. But when I attempted to log on at home and finally read my mail, the phone again went dead.

After fooling around with my equipment for a while, I discovered my disk was faulty. With a borrowed copy of AppleLink

(continues)

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DICTIONARY

irrefragably, *adv.*, Undeniably
rodomontade, *n.*, Boasting, bragging
syntagma, *n.*, Word or phrase forming
a syntactic unit

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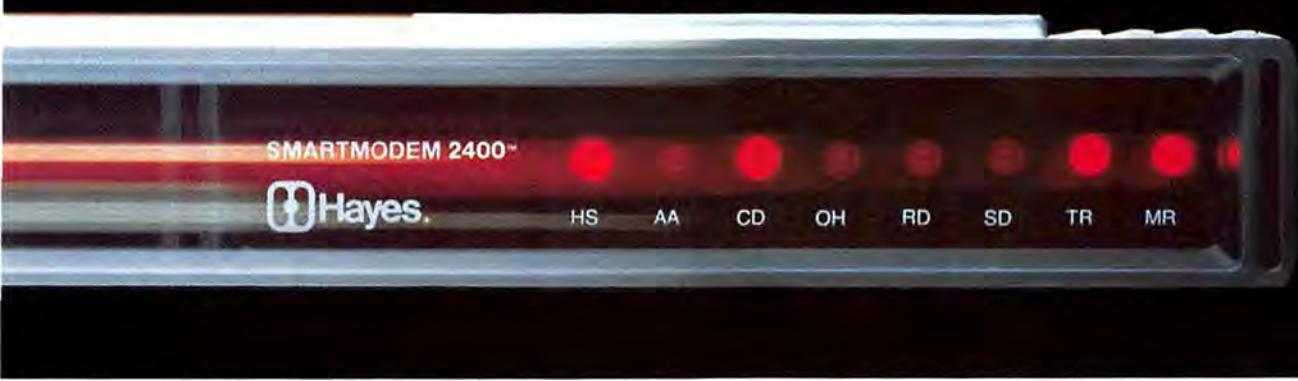


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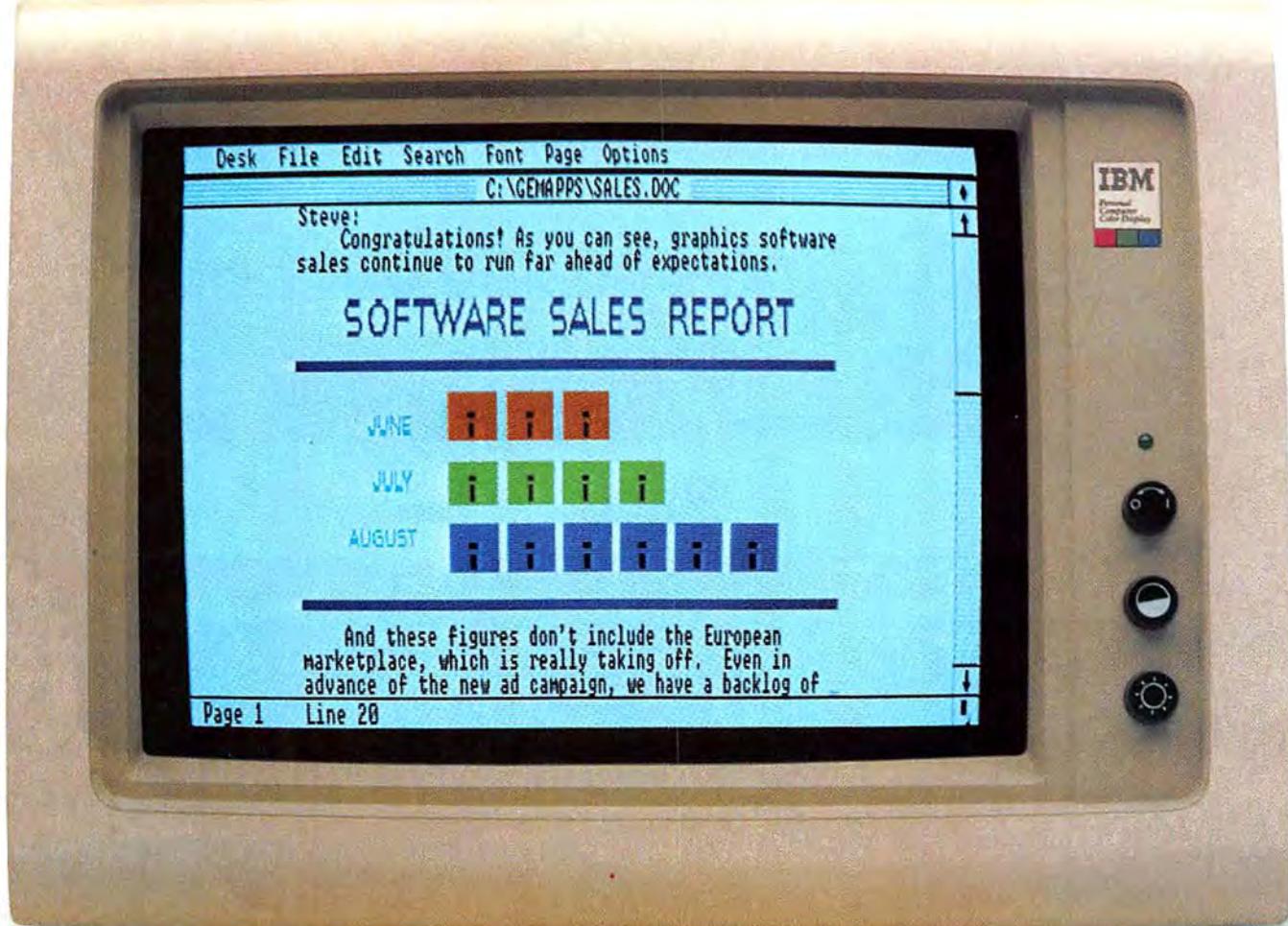
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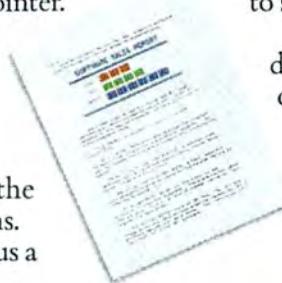
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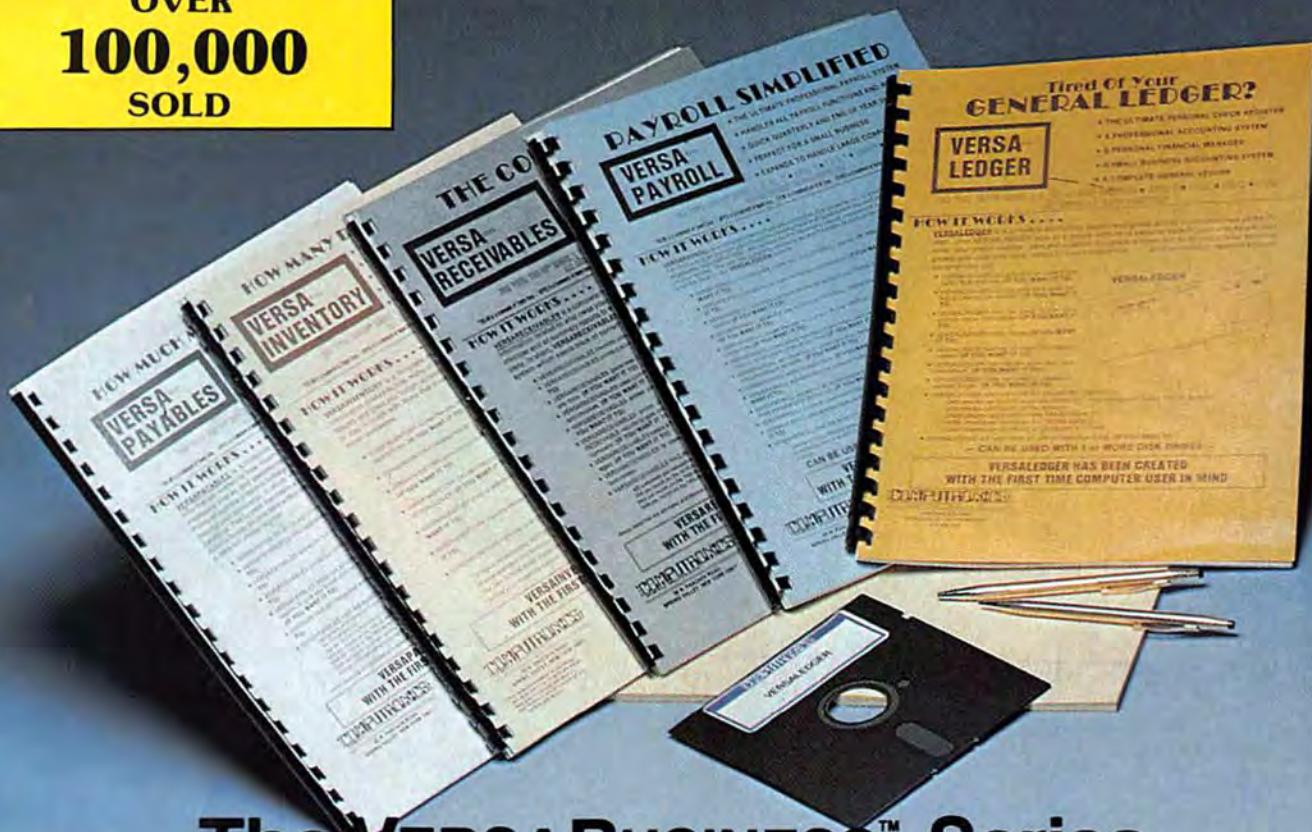
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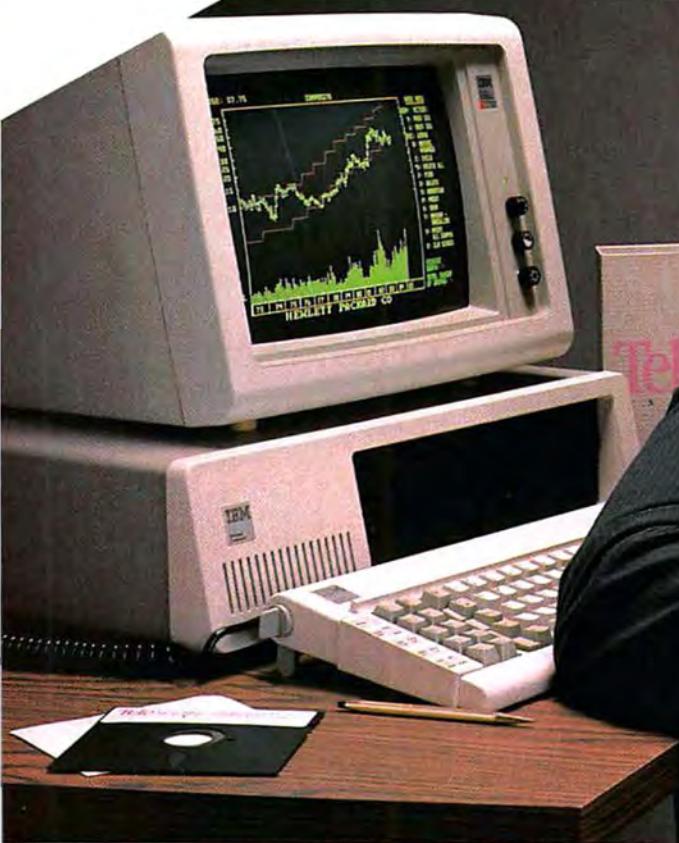
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Harry Miller

The Next Wave

This special issue of PC World examines personal computing: recent breakthroughs, current developments, and future trends.

Like surfers paddling out to sea, hardware and software makers are getting ready for the next wave, hoping that this time the ride will be a long one and that their form will be good enough to keep them safely perched in the curl and moving forward.

The first wave of PC users consisted of enthusiasts and those so desperate to solve their business problems that they were willing to decipher inchoate manuals. The next wave of potential buyers will be more demanding. Because their needs will not be as pressing, they won't be willing to accept as much responsibility for the PC's housekeeping; products will have to be a good deal easier to use before this next group will climb on board.

We're starting to see signs that the new software will understand and meet this need for simplicity and power. Software developers have two options. They can demand more intelligence of the user, or they can build more intelligence into their programs. The coming swells will clearly deliver

smarter software to shore. Intelligence will be found at two levels: on the surface, in the form of natural language query and command systems; and behind the scenes, where the program rather than the user will determine the most efficient way to implement a request. Hardware resources (cheap memory and affordable mass storage) are also certain to greet breakthrough software.

Between now and the arrival of the next wave, much hard work remains. For those with arms strong enough to keep paddling, the dream of the endless summer is in sight: The surf's up, the water's fine, and the next wave is just waiting to be caught.

Dirge Versus Polka

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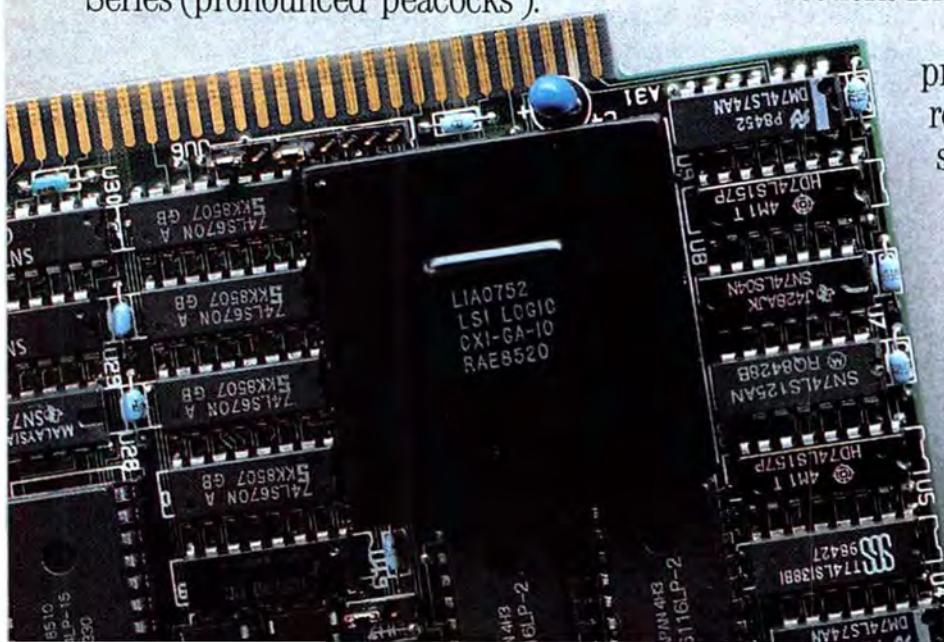
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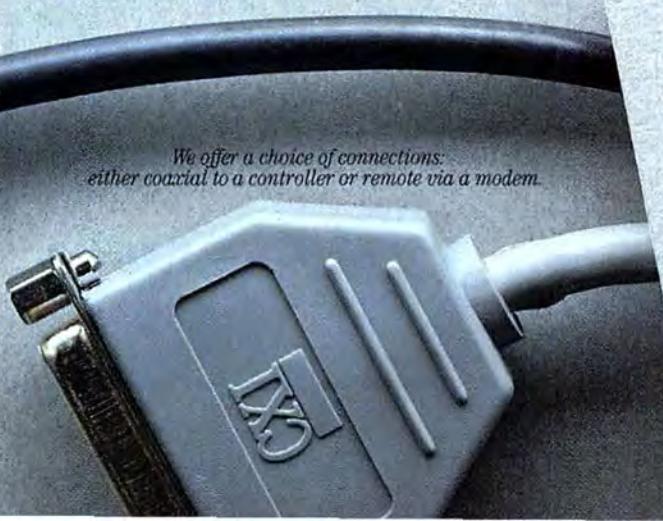
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couple of their investors) would be quick to harmonize with that dirge. But we felt it was time to step back and take the users' view. That perspective tells us that while it's not quite time for a polka, nothing that transpired this year has substantially diminished the PC's great promise. It is no accident that this year IBM shipped more computing power in the form of PCs than mainframes.

That's why we've created this special issue of *PC World*. We've replaced our usual structure with a series of essays that collectively capture the state of the industry. Each provides a snapshot of a major industry segment, examining the trends that defined the past year as well as the directions and

the issues that will shape the coming one. This month, information about products is assembled at the back of the magazine in "Access to Products."

Some themes emerge from these essays: The availability of cheap hardware continues to act as a catalyst for innovative product development; de facto standards are developing, primarily in the form of common file formats and familiar software interfaces; and a mass-market mentality is a hopeful sign of the PC industry's maturity.

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In general, we've watched hardware and software capabilities leapfrog each other. Each advance in software bumps up against the limits of current hardware technology, and as hardware horizons expand we await the systems and application software that can fulfill this newly created potential. That will undoubtedly remain the pattern for the foreseeable future of personal computing.

(continues)

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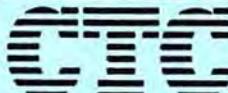
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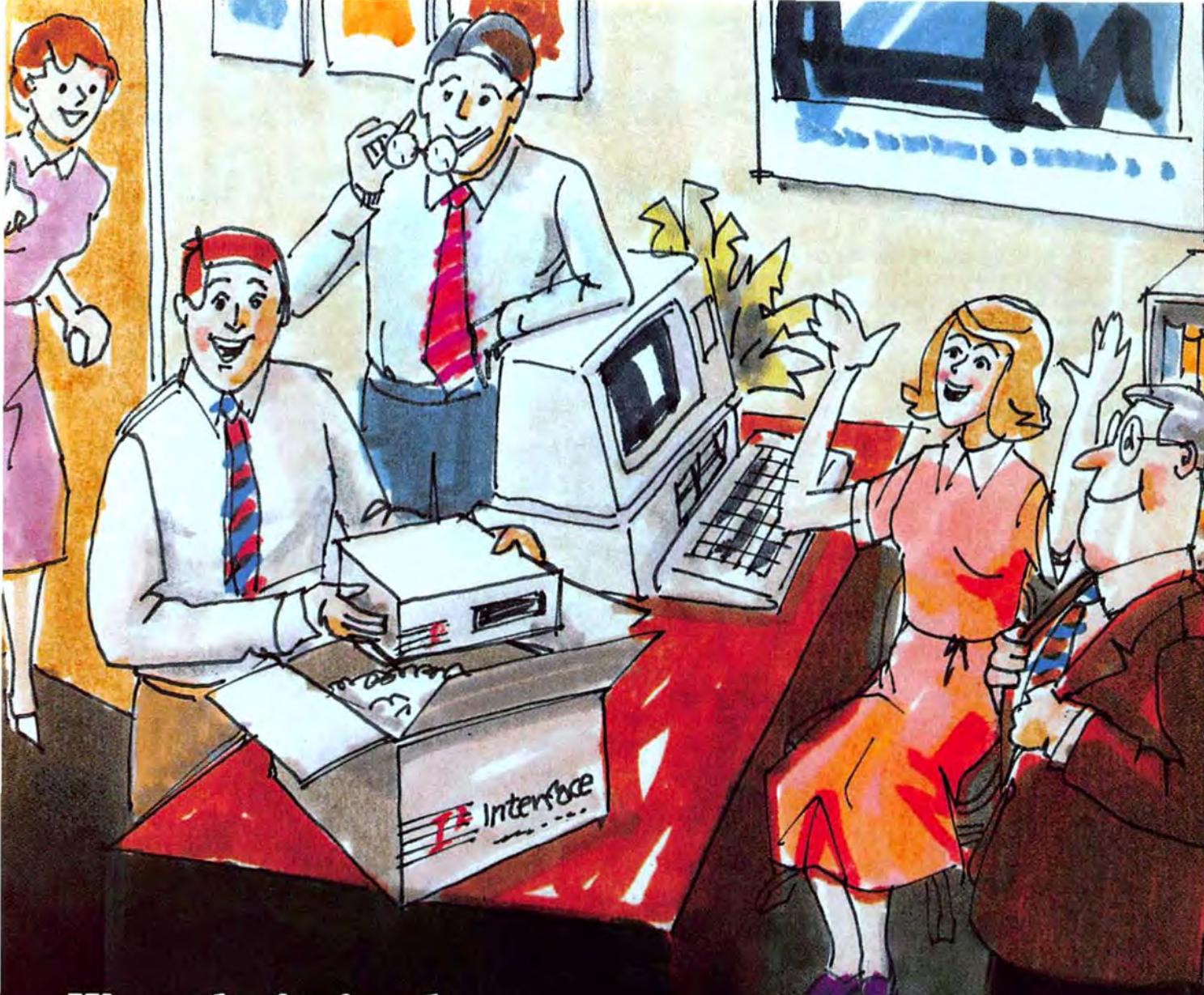


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Circle 858 on reader service card

File Format Follies

While the personal computing industry still suffers (or benefits, depending on how you look at it) from a lack of formal standards, certain file formats have become de facto standards that most new programs will accommodate. Almost any new package you can name reads 1-2-3 .WKS files, and many also create them. Most software comes with conversion utilities to match file formats, but increasing numbers of programs are able to read several formats directly. Some programs can even process files in their original format before translating them. *Reflex*, for example, can filter dBASE files to convert and import only those records meeting specified

criteria. This emphasis on file compatibility has given software developers added flexibility: You can do anything you want as long as your file formats are compatible.

Monkey Business

File formats aren't the only things to surface as standards. Several programs introduced in late 1985 tend to look and work alike. *VP-Planner* is a spreadsheet that looks and acts just like 1-2-3; *Paradox* uses the 1-2-3 interface to make learning its data management functions easier, and *Freelance* does the same to create business graphics. Naturally, all three programs read 1-2-3 files. The clear

aim of each designer was to minimize learning time by mimicking an interface familiar to nearly 1 million people. In the process, these developers have created a set of powerful stand-alone tools that encourage integration. All that's missing from the market are stand-alone word processing and communications programs that look, feel, and smell like 1-2-3. I'm sure it won't be long before we see those as well. Faith in a popular interface isn't limited to 1-2-3; Symantec's *Q&A* emulates the *pfs:file*, *pfs:report*, and *pfs:write* interfaces.

(continues)

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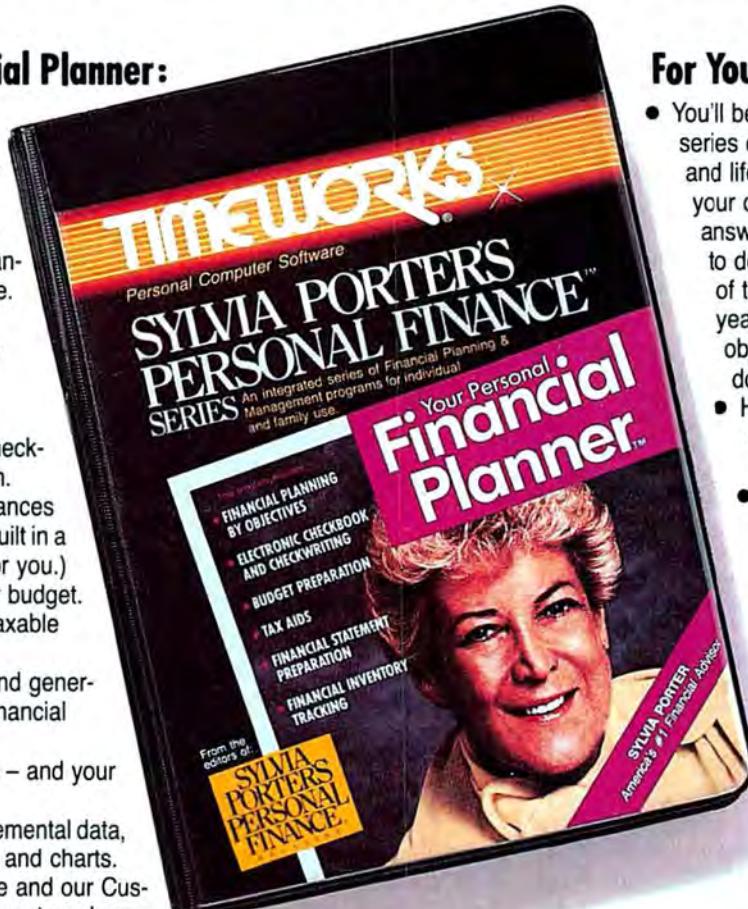
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Jigsaw Clues

As you move through this issue, you'll garner a sense of the current status and short-term direction of the personal computer marketplace. Each article adds another piece to the puzzle, indicating a new trend or uncovering a seminal product.

Talk of the Times. In the first PC World Forum, industry leaders examine the pressing issues facing a marketplace poised for a new spurt of growth. They assess the struggle between technological innovation and the need for standards. More pragmatically, they debate which endeavors will be most fruitful for the industry—

raising the level of user sophistication through education or obviating that sophistication by making PC products more intelligent. While the stated goal is to move more products, the industry's role in improving overall productivity and the quality of our work lives is evident as well.

Committed to Memory. The Systems essay analyzes the PC's new ability to leap 640K in a single bound. Few would contest the fact that the Lotus/Intel/Microsoft Expanded Memory Specification was a crucial advance. Just months after the spec was announced, machines packing multiple megabytes of RAM began popping out all over. Suddenly, you could have three times as much RAM as the

two-floppy disk storage that was the norm only a year or two ago. The benefits for larger spreadsheets, usable integrated software, and data base manipulation in RAM are obvious. As this issue goes to press, the user community is just starting to explore the advantages of multitasking when all that RAM is unlocked by *Microsoft Windows* or *Desqview*.

Filling in the Gaps. Growing user sophistication, combined with a general search by vendors for market niches, has created a booming business in utility programs. A category that once encompassed only technical tools

(continues)

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A review of the IBM Personal Computer Family. Vol. 2, No. 3



HARDWARE NEWS

A growing family of PC Printers.

Different jobs demand different printers. IBM has developed a full line of printers for its Personal Computer Family to answer those demands. Two of the most recent—the IBM Proprinter and the IBM Color Jetprinter—deserve special mention.

Both are compatible with the IBM PC Family of Personal Computers as well as with many other leading home and office personal computers. And both offer the traditional high standard of IBM reliability and support.

The IBM Proprinter:

The IBM Proprinter alone can help you complete a variety of different home or office jobs.

It has an unusual feature that will be welcomed by everyone who has spent time switching back and forth from single-sheet to continuous forms printing. A special slot in the front of the Proprinter allows you to print single pages or envelopes quickly and easily without removing the continuous forms paper.

The Proprinter's high-speed (200 cps), dot-matrix technology can make short work of your day-to-day

printing tasks like first drafts of letters or reports.

For more finished work, the Proprinter does near-letter-quality printing (at 40 cps) and lets you add emphasis to your text (at 100 cps) with bold print, condensed print and underlining.

It also has all-points-addressable graphics capabilities that can help you produce a complete range of charts and graphs to illustrate your text.

One additional plus: it's very competitively priced.



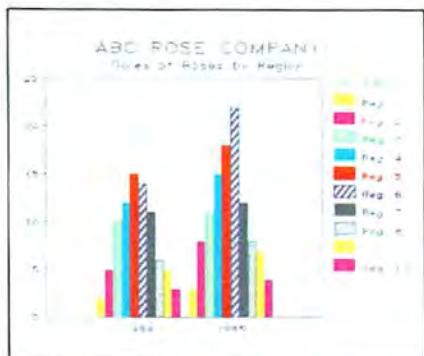
IBM Proprinter has a convenient slot for printing envelopes or single pages.



IBM Color Jetprinter quietly utilizes "drop-on-demand" ink jet technology.

The IBM Color Jetprinter:

The IBM Color Jetprinter is an unusually quiet, compact workstation printer that utilizes advanced "drop-on-demand" ink jet technology.



Samples of color graphics and texts produced by IBM Color Jetprinter.

Designed to be used with the IBM PC and many other personal computers, it's supported by a wide selection of software programs.

You can use it to produce draft and near-letter-quality text and high-quality graphics in up to seven colors.

In addition, the Jetprinter allows you to highlight your text with bold and underlined passages done in color or printed against a background color.

The Color Jetprinter also prints graphs, charts, engineering drawings and texts directly onto special Jetprinter transparencies for presentations.

And, thanks to a unique non-clogging ink formula, it performs all these functions very reliably.



FAMILY TIES

Videotex connections.

Videotex provides a key to much of our future shopping, entertainment and business information. Videotex services, using existing

telephone lines, already supply travel information, personal shopping options and personalized messaging, banking and investing services.

PC Videotex software from IBM allows you to access these services from your IBM Personal Computer, IBM Personal Computer XT™ IBM Personal Computer AT® or IBM PCjr™.

With only a few simple commands, you can use your IBM PC to receive, display, store and replay the data you choose in high-resolution color graphics and texts.

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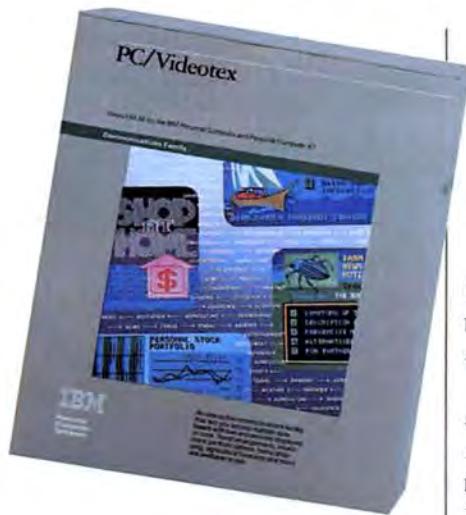


WHAT'S THE PROGRAM?

Create your own presentations.

Everyone who has ever put together a visual presentation for a business meeting or other educational purpose can now take heart. With the help of IBM PC Storyboard software, an IBM PC and a color graphics monitor you can turn out professional-looking, captivating presentations complete with color, special effects and eye-catching graphics.

PC Storyboard's four modules—Picture Taker, Picture Maker, Story Editor and Story Teller—make it fast, easy and comparatively inexpensive to create, combine and modify pictures and stories. There's even an animation function that makes it possible for birds to fly, ships to move across water, words to become bigger.



IBM PC Videotex software makes Videotex connections in high-resolution color graphics and text.

Picture Taker lets you store the contents of screen displays from software you regularly work with, such as spreadsheet, business graphics, drawing or word processing programs.

You can use the Picture Maker module to edit and combine the graphics you've saved. Picture Maker also allows you to create completely new pictures containing both text—in a variety of type styles—and graphic figures.

Story Editor helps you organize and edit your pictures into a presentation and add various special effects. The results can be dramatic.

You can then use the Story Teller module to display the results on an IBM PC Color Display, on a TV or with a video projector.

The finished presentation can be copied on diskettes for distribution. You can also produce printed copies with a graphics printer like the IBM Color Jetprinter reviewed in this issue of *Read Only*.

After that, all you need is a director's chair from which to view the finished product.

Expand capabilities with IBM Planning Assistant Solutions, IBM Document Retrieval Assistant and PC Storyboard software.

Information at your fingertips.

A few months ago in this space, we reviewed Office Correspondence Retrieval System (OCRS) software from IBM, which provides a convenient way to keep track of information that otherwise might be filed and never found again.

That same application is now available as a member of the IBM Assistant Series, with an easy-to-use menu system that's consistent with those found in other Assistant Series programs.

Like the original OCRS software, IBM Document Retrieval Assistant makes life much easier for anyone who stores large amounts of information on a fixed disk or who has a library of documents, memos or files stored on diskettes.

First, it automatically summarizes information and stores it for future reference. Second, and most important, Document Retrieval Assistant allows you to locate information with simple English-language queries.

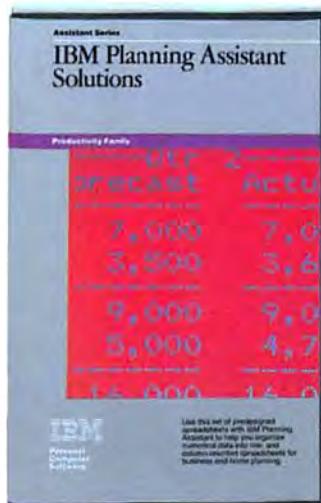
Among other popular word processing software, Document Retrieval Assistant works with IBM Writing Assistant, IBM PCWriter, the IBM DisplayWrite Series, and WordStar® (version 3.10 or higher).

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IBM BASIC Compiler 2.00 updates an indispensable business programming tool.

tion on simply designed spreadsheets. Your IBM Personal Computer does the hard part.

Planning Assistant Solutions includes spreadsheets like Loan Calculation and Real Estate Analysis for home use. Others, like Travel Expense Form and Financial Statement Worksheet, can help you sort out your business finances.

Many of the spreadsheets can use information from files you've created with IBM Filing Assistant. You can also include the results of your Planning Assistant Solutions work in IBM Writing Assistant documents and present them graphically with IBM Graphing Assistant.

BASIC improvements.

It's good to know that in a business based on technological advances, the basics aren't forgotten.

The IBM BASIC Compiler 2.00 gives exactly that reassurance. It's an improved version of an indispensable business programming tool for the entire Family of IBM Personal Computers.

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And there's a trade-up offer for current licensees that represents a significant savings on the IBM BASIC Compiler 2.00. See your Authorized IBM Personal Computer Dealer or IBM Product Center for details.



HARDCOPY

Guides to the top.

IBM TopView™ is a program that allows you to run more than one program at a time (multitasking) and to view screens from more than one



program on your display (windowing). This, in turn, makes fast work of switching back and forth among programs that you use frequently—word processing, filing and spreadsheet applications, for example.

The TopView Application Guides shown below are now included when you purchase a TopView program. They're useful listings of the many programs—IBM applications and software from non-IBM sources—that can be used with TopView. Both are arranged alphabetically and include special operating considerations and notes whenever necessary.



TopView Application Guides now included with the program.

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IBM



such as debuggers or memory mappers now welcome such mundane applications as notepads, calculators, and phone dialers. But it's a sure sign of the industry's maturity that these utilities are treated like application software, with fancy menus, polished manuals, and built-in help screens.

Fast Is Not Enough. The year's major movements in communications clearly concern high-speed modems, concurrent sessions, and micro-to-mainframe links. With 2400-bps modems, we're experiencing a repeat of the pricing and popularity pattern that characterized 1200 bps about two years ago. At that time, the least expensive 1200-bps modems cost around \$1200 and qualified as luxury items. As prices fell to about \$500, on-line enthusiasts found them within reasonable reach. Now that those products can be had for \$200 to \$300, 1200 bps is standard equipment. This fall, 2400-bps modems began a similar price descent. Because the installed base of PCs is so much larger, and the market simply moves so much faster, 2400 bps will probably be standard fare in a few months. Meanwhile, 9600-bps modems are tearing up the phone lines and pushing the limits of voice quality lines.

(continues)

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Environmental Impact. The real story of integration is in getting the operating system—or a close enhancement of it—to handle the hardware housekeeping that enables programs to coexist and share data seamlessly. While the integrated programs have certainly met a need and continue to grow in power, they are primarily a stopgap measure. People are simply unwilling to sacrifice the rich functionality of stand-alone software.

PC World Pacesetters

Accompanying each article is a description of the products chosen by the editors of *PC World* as the year's most influential in that category—our "Best Bets" for the coming year. Technology and product design weighed as heavily as performance in our evaluations. We applaud the contributions these products have made to the evolution and utility of personal computing.

You Can't Always Get What You Want...

Perhaps the most important industry trend is the effect that end users are having on product design. It was not very long ago that engineering determined the features that would be included in a given product. Programmers or designers would pack their creations with as much whizbang as

(continues)



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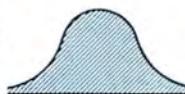
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current technology would allow and leave it to users to tailor the resulting product to their day-to-day workloads.

Due in part to any new product's high cost of entry into what has become a mass market, those days are over. As bigger, better, and faster hardware resources become available, products rely less and less on user sophistication and adaptability. Users will continue to be the most powerful force driving the market. Software developers are definitely eliciting users' needs and filling them, asking for users' reactions and listening to them. The days of whizbang seem to be behind us, to be replaced by, with luck, a much saner focus on the PC as a tool to accomplish everyday work. It's now true about the PC marketplace that if you try, sometimes you *can* get what you need. ●

|| Harry Miller is the Editor of PC World.



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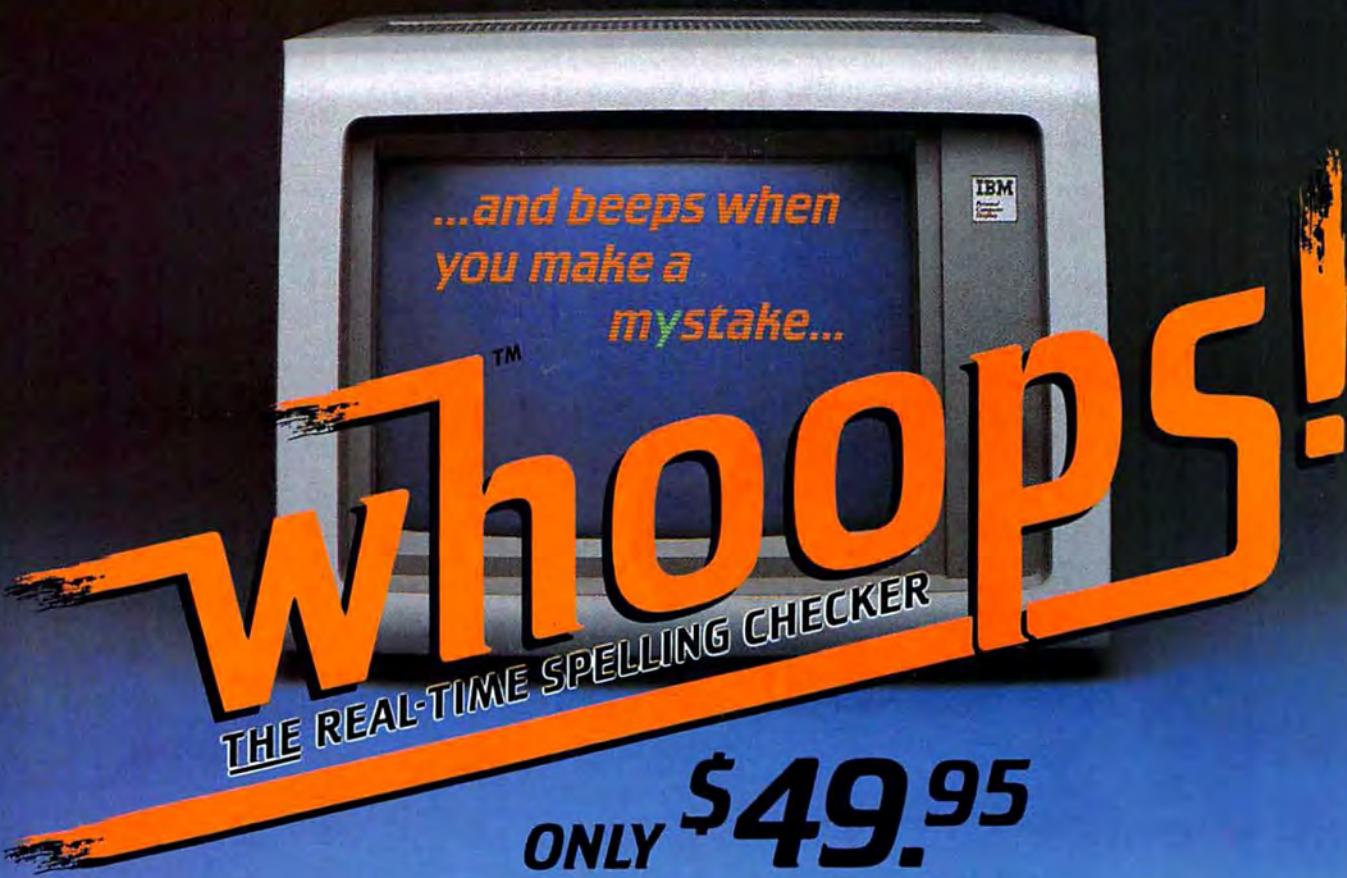
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Letters

Reactions and responses from the PC World community

Piracy Permutations

As the former director of Future Computing's software piracy survey, I applaud Darcy DiNucci's article "Copying Software: Who's Right?" [PCW, September 1985]. It provides important insights into this controversial issue.

While the two surveys concur on many key points, they differ on the level of software piracy occurring. The Future Computing survey showed a 50 percent rate compared to *PC World's* 27 percent. The variance is due to different methods of data collection. *PC World* asked about piracy point-blank. Future Computing counted the number of business software packages in use without asking if they were legal, projected these numbers to the entire work force, and then subtracted the result from the number of copies sold as reported by software publishers. Given human nature and the publicity received by software piracy lawsuits, it's likely that many of the respondents to *PC World's* survey didn't confess. In any event, even a 27 percent figure is cause for concern.

A less publicized issue is the expected decline of software piracy. Several factors will contribute to this: software prices are dropping; the average new user will be technically less sophisticated than most current users; site-licensing is becoming more common; lawsuits against wayward corporations are gaining strength as a deterrent; and copy-protection schemes will be more sympathetic to the user and more effective in thwarting the hacker.

What lessons might software publishers draw from the piracy surveys? If you can't come up with

a protection scheme that doesn't get in the way of the honest user, don't use one; offer a money-back-guarantee trial period; write a sensible license agreement; and most of all, offer good value for the money.

*Joseph Curry
Ketchum, Idaho*

High Noon at CompuServe

John Dvorak's article in the August issue of *PC World* ["Entertainment and Time—The Razor Blades of the 1980s"] presents so many contradictions, innuendos, and outright lies that it is difficult to address them all in one letter.

John Dvorak is the computer industry's most prolific gossip columnist, exhibiting all the journalistic skill and integrity that the title implies. Although the aforementioned article contains specific allegations regarding CompuServe and its policies, not once did Dvorak contact anyone from our company to verify his information—nor did anyone from *PC World*.

Among the article's more misleading misrepresentations is the implication that CompuServe discourages our system operators from attracting maximum participation in our forums, simply because we are reluctant to pay them the commissions involved. According to Dvorak we say, "Hey, this guy is doing too well. Let's get rid of him."

Our policy is, and always has been, to encourage CompuServe SYSOPs to run the best and most popular forums possible and to

(continues)

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You'll want to use the batch mode for routine operations though, because it allows you to create a "file" to contain those operations and run them automatically, just by hitting a few keys. You can create your batch files easily, too, using the same commands as the menu mode.

But probably the best example of just how downright civil the Galaxy systems can be is our auto backup. You just preset the time and the desired function, and the system does the rest. Automatically.

No other tape backup systems, by the way, operate this simply. In fact, if you saw what passes for "user-friendly" these days, you'd be horrified.

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Before you make your first backup—which is the right time to do this—our installation software checks your disk configuration to make sure your tape drive will run at top speed. And it checks the entire system to guarantee it will perform as promised. Elapsed time? About 7 minutes.

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Another thing you can do is abort any command at any time. So you don't have to sit through a 20-minute file-by-file restore just because you hit the wrong key.

Something else not everybody can do.

You can also do a file-by-file restore from an image backup. Now you'd think everybody could do this, but no. It's important though, because if you've made an image backup (as most people do since it's so fast), you want to be able to get back the one file you need rather than all the files you don't. Hence, file-by-file restore from an image backup.

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pay the agreed-upon commission as an incentive to do so. Anything else would be counterproductive.

Dvorak claims that CompuServe makes most of its money in entertainment. Had he ventured beyond his world of plastic West Coast press conferences, he would have known that the majority of CompuServe's revenues come from the communications and information services it provides to Fortune 500 companies.

Dvorak endeavors to tell us how to run our business, how to set our prices, and what to call our services. Suffice it to say that we have operated a successful and profitable communications and information company for more than 16 years, our subscriber base to the CompuServe Information Service grew by more than 70 percent last year, and we offer our customers 800 subject areas for a standard price of 10 to 20 cents per minute.

Again, my argument is not with Dvorak's opinion of CompuServe but with his less than professional tactics. A fine publication such as *PC World* does its readers a disservice by presenting such careless commentary.

There's nothing wrong with a reporter shooting from the hip, but when he takes aim at someone he'd better make sure he's right or they might shoot back.

Richard A. Baker

CompuServe
Columbus, Ohio

Entertaining but No Fun

I just finished reading John C. Dvorak's article in the August issue of *PC World*, and I haven't stopped laughing. For some time I've been trying to put my finger on what was wrong with CompuServe and The Source. Mr. Dvorak hit the nail right on the head. There's no question that these on-line systems entertain people but do not adequately provide information. A clear testament to that state of affairs was the recent flurry of articles in several New York City newspapers that dwelled on CompuServe's CB Simulator and the psychology of anonymity to the exclusion of other available CompuServe services.

I, too, have been victimized by the aberrant notion that those guys provide information. Though I'm ashamed to admit this, several weeks ago I spent 17 minutes on line suffering and paying for all the pauses and burps Mr. Dvorak adeptly identified in his fabulous commentary—and I didn't get an answer to my query.

I would like to propose a toast to Mr. Dvorak for having the insight and guts to "tell it like it is."

Dan Lawson
Tarrytown, New York

Down on Dvorak

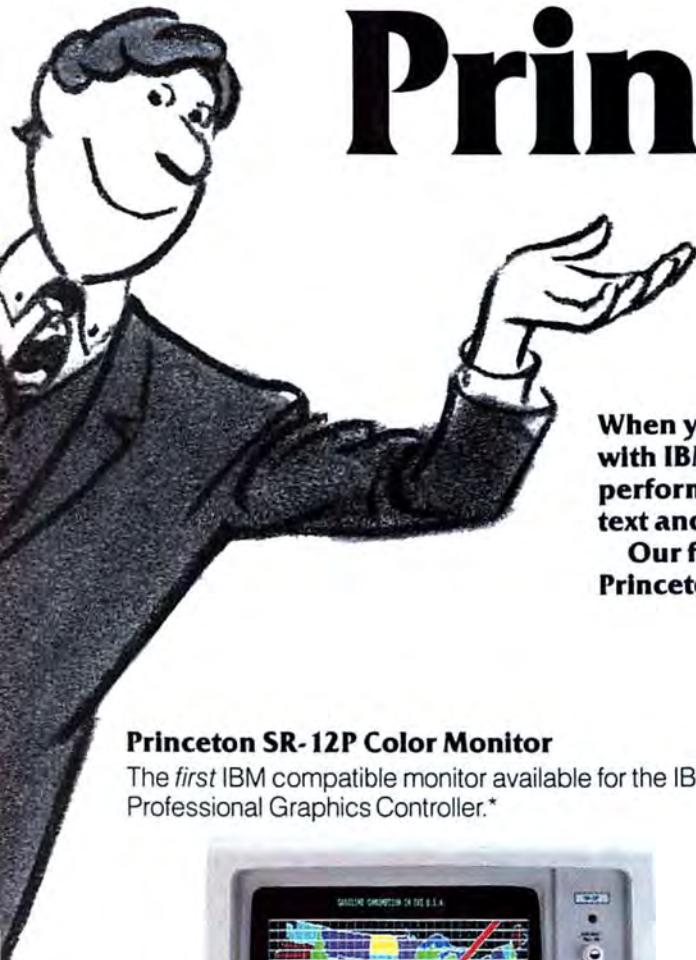
Thanks for the column by John Dvorak. I used to read your magazine from cover to cover so I wouldn't miss anything vital. Now I can skip a few pages.

Thomas Wilson
Seattle, Washington

(continues)

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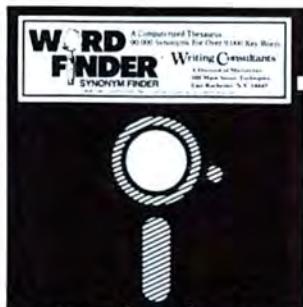
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Rough Reading from Lotus
Lotus Development Corporation is tilting at windmills. If Management Information Source (MIS) can do a better job documenting Lotus's software, so be it. ["Hot Summer Reading," *PC World View*, PCW, August 1985.]

I am appalled by what Lotus passes off as user manuals. *Symphony*'s documentation is laughable; now Lotus has published a separate book about *Symphony*. If the company feels an additional reference is necessary, why doesn't it include the book with the \$695 *Symphony* package? Lotus should rise to the challenge by rewriting its manuals—not by suing MIS.

*Jacob Turk
Lee's Summit, Missouri*

All in the Family
A warm thanks to Peggy Nauts for her comprehensive and lucid review of *The Art of Negotiating* software [From the Software Shelf, PCW, September 1985].

We are somewhat distressed to learn that she found the copy of my father's book of the same title biased toward men; I know that certainly was not his intention. However, her observation has been taken to heart, and we have developed what we feel is an appropriate solution.

A copy of my mother's new book, *Women and the Art of Negotiating*, published by Simon & Schuster, will be included with the software when it is purchased by

(continues)

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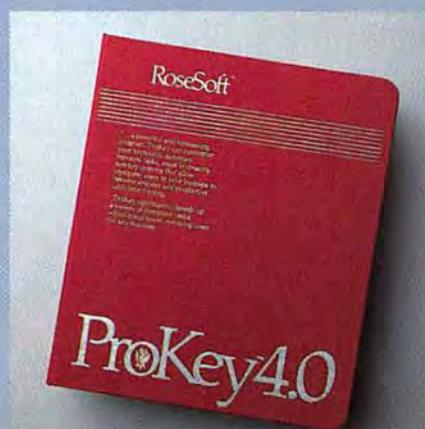
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ment on its fairness to both sexes.
However, regardless of the gender
of its readers, Gerard Nierenberg's
book needs to be brought up to
date. —Peggy Nauts*

Back to BASICS

Donald George did a good job of discussing the features of Better-BASIC and True BASIC [PCW, July 1985]. However, I think he

neglected one important aspect—who would use these versions of BASIC and for what purpose? Frankly, I doubt that anyone writing a serious application would consider using either one. Despite their vast improvements over the current version of Microsoft BASIC, these products lack the one attribute that is critical in any commercial setting—speed.

Even though both versions claim to produce "compiled" code, the article's benchmarks clearly show that programs from these two products run at roughly the same speed as the BASIC interpreter. For example, True BASIC scored the best time on the

10,000-primes benchmark—about 1.3 minutes. By contrast, a program from a true compiler (producing native 8086 machine code) runs that same benchmark in 1.5 to 2 seconds, depending on the algorithm and compiler used (for example, Microsoft's or IBM's BASIC compiler or Turbo Pascal 2.0).

Both products have some excellent features that BASIC desperately needs, such as local variables, named functions and procedures, separately compiled modules, and access to a data segment larger than 64K. However, without a native code compiler that is at least as fast as BASCOM, I can't

(continues)

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imagine using these systems for anything other than small utilities or personal use.

Ralph Kevler
Seattle, Washington

You raise an interesting point. True BASIC and BetterBASIC are not fast, at least compared to a native code compiler, but is speed always needed? With financial and accounting software, the computer spends most of its time waiting for input from the keyboard, printer, or disk drives. In such an environment, faster execution of the code is not vital.

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nature, then execution is a major consideration. But in many major business systems this is simply not the case. For these systems, the ease of coding and the maintenance of the chosen language are more important considerations.

—Donald P. George

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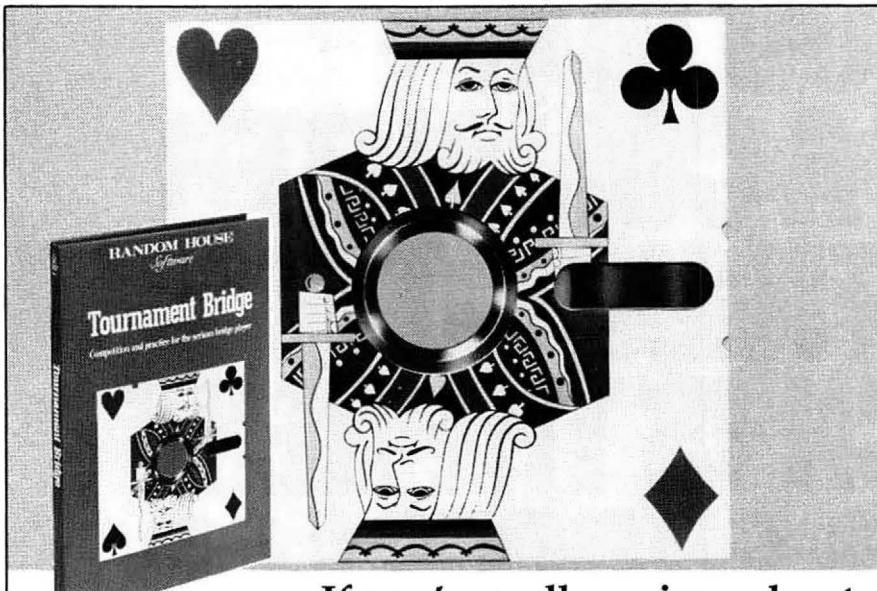
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Where Have All the Jrs Gone?

I noted with dismay the absence of *PCjr World* in the August issue. Is *PCjr World* gone forever?

The *PCjr* articles in previous issues have been informative and helpful. They've also served as comforting reminders to me and my 400,000 fellow *PCjr* owners that we remain part of the IBM PC "family."

Is the *PCjr* user community so small and unimportant that we no longer merit three or four pages in each issue of *PC World*? Please don't abandon us. Revive *PCjr World*.

W. Thomas Cross
New York, New York

Alas, the shifting sands of the PC marketplace have relegated PCjr World, like its lamented namesake, to PC limbo. But much of our PC material is also applicable to the Jr, and PC World will cover any major Jr developments. —Ed.

Letters should be mailed to Letters, PC World, 555 De Haro St., San Francisco, CA 94107, or sent electronically to MCI Mail PCWORLD, CompuServe 74055,412, The Source STE908, or Direct-Net 500. We reserve the right to edit letters. All letters must include the writer's name, city, and state before being considered for publication and should not exceed 300 words. ●

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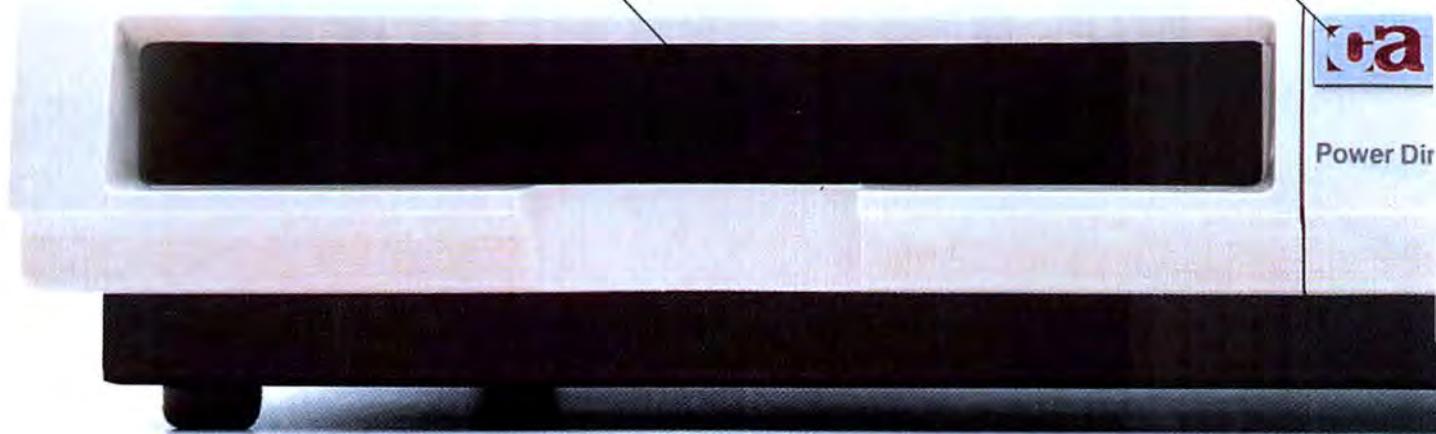
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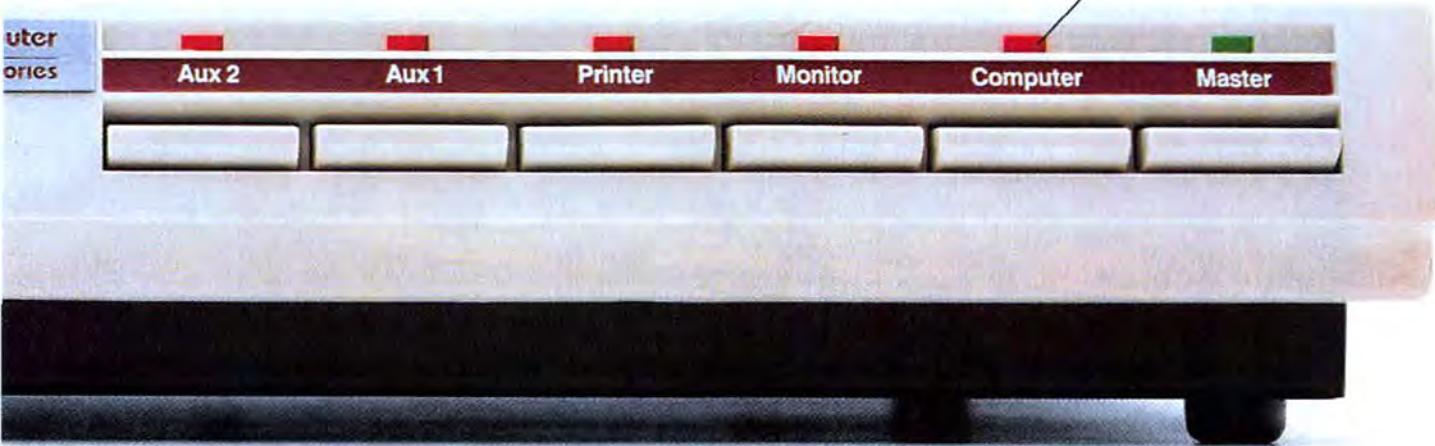
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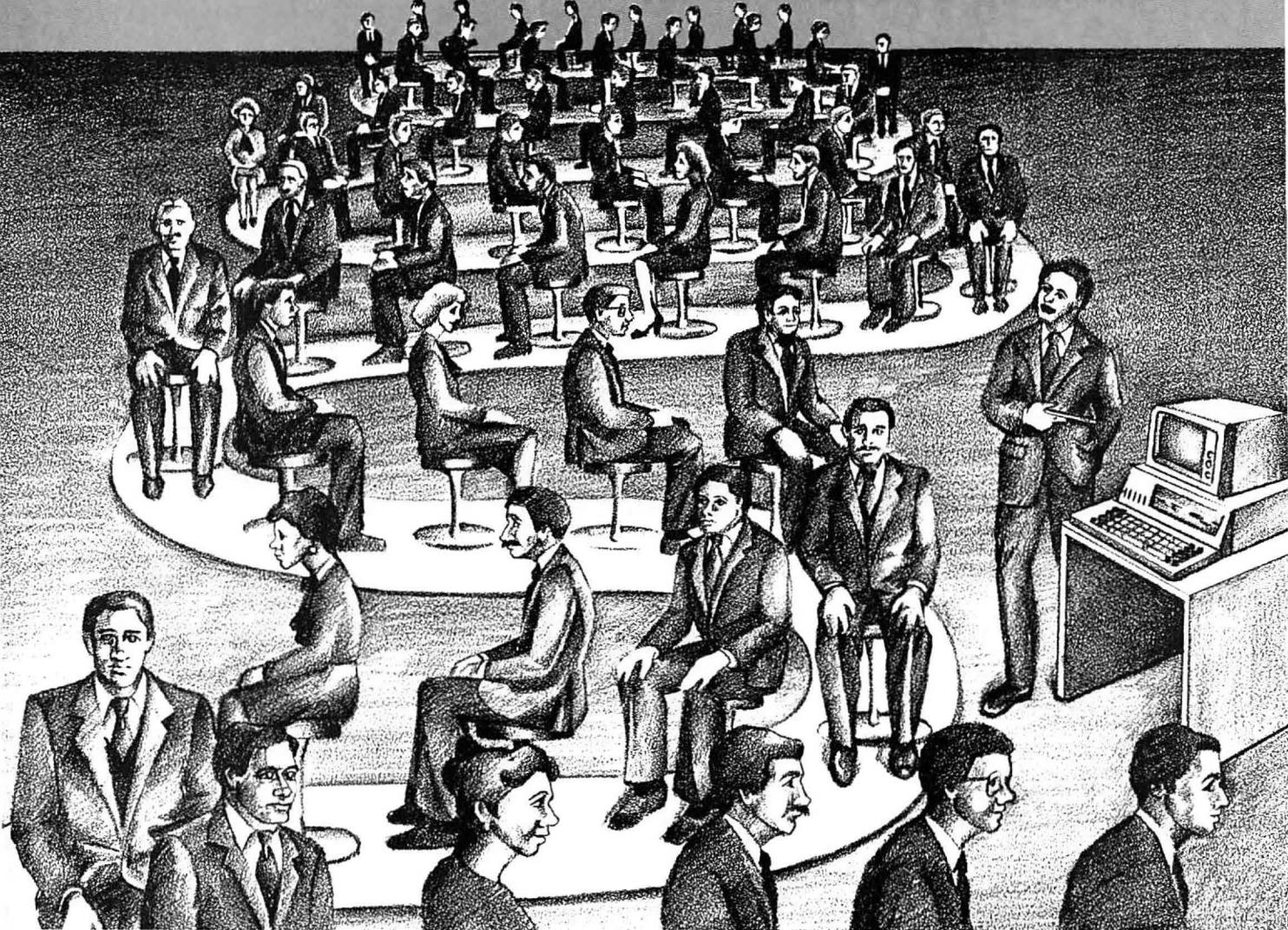
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The Year That Got Away

Don't mourn for the computer industry—it's merely growing up.

"The king is dead, long live the king!" For centuries, this seemingly contradictory edict announced both the passing of one monarch and his immediate replacement by another. As a statement of change and continuity, it fits today's personal computer business exceedingly well.

There's so much glum news around that people would be well advised not to walk near tall buildings, lest they be flattened by a plummeting computer company president. The growth rate for personal computer sales has slipped to about 30 percent this

year. While that may evoke crocodile tears from other industries, it does suggest that for a while at least, the days of wine and gold-plated Ferraris are over.

Two factors have helped apply the brakes to computer sales: the normal slowdown that ultimately afflicts any streaking industry and a cyclical pause in the economy (particularly business purchases). Businesses wait to do their buying until the fourth quarter, when they have a good idea of how deep the tax bite will be.

The slowdown has been felt most tangibly in worker paychecks. In a business where job-hunting used to mean just sitting by the phone, a blizzard of pink slips now threatens to blanket the land. Layoffs have been announced with numbing regularity: Wang Labs, 1600; Activision, 275; National Semiconductor, 600; ComputerLand, 128; and Apple, 1200. Wages at the low end are slipping, workweeks have been trimmed, and tension among yesterday's high-fliers has driven stressed-out Silicon Valley executives to therapists in droves.

The labor crunch in the electronics sector is especially ominous, because while the national economy isn't booming—the GNP rose only 2 percent in the

second quarter, compared to 7.1 percent for the same period last year—it isn't in a recession either.

It's also conceivable that a portion of the so-called early adopters were doomed to disappointment. Like the Cuisinart, the personal computer is usually more capable than its owner; once we've julienned a few green beans, many of us go back to cooking bacon and eggs.

Viewed in perspective, a major industry shake-up was probably long overdue. As a market matures, declining growth rates are an inherent, if unpleasant, part of the business cycle. Walter Popper, a consultant with Index Systems of Cambridge, Massachusetts, suggests that supply has simply exceeded demand. "In retrospect, it looks as if people stopped buying," he says, "but more hardware and software has been thrown out there than they could possibly buy."

Popper deals with Fortune 100 brass and sees corporate America using computer power at a steadily increasing clip. That experience has enabled him to view the current downturn in perspective.

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

—Ken Greenberg

View

News and notes for the computing community



"When there's too much corn, farmers go out of business," he says. "It doesn't mean we don't need corn."

How much corn you sell, or how many computers, depends on how well you're prepared for industry tremors—in this case, the computer industry's inevitable maturity. "There's a lot of room for

growth," says Ted Williams, a senior analyst for Future Computing in Dallas, "but it's not as easy to make a buck as it was three or four years ago." Just the same, says Williams, while the annual increase in number of units sold is dropping, a great deal of cash is still changing hands.

Assessing the performance of the market as a whole—including the business, home, and government sectors—Williams projects slightly sluggish sales growth by the end of 1985, but forecasts a 26 percent upturn in 1986. The firm expects the dollar value of the PC market to increase 32 percent this year (versus a 49 percent rise last year).

"That's a pretty healthy rate of growth," Williams says. "We're talking about a \$19 billion hardware market this year. Next year's growth will put that at \$25 billion."

So surviving the downturn may require nothing more than fortitude and a little patience. Innovations like videotex and artificial intelligence aren't yet pervasive, and the local area network market, which grew by 40 percent this year, is still in its infancy (although some would say it's suffering from a case of arrested development). At a time when many manufacturers face whopping inventory adjustments, IBM and Compaq, for example, expect their respective U.S. shipments to be up 48 and 67 percent over 1984. The bloom may be off the rose, but that flower is proving to be a hardy perennial. —William Rodarmor

The Glaring Feud Over VDTs

Control of the office of the future is up for grabs in state houses today.

Although many authorities have given video display terminals a clean bill of health, the controversy over VDT safety remains a lively issue in state legislatures. The debate pits the growing numbers of workers whose jobs demand daylong use of VDTs against the industries whose smooth functioning relies increasingly upon PCs and dedicated word processors. The real issue is whether employer-financed safety measures should be implemented to prevent the eyestrain, muscle aches, wrist injuries, and stress that reports confirm often accompany prolonged VDT use.

"If I had to sit at one of those things 8 hours a day, I'd never make it," says Marilyn Wright of the Communication Workers of America, a labor union favoring VDT regulation. When Wright requested improvements for the 30 VDT operators in her office, her boss said funds for the enhancements simply weren't there. "Workers must lobby to get something done," she says.

Renee Ross, executive director of the Center for Office Technology (COT), a coalition of companies and organizations opposed to VDT regulation, articulates the corporate view: "The VDT is a



For COT's Renee Ross, change in the workplace needn't be accompanied by fear—or by fights for VDT regulation.

symbol of change in the workplace, a symbol of fears surrounding new technology. But the answer is not uniform regulation of the workplace by the state."

COT's formidable 27-member roster includes IBM, AT&T, Hewlett-Packard, DEC, Xerox, the American Electronics Association, the American Council of Life Insurance, the Air Transport Association, and the American Newspaper Publishers Association.

During the last four years, dozens of bills outlining various forms of VDT control have been introduced but ultimately killed in at least 20 states. At the federal level, a House Education and Labor subcommittee has also spurned mandatory VDT regulations.

Because the issue affects so many people, foes of regulation recognize the fight isn't likely to die a quiet death. An estimated 13 to 15 million Americans now work at VDTs, and approximately 60 million are expected to be using them by the year 2000.

Among the most ardent lobbyists for VDT regulation are the National Association of Working Women, also known as 9 to 5, and the Service Employees International Union. The two groups

jointly launched a "Campaign for VDT Safety" last June. 9 to 5's bill of particulars for VDT regulation includes transfers for pregnant operators, radiation shielding, periodic rest breaks, employer-provided eye exams, and periodic testing of VDTs for X-ray emissions.

Many COT members, meanwhile, have independently lobbied long and hard to defeat bills governing VDT use. COT itself opposes legislation on grounds that it is unnecessary, costly, harmful to the growth of technology and business, and destructive of the individual character of the workplace.

In this instance, controversy is the mother of invention; short of legislation, the VDT debate is spawning a new breed of correctional innovations to meet the demands of an ergonomically sensitive marketplace. Ericsson Information Systems of Sweden has been researching the "ideal comfortable computer" for 15 years. Its Ericsson PC features an enlarged character matrix, high-contrast amber screens to reduce eyestrain, and an "ergoarm" on which monitors can be swiveled, tilted, and raised. Ericsson is promoting ergonomic design as "good for business" rather than as a noble gesture for frayed VDT operators.

The American Optical Company recently introduced VDT safety glasses, which come in three colors to match display units. The glasses promise to cut glare, increase screen contrast, and eliminate most ultraviolet radiation. Sentinel Bio-Tech Products has produced a VDT radiation shield to guard against allegedly harmful emissions. But

this is hardball, folks; Sentinel also recently threatened to sue CBEMA for libel, repudiating the organization's allegation that Sentinel acted "unethically" in promoting the device. CBEMA has since issued a guarded *mea culpa*.

Stay tuned for a flood of video static at state capitals in the year ahead. —Rebecca Bruns

Big Blue's News

IBM on the same bill as *Frankie Goes to Hollywood*, *Thomas Dolby*, and *Heaven 17*? Are you daft?

Not to worry—there's no imminent threat to starched collars and wing tips. It's merely Big Blue's way of luring a youthful generation with applications that matter to them.

The vehicle for this departure is *Exhibit*, an IBM-sponsored high-tech expo touring Europe through 1987 in a bid to win friends and influence kids via snappy tableaus like "Sorcerer's Apprentices—Robots from 300 B.C. to Woody Allen" and "Love at First Byte—Girl Meets Chip."

While *Exhibit* is an unabashed mosaic of IBM products and technologies, it feels more like a public service announcement than a commercial. *PC World* caught up with the show in York, England, where its futuristic trappings were



IBM's *Exhibit*, framed by pillars of York's past, offers its high-tech tableaux to northern England.

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Will It Play in Pretoria?

The conflagration over U.S. policy in South Africa has managed to singe companies that export computers and software to the white minority regime.

Although the White House eventually preempted congressional attempts to impose economic sanctions, instituting a set of its own, the computer industry marshaled its troops in the Capitol Hill wrangle that preceded the Administration's move. President Reagan's executive order bans the export of computers to South African military, police, and security

forces involved in enforcing the official policy of racial separation. The congressional measure would have halted exports of U.S.-made computers and software worth at least \$100,000 bound for government agencies that administer apartheid.

That proposal, in turn, was essentially a compromise between differing House and Senate bills. Legislation introduced in the House would have barred computer sales to *any* South African government entity; the compromise incorporated milder computer export restrictions from the Senate bill.

During the debate on Capitol Hill, the computer industry's two principal trade associations played somewhat divergent roles. For the chief lobbying group for software vendors, ADAPSO (the Association of Data Processing Service Organizations), the debate's emotional nature dictated a low-key, noncommittal stance. Olga Grkavak, spokesperson for ADAPSO's government affairs committee, said the group monitored congressional activity "very closely" but recommended that members with interests in South Africa lobby Congress directly.

Not so for CBEMA (the Computer and Business Equipment Manufacturers Association), primary representative of the nation's hardware suppliers. In deference to members actively engaged in trade with South Africa—a contingent that includes IBM, Data General, Hewlett-Packard, and Control Data—CBEMA lobbied energetically against the tougher House bill and for its Senate counterpart. CBEMA's Charlotte LeGates called the congressional measure "a good compromise," adding, "We're not wild about sanctions against computer sales, but certain political activities going on there demanded some action." LeGates estimated that the affected CBEMA member companies derive no more than 1 percent of annual revenues from exports to Pretoria.

Big Blue's News (continued)

strikingly juxtaposed against that historic city's ruins. *Exhibit* is housed in a translucent tube conceived (with a little help from a computer) by the architect who designed the Pompidou Centre in Paris.

Slick, four-color road maps of the exhibition manage to keep the pedantic to an absolute minimum. Displays encompass five distinct areas—information, circuitry and storage, applied technology, interactive applications, and science and communications—and provide an edifying peek at what's ahead. *Exhibit* covers the gamut: plasma screens and touch screens, CAD/CAM and graphics workstations,

3-D imaging, mouse technology, speech and voice recognition, robotics, holographic scanners, wafer fabrication—even offerings as prosaic as the PC itself.

When its three-year run is concluded, *Exhibit* will have touched down in 20 cities in 14 countries, from Helsinki to Madrid and Dublin to Rome, revising its components as the state of the art evolves. The project, touted by IBM as "an adventure in information technology," was approved by Big Blue's European arm in 1983 and opened in Paris in May 1984. More than 89,000 passed through *Exhibit*'s portals in London in six weeks, and 50,000 jammed the pavilion in York in its first two weeks alone. All of which proves, apparently, that the coming generation hasn't been blinded with science.

One percent can still be a hefty figure, and some computer concerns doing brisk business in South Africa did indeed dispatch lobbyists to the Hill in a bid to soften sanctions. Representative Howard Berman (D-Calif.), sponsor of the original House measure, recalled "active" lobbying by representatives of IBM, Control Data, and Hewlett-Packard. "Sure, they've got to heed their corporate interests," said Berman, "but the public relations damage done to IBM or any company whose product is an instrumentality of apartheid is a long-term thing."

IBM spokesperson Mike Dutton confirmed that "less than 1 percent" of IBM's worldwide revenues accrue from its South African affiliate. "IBM has always considered apartheid reprehensible, and we believe we're a force for positive and peaceful change there," Dutton said. "IBM already prohibits sales to agencies that directly support apartheid, such as the military and the police." So, apparently, does every other vendor: Computer sales to the targeted agencies reportedly stopped during the Carter years and have not resumed.

One Berman staffer, however, remained perplexed: "It's amazing that computer companies have been willing to take so much heat over something that represents such a minimal portion of total sales." —Wes Nihei



Way Beyond the Gray Market

While protectionism and concern about an influx of cheap imports grab the headlines, anyone in the vicinity of the Far East can grab PC software for next to nothing. Virtually any package you'd want is available in Hong Kong for little more than the price of a floppy disk. Software copying fees average between \$1.50 and \$5, plus a farthing for the documentation.

Take *dBASE III*, for example. The system, utility, and tutorial disks, plus a manual cribbed from the original, run around \$20. If your disks don't work, your unauthorized dealer will cheerfully replace them, and your "warranty" will be extended—as long as you can find the vendor.

IBM Hong Kong, along with software publishers from the U.S., the U.K., and Japan, grumbles about the blatant trampling on copyright law. Thus far, however, authorities haven't been able to effectively stop this spontaneous and buoyant business.

Hong Kong's Golden Shopping Centre, the notorious pirate hangout in the software counterfeiting capital of Asia, is raided regularly—to minimal avail. Last summer, 41 suspected dealers were rousted during two days of raids on 75 shops. The constables confiscated fake computer products bearing a total street price of \$26,000; if genuine, the goods would have brought in \$180,000. Although the haul was relatively modest, it triggered the first test cases on software piracy.

But Stephen Payne isn't popping any champagne corks yet. Payne is

(continues)

Way Beyond the...

(continued)

general manager of the CTS Group, a firm that investigates counterfeiting activities in southeast Asia for IBM and several software manufacturers. "We'll have to see how the court cases go," Payne says.

Raids are conducted in response to specific manufacturer complaints—but there are often compelling reasons not to complain. "All IBM will receive [from raids] is bad publicity," Payne says. He doubts a serious crackdown is likely anywhere in Asia, citing the financial and public relations costs of such a policy.

Most Asian countries share this ambivalence toward software piracy. The Taiwanese government, although anxious to lose its image as a bastion of piracy, is also encouraging a computer-savvy work force, considering it vital to the nation's economy.

The popularity of bootleg hardware has, not surprisingly, fed a market for pirated software. Indeed, the price of a \$500 PC knockoff often includes 20 to 30 contraband programs. The black market in PC products is even complementing the booming legal market for PC software; Hong Kong alone has experienced a fourfold increase in the number of software firms doing business on the island.

Graham Mead, head of the computer studies program at Hong Kong Polytechnic, recently assessed the situation for International Data Corporation-Asia. "In computers, you can become a brain center with relatively little

outlay," Mead says. "We must protect those companies who have made large R&D investments, but country boundaries aren't barriers anymore. Southeast Asia can do anything, really."

When China, one billion strong, begins churning out PCs from scratch and needs software... Stephen Payne rolls his eyes at the thought. "Then we'll really have problems," he warns.

—Sally Adamson Taylor

Second of a two-part series.

Postscript to Piracy: Trade Sanctions?

Snaring the copying culprits may be futile in the Far East, but in Washington, industry groups have taken the offensive. ADAPSO and CBEMA are calling for U.S. trade sanctions against developing nations that wink at bootleg software and hardware.

The groups' pique was prompted by a report from the International Intellectual Property Alliance. The IIPA estimated at \$1.3 billion the annual losses to U.S. firms from failure to quash piracy of movies, records, and books as well as software. The report names the prime offenders as Singapore, Taiwan, Indonesia, Korea, Nigeria, the Philippines, Malaysia, Thailand, Brazil, and Egypt. Sanctions would slam the door on duty-free exports to the U.S.

The report is, however, strangely silent on Hong Kong.

Turnabout is Good Business

Truth to tell, it's been a nasty few years for relations between some U.S. and Japanese computer firms. IBM is seething at Hitachi, NEC and Intel are duking it out in court, and Leading Edge continues to spar with Mitsubishi.

None of this, however, is deterring a handful of American graduate students from penetrating the inner sanctum of the Japanese electronics industry, the better to short-circuit future friction.

In this case, the "brain drain" is occurring under the aegis of the American Electronics Association. The AEA Japan Research Fellowship is, for the second year, placing five young computer science luminaries in the labs of Sony, Fujitsu, Hitachi, and NTT. The program is aimed at imparting an appreciation of both Japan's technology and its culture. U.S. sponsors include Hewlett-Packard, Motorola, and the American affiliates of Sony, Epson, and Mitsubishi.

William Rodarmor and Rebecca Bruns are freelance writers based in the San Francisco Bay Area. Sally Adamson Taylor is PC World's roving Far East correspondent.

PC World View welcomes contributions from readers, and we'll pay up to \$50 for the items we use. Please include your name, address, and phone number with your contribution; send it to PC World View, PC World, 555 De Haro St., San Francisco, CA 94107. ■

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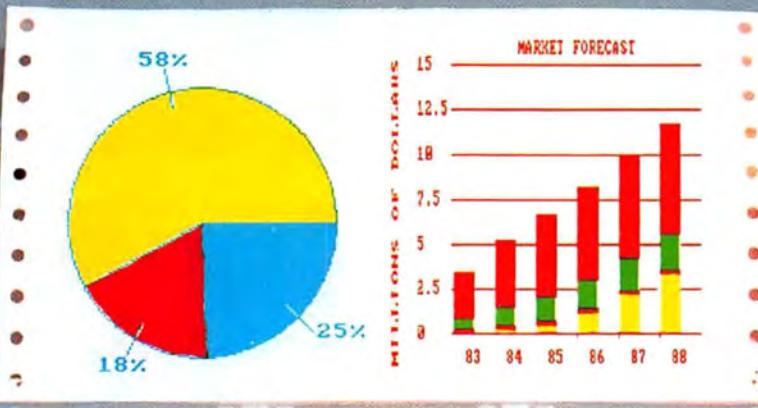
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InfoWorld—DeskSet has taken the Sidekick idea a step further.

Byte, Mark Welch—I found DeskSet's Pop-Up Calculator to be the best for office work.

PC World, Danny Goodman—Financial Calculator is the height of functionality. Perhaps the best feature of Pop-Up DeskSet Plus is the Clipboard when used in tandem with a recent addition called Pop-Up Anything.

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Computer Retailers' Guide, Mick Taylor—The DeskSet is a very powerful set of tools that is both flexible and easy to use.

Online Today, Ernest Mau—Pop-Ups add flair to operations and enhance computer utility.

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J. P. Edmunds—It is so good, your computer is not complete without it.

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Atlantic Richfield Co., Craig Parker—For the first time I can use my printer options!

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Keystrokes required to paste 20 lines of numbers into spreadsheet	6	52	Can't
Adjustable margins	YES	Yes	No
Scheduler message size	UNLIMITED	36char	35char
Alerts you to appointments	YES	No	Yes
Stop watch/elapsed time feature	YES	No	No
Start programs at specific time (unattended operation)	YES	No	No
Display time constantly	YES	No	No
Date stamp documents	YES	No	No
Calculator has on-screen and printable tape	YES	No	No
Does financial calculations (interest, annuities, etc.)	YES	No	No
Statistical analysis mode (standard deviation, etc.)	YES	No	No
Allow user access to any DOS command	YES	No	No
Allow user to run any program while within another	YES	No	No
Set up printer while in an application	YES	No	No
Use printer as electronic typewriter	YES	No	No
Auto dial phone numbers	YES	Yes	No
Tools entirely RAM-resident	YES	No	No
Load only what you want/expand as needed	YES	No	No

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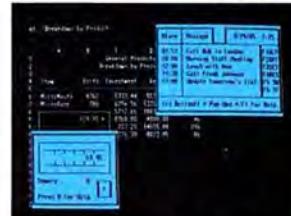
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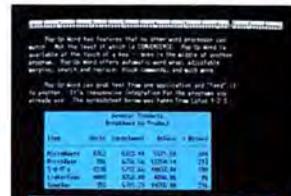
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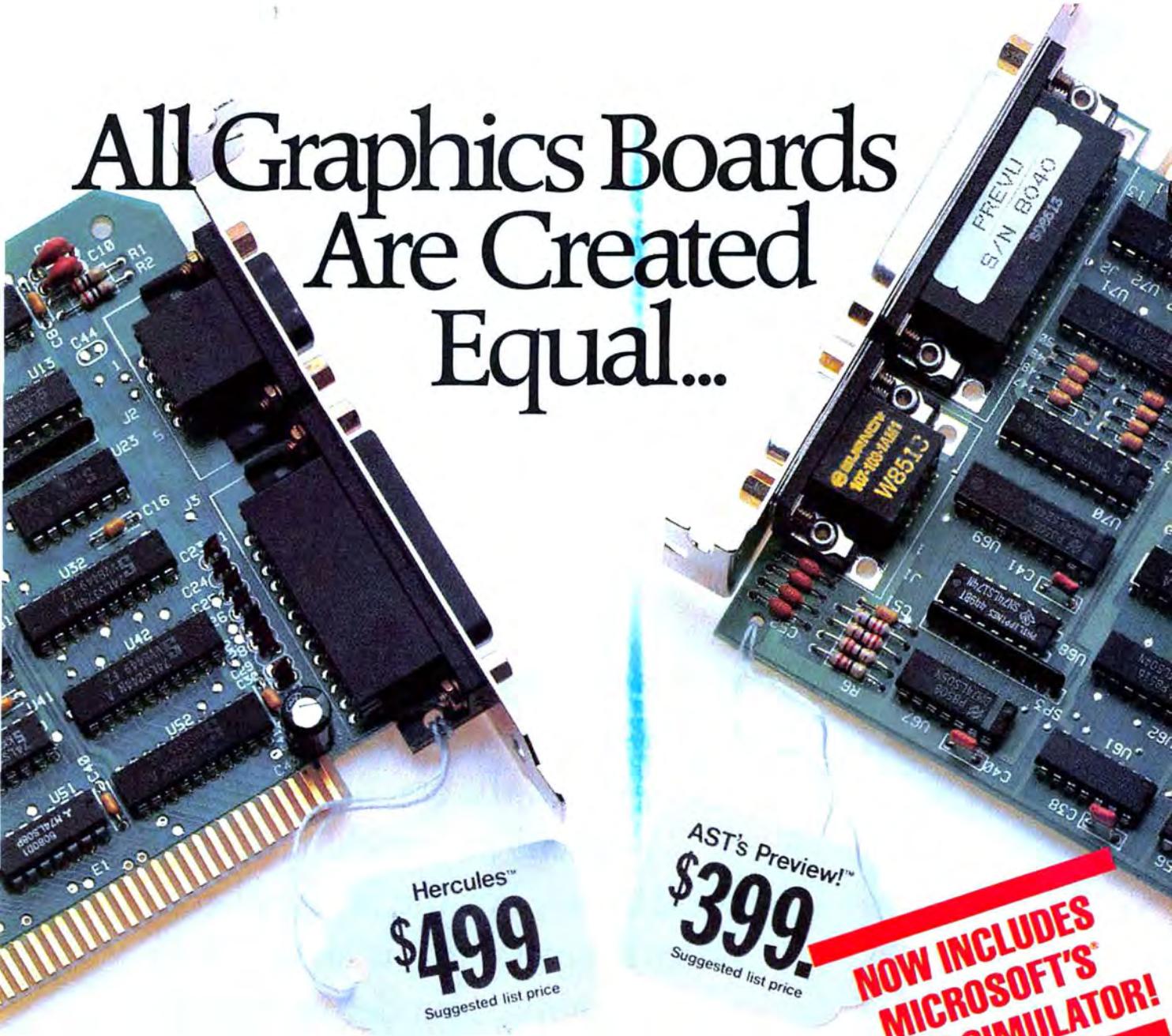
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Talk of the Times

Edited by Ken Greenberg



It was the best of times, it was the worst of times, it was the age of 1-2-3, it was the age of vaporware.

Dickens just might recognize these times. For the personal computer business, this is an epoch in which layoffs, foundering ventures, and evaporating products coexist with breakthrough software, ever-heftier cash cows, and an industrywide growth curve doggedly hugging the 30 percent mark for as far as the eye can see.

While the pundits are talking slump, the entrepreneurs are



extolling innovation. That is the overwhelming conclusion of the first *PCWorld* Forum.

Six individuals who figured prominently in the personal computer's first decade and who are avidly molding its second recently congregated at the Mark Hopkins Hotel in San Francisco. Their ostensible purpose was to check the industry's vital signs and measure its gait. But this group did not stop at diagnosis.



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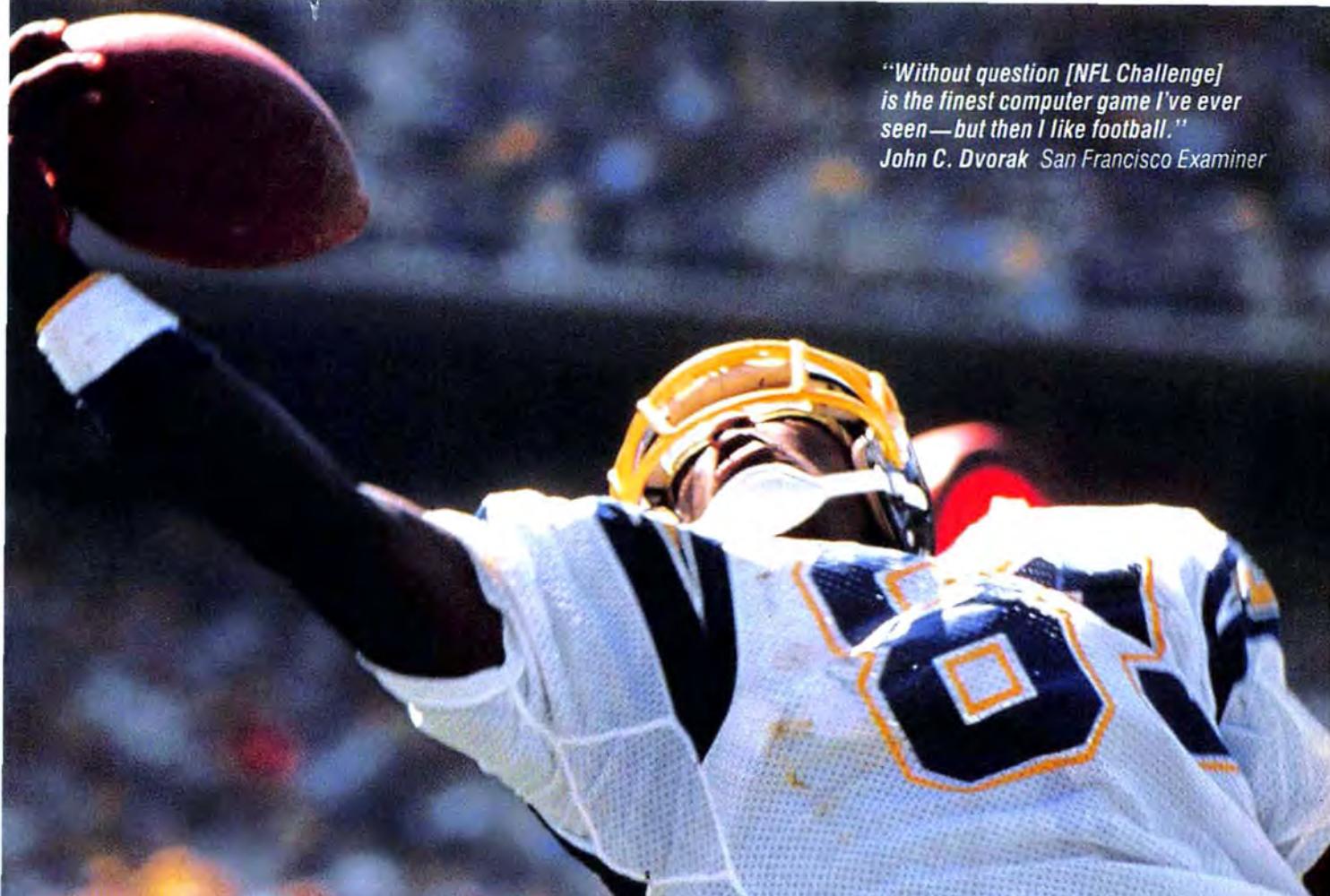
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"Without question [NFL Challenge] is the finest computer game I've ever seen—but then I like football."
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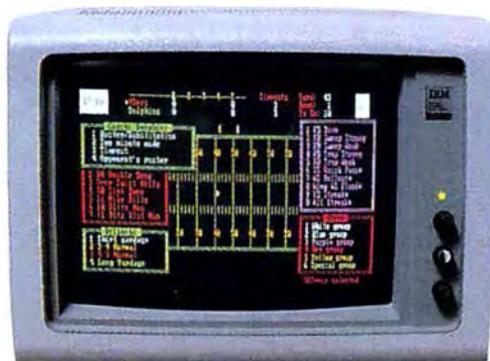
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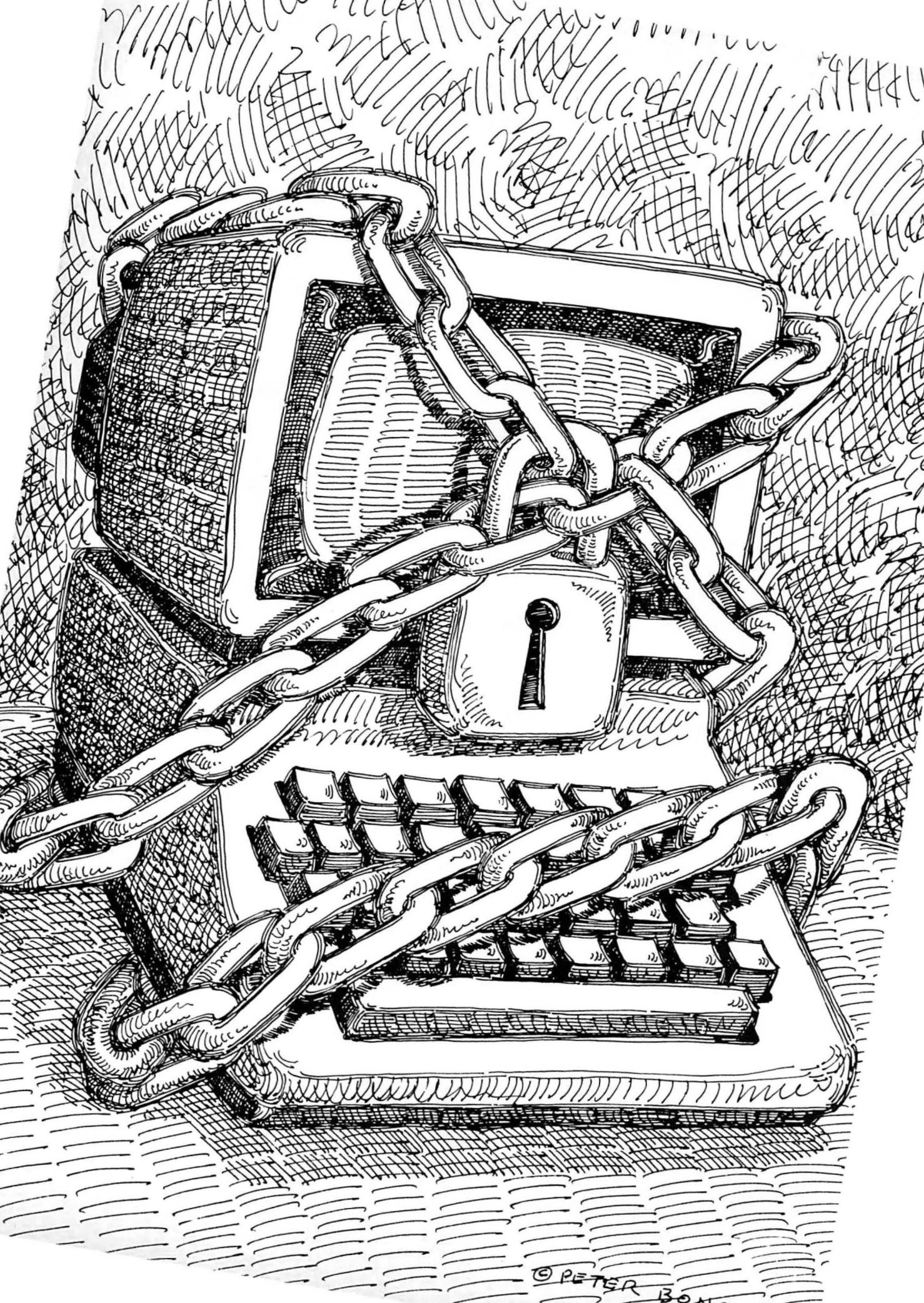


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What to do after you've tried banging on the PC and yelling 'I know you're in there'

Let's face it. Human beings have a tendency to lose things. Socks. Car keys. Data. Losing your data has got to be the absolute worst.

By now, you've probably heard of The Norton Utilities™ with UnErase™, a program that actually searches for and retrieves erased or deleted data. UnErase has made The Norton Utilities into a legend. But some of our other utilities are just as useful when it comes to organizing and tracking down your data.

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And UnErase is always there if you truly have lost your file. If your data is anywhere to be found, UnErase will bring it back.



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■ Rx: A New VisiCalc

Against that backdrop, the colloquy began. An edited transcript of the proceedings follows.

Bunnell: Let's begin with a question that strikes at both the computer industry's talent for innovation and its need to rise from this year's doldrums: Is it too late to find a new *VisiCalc*?

Morrow: No. We've solved a very limited set of problems, and we've solved them easily—now the hard ones remain. In looking at why the computer industry is slowing down, I've considered the lack of easy-to-use software and where the next *VisiCalc* might come from. Before we really benefited from the printing press, everybody had to learn to read and write. The reason some companies have ten computers sitting around while officials wait to use them has to do with the machine's difficulty. They're hard to use on a machine-language level and at the *dBASE II* level. Is there anything else in human experience like it?

Bunnell: So you say computer literacy is the most important issue?

Morrow: Right.

Osborne: I'm concerned with more pragmatic matters. This industry has known explosive growth. We've seen a great number of people with problems to solve, and solutions suddenly became available at a price they could afford. We have saturated that market. The overall decline in prices has leveled off, and until it picks up again, we're going to face a market whose expansion has nothing to do with the old days of hypergrowth. Like with canned peas, automobiles, or anything

(continues)

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Circle 110 on reader service card

Morrow: It took the Apple to spark that process of imagination.

Canion: Yes, it was great that there was a small, low-cost micro. Why can't we come out with a new *VisiCalc*? It's not because there are standards, or because people won't think, it's a matter of the right combination of people coming together.

Morrow: The people in this room are not able to see what the next *VisiCalc* ought to be.

Canion: Why is that?

Morrow: We're too caught up in everything we're doing.

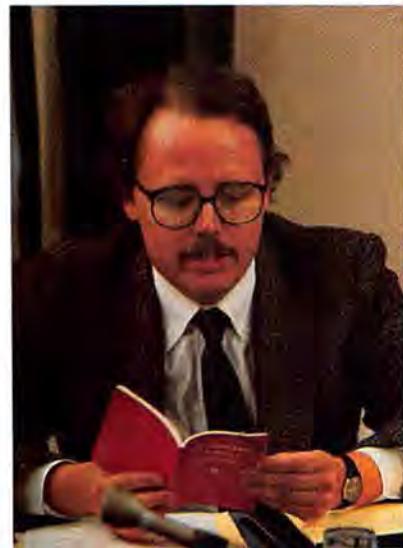
Canion: But nobody saw *VisiCalc* before it happened. You don't see the great breakthroughs ahead of time.

Esber: It was *VisiCalc*'s real-time interaction that counted. *VisiCalc* was as much a utility in its time as Borland's *SideKick* is today.

Raburn: The program accomplished the same task as mini and mainframe software, but it didn't feel the same in combination with the human being.

Osborne: That's not true of just *VisiCalc*. All you're saying is that when we reached the point at which computers became interactive, everything changed. The hardware for the first time got rid of batch mode, which eliminated the high priest and allowed you direct access. **Bingo:** You had established software on hardware that was easier to use, and you call that innovation? Maybe it was and maybe it wasn't.

Canion: So the hardware was the vehicle—the real innovation was *VisiCalc*, but it would have been just as useful on a terminal hooked to a mainframe.



PC World publisher

David Bunnell: "What bothers me about integrating the PC into the mainframe world is that the largest market for PCs is people who don't have mainframes."

■ **The Mystique of Marketing**

Raburn: Apart from innovation, I don't think anyone can argue with what Adam is saying about pricing.

Morrow: Borland International's whole thing [with *SideKick*] was pricing.

Esber: I disagree that Borland has led the low-price trend; that's garbage. *SideKick* is a utility product, it's priced like a utility, and it has sold like a utility.

(continues)

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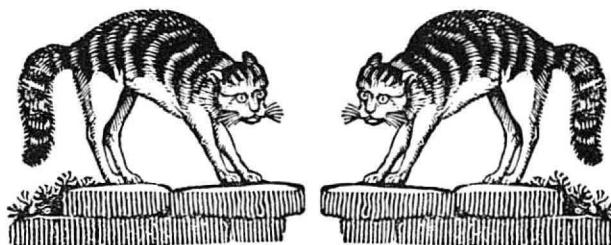
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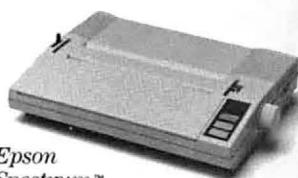
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■ PC World Forum



Morrow: Yes, but [Borland president Philippe] Kahn was the first to realize that.

Greenberg: Sounds like we're talking as much about innovation in marketing as in technology.

Esber: *SideKick* and all those small, memory-resident programs were written by one or two people. When you look at products like *1-2-3*, *Framework*, and *Symphony*, you see efforts by teams of people. These are 400K, 500K, 900K—even megabytes worth of code.

Miller: But what percentage of the price of a product like *dBASE* or *Framework* actually goes to the team of programmers who created the code? Whether one person wrote it really isn't the issue, is it?

Canion: I agree *SideKick* was successful largely due to its low price, not because it did something the world was waiting for. The basic problem *SideKick* solves is not something that'll make you buy a PC.

Osborne: The Borland case points up how software has become an ever-increasing percentage of the system price. Look at somebody who buys a computer for \$1500 to \$1800 and then buys *1-2-3*, *dBASE III*, and a word processor—that more than doubles the price of the system.

Morrow: And it's going to get worse, not better. Hardware will always be cheaper, because it's easier to make hardware than software.

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Jeffery: Let's get back to basics here. What about the idea that if the PC industry is to progress, it's got to stop being a personal computer industry? The concept of the personal computer as a stand-alone, single-user computer, *my* computer—has it had its day?

Osborne: No, I don't think so. It's, "Me and my computer can do the work of five people."

Morrow: I don't think you'll ever get people to ride a bus once they've ridden in a car.

Greenberg: But isn't that what IBM is trying to do right now?

Jeffery: That's right.

Morrow: And with a gun I guess you can get people back on the bus. So far, there have been three waves of computers: mainframes, minis, and micros. Not having a fourth or a fifth is like the sun not rising. And each one's been different!

Canion: But we haven't run out of gas on the current one.

Greenberg: Is it conceivable that success in the marketplace inhibits innovation, that as companies do well, they refuse to take risks? Are we looking at a situation like the oil industry, where the big guys sit and watch the little guys drill the wells, and then go in?

Osborne: I think what is working against innovation is the existence of standards.

Morrow: No, standards are the best thing that ever happened to the industry.

Osborne: Sure they are, but at the same time they prevent innovation. Innovation is much tougher once people have learned things they don't want to relearn.

(continues)

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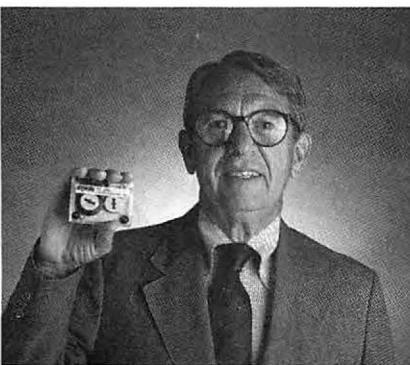
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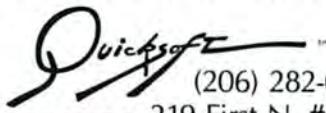
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■ PC World Forum

That's why the scope open to you is shrinking. You've got to innovate within ever-smaller areas or come up with something absolutely new.

Morrow: You're saying, "I don't want to change the boundaries—the arena," but the arena is changing all the time. Innovation is just a different game today.

Osborne: If you want to innovate but think you're going to break down everything people have learned in terms of hardware or software, you're nuts.

Jeffery: Look at the mainframe and mini industries—the moment you had a large base of software you had to start worrying about compatibility issues. Adam's right—you can't ask users to junk ten years of application software. *That* retards innovation.

Canion: There's never been a standard like the one we've got today.

■ Living With Momentum

Greenberg: Have we established that innovation is the missing link, the one ingredient needed to get the industry rolling again?

Canion: The industry *is* rolling.

Greenberg: To get it rolling faster?

Canion: I don't know if it should roll any faster. We don't want the industry to act like a roller coaster, as semiconductor manufacturers can attest. We'd like innovation to give the industry increasing momentum, or at least enough energy to keep it rolling long-term.

Osborne: At a lecture I gave back in 1977, somebody asked where the next innovation was likely to come from and how they



Ashton-Tate's Ed

Esber: "We're ignoring users who buy one machine or one program at a time. Maybe it's a matter of price, maybe of software usability."

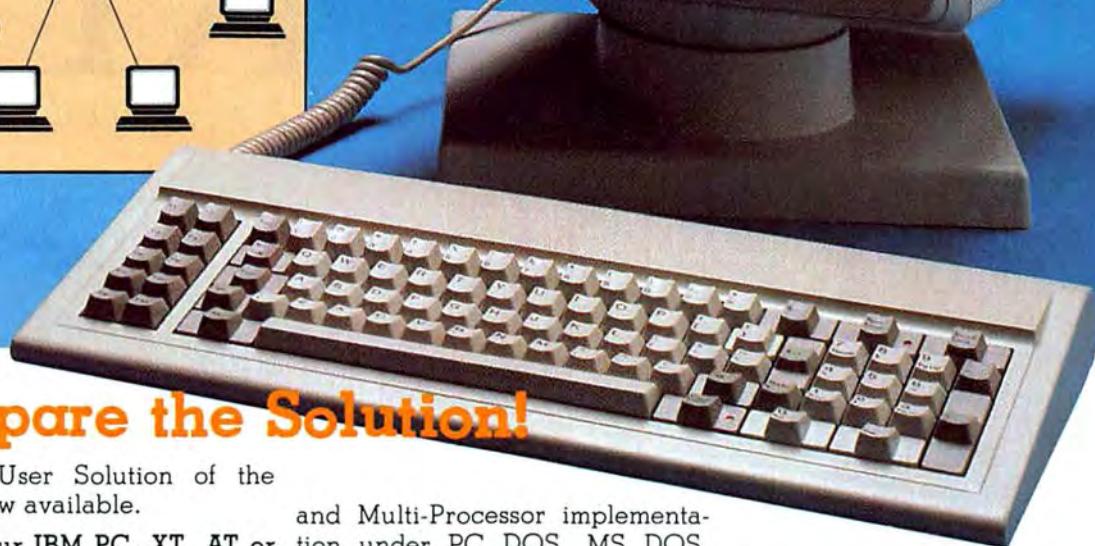
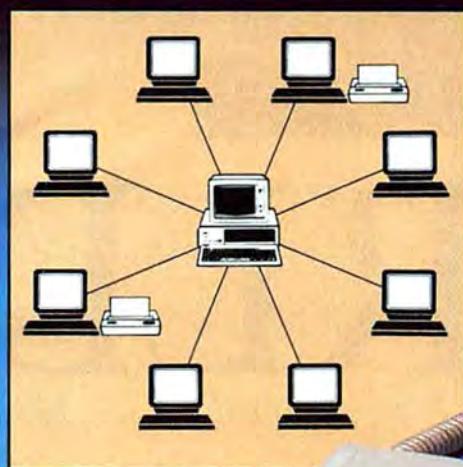
could cash in. My answer was not to rush into the microcomputer industry but to look at whatever they were doing, learn about microcomputers, then find out what PCs will do for the industry they know. That's how to get rich.

Raburn: This flag of innovation has sometimes been waved falsely. Yes, the changes have been extremely rapid. In the last four years, there's been more thrown at the information worker—it's almost as if we invented the phone, the typewriter, the dictating machine, and the photocopier all at once. How long do you want to keep innovating like that? We're in a period of assimilation, which

(continues)

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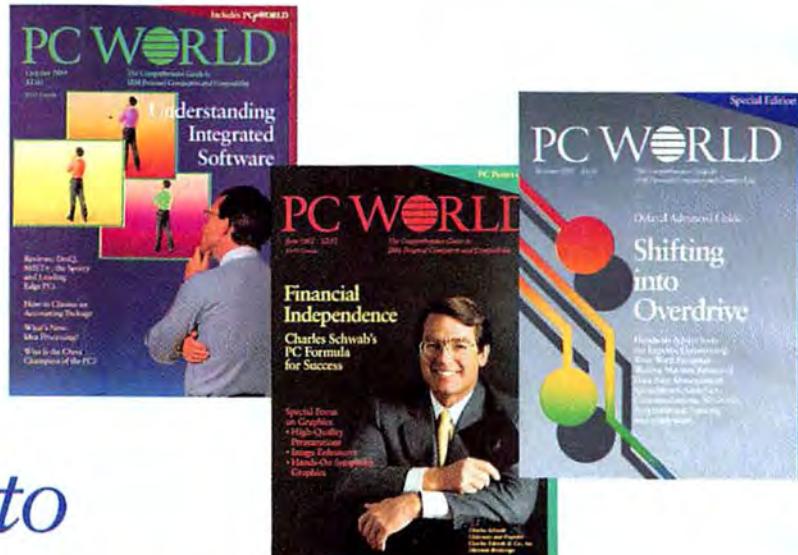
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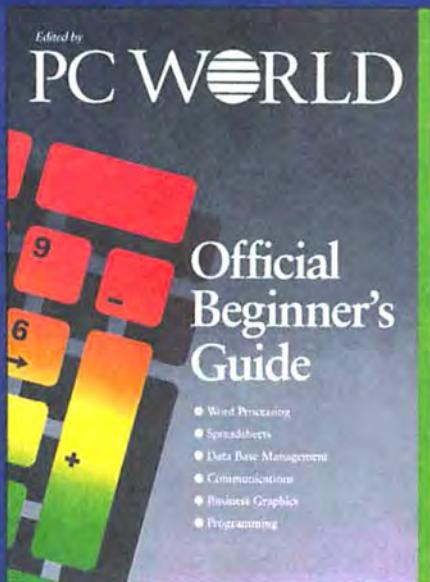
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gets back to computer literacy. People are saying, "This is good stuff, now how do I use it more?"

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Morrow: A revolution!

Raburn: That's right. The corporation admitted that PCs were there and maybe they'd better get involved. Lotus was one of the big beneficiaries. Suddenly, instead of fighting for single-digit unit sales, we were fighting for hundred- and then thousand-unit sales.

Esber: I'm afraid we're ignoring users who buy one machine or one program at a time. Maybe it's a matter of price, maybe of software usability. Corporations are slowing down their buying, but I think they'll be getting their second wind, and that by the first quarter of 1986 we'll see an avalanche of corporations buying products.

Morrow: What are they going to be buying—hardware, software, what?

Esber: I think they'll be buying everything.

Greenberg: They won't be buying PCIIIs because there won't be a PCIII, right?

Esber: I don't know what they'll buy. It's not an issue of what, it's an issue ...

Morrow: That they will buy ...

Raburn: And how they'll control it.



PC World editor

Harry Miller: "What's necessary to get a distribution channel that serves both manufacturers and users? We don't have that now—the channel is not even serving itself."

■ **Sweet Bird of Fortune**

Greenberg: I think the hardware does make a difference. Back in 1981, IBM's presence clearly attracted corporations to PC purchases. If certain vendors issue confusing signals, corporations may continue to sit on their hands. That second wind may not happen for quite a while.

Raburn: That's a very good possibility, I won't discount that.

Esber: We have a corporate advisory board whose members tell

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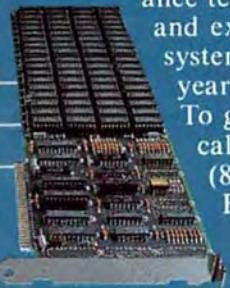
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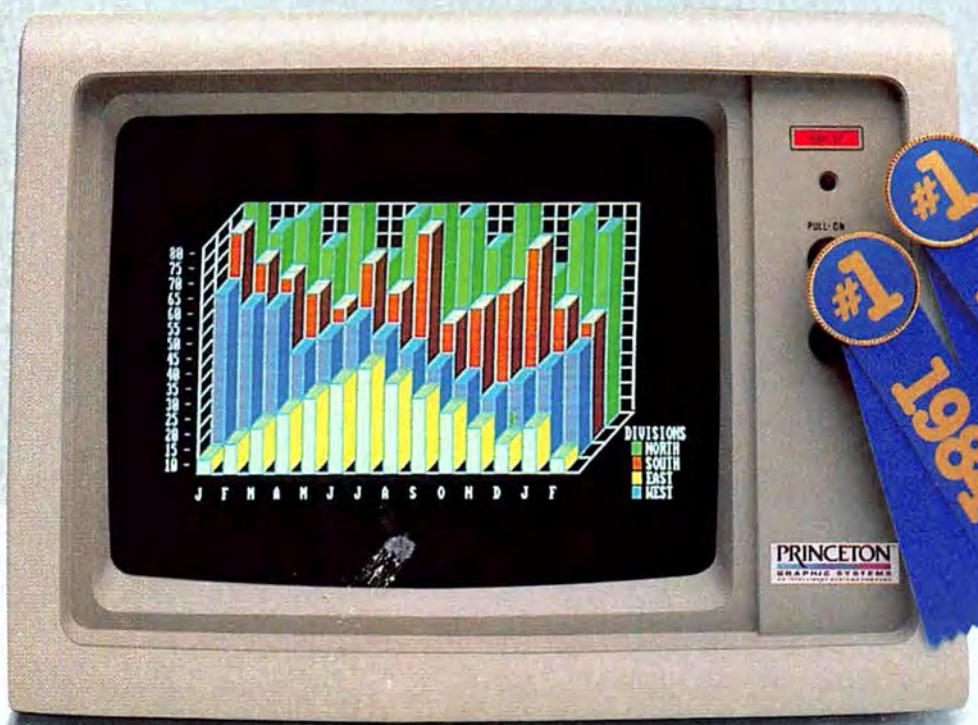
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BASF

Circle 207 on reader service card

us the growth in their own demands has not slowed. I think management will be getting requests for millions of dollars. Everybody has been counting on this bluebird to carry the industry.

Morrow: What bluebird?

Esber: The Fortune 1000. It's a timing issue, and we're off a bit. Corporate buying runs in 18-month cycles; they've been buying this way for years, and now that they've got control of personal computers, it's going to take some time before the big buys occur.

Morrow: You software guys have a bit of a different perspective.

Esber: How's that, George?

Morrow: The big Fortune 1000 buys do not favor the guy who's going to bring innovation to the marketplace. They favor the larger vendor.

Esber: Because of corporations, it's true that innovation is slowing and development cycles are getting longer. Buyers don't want us to innovate if innovation means continually releasing new versions of our products. Corporate buying lends credibility to the current winners in the market. Just like hot-seller lists.

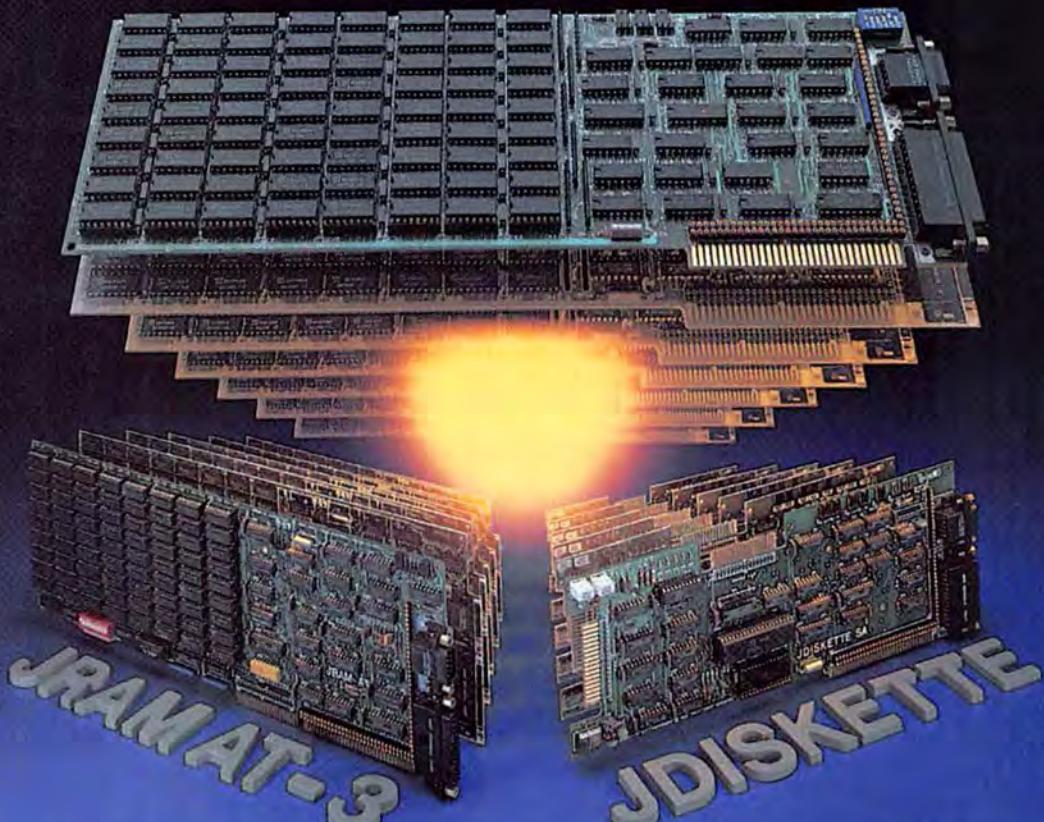
Raburn: You're correct that corporate buyers who want to go with standards are stifling innovation. That's where we've screwed up as an industry—we've cut out the people who'll buy innovation. We don't know how to talk to them anymore.

Esber: We're selling to corporations, but the difference is that an individual was buying before—some MIS [Management Information Systems] manager or PC coordinator ...

(continues)

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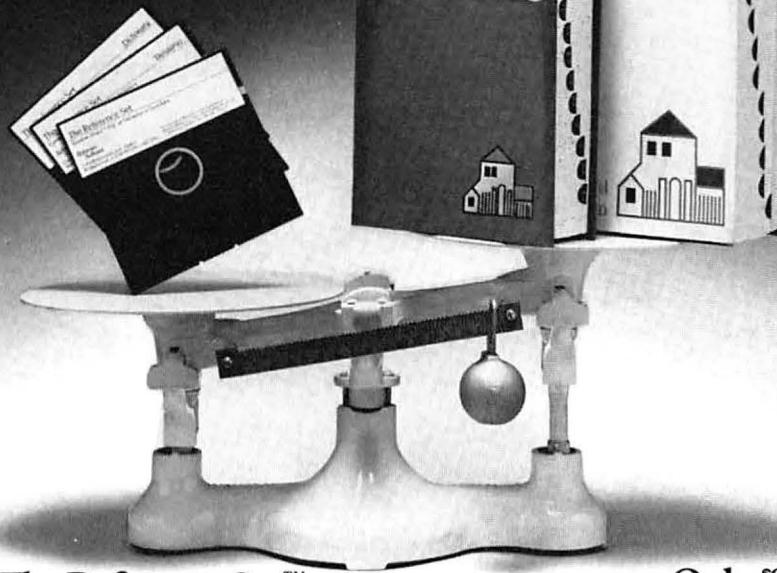
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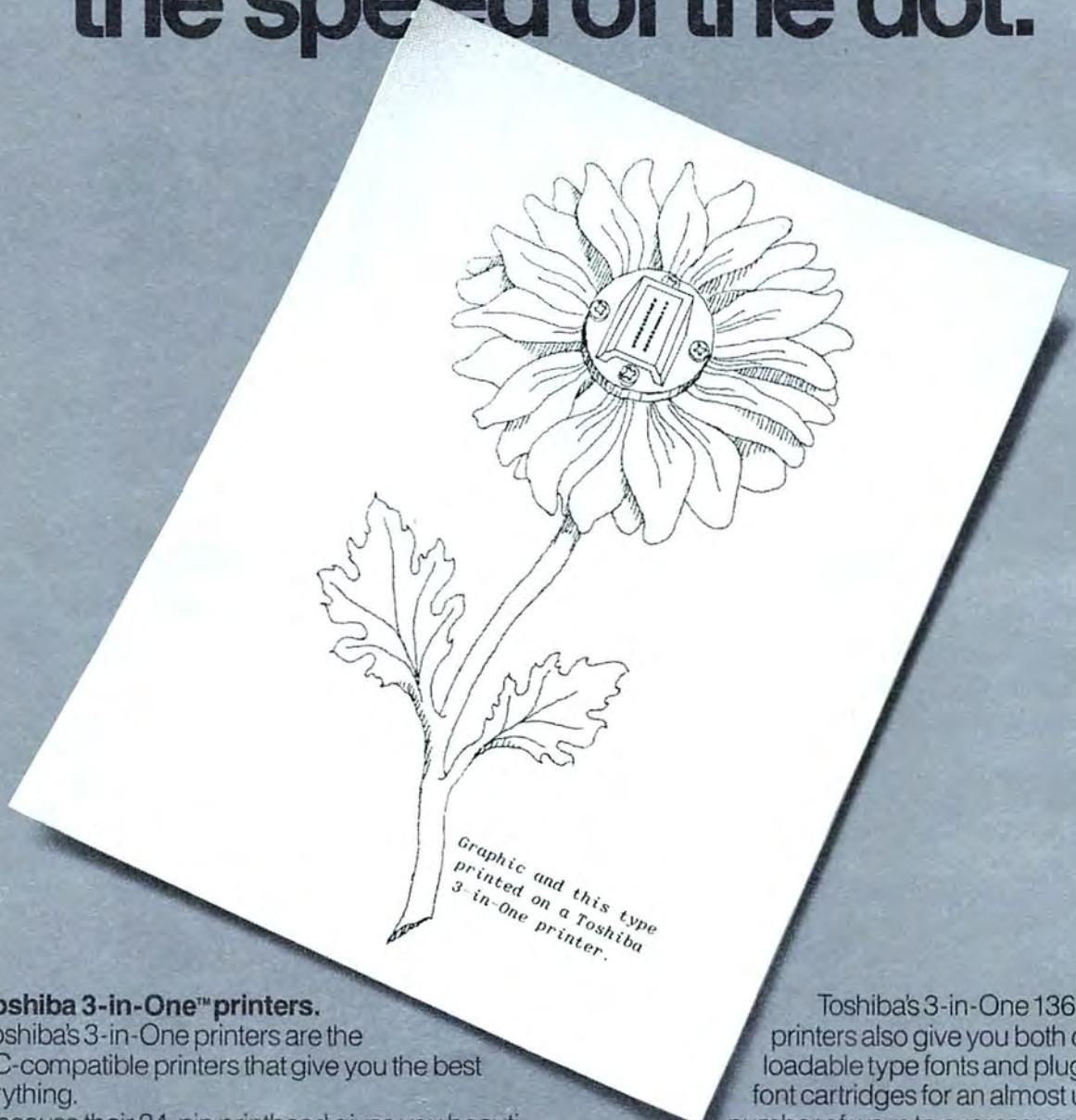
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Morrow: On his own little budget. And what happens after that—how long will it take to satisfy the demands of corporate buyers?

Raburn: What happens, to paraphrase Steve Jobs, is you go out and sell to the Fortune 5 million, not the Fortune 500.

Morrow: One of the things that a microcomputer can't do adequately is a payroll. Everybody has to do it—and it's a total pain. If we don't know how to attack problems like that, we're never going to get to the Fortune 5 million.

Raburn: Accounting is an issue on which computers have gotten a bad rap; they've been blamed for not making a nasty chore easier. George, there's a fundamental observation here: A lot of tasks in life really dissolve into two issues. One is getting the data, and the other is manipulating the data.

Morrow: I just want payrolls to be easy, and I know there's some way to mechanize it.

Raburn: I don't think there is.

Esber: You ought to get in the software business, George.

Morrow: Maybe we don't have the right hardware, or the right information-gathering tools.

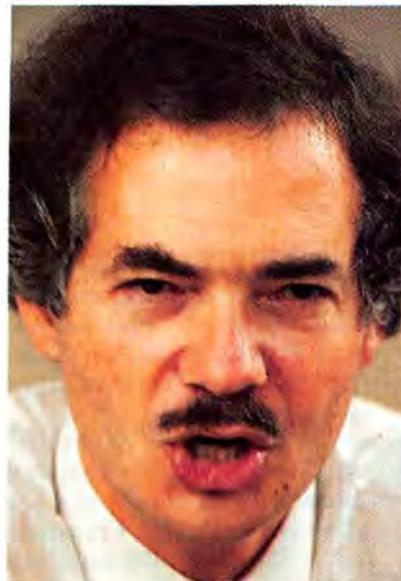
Raburn: Now you're talking.

Morrow: But if you want to get to the Fortune 5 million you've got to solve problems like that. Payroll and inventory!

Canion: That's an interesting issue, but is it the most exciting opportunity we have in the industry?

Morrow: If you want to get to the 5 million, you're talking about small business. You want to solve *their* problems.

Canion: What is the most important problem that hasn't



Industry pioneer

Adam Osborne: *"I've always felt that 10 percent of the buying public would let hell freeze over before they'd buy IBM—that's enough to keep one or two other companies healthy."*

been solved yet? Surely, the software companies are constantly beating their heads over that one.

Morrow: You want the computer to do what we do best.

Esber: What do we do best?

Morrow: Adapt. I don't want anything else that's as adaptive as we are.

(continues)

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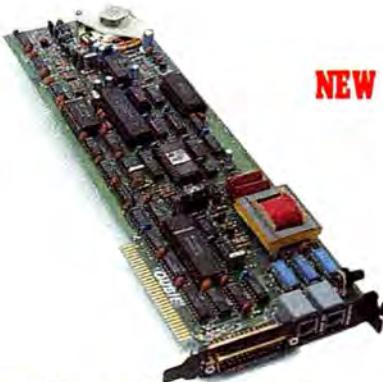
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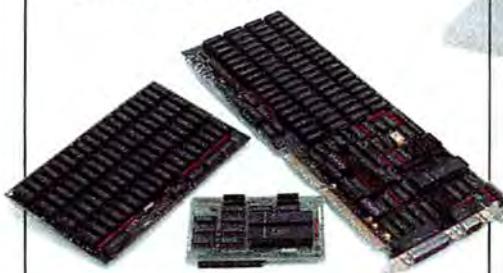
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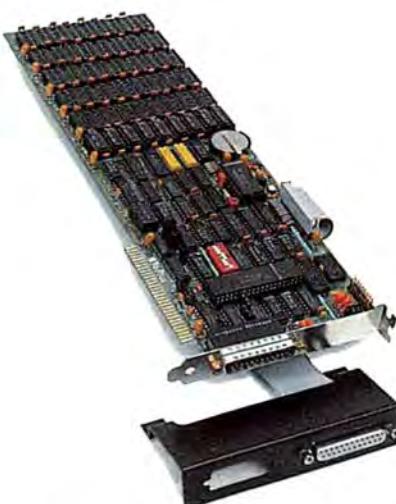
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An Aye for an AI

Jeffery: Everyone's focusing on limited problems. Maybe the next stage of innovation isn't 20 software guys in a back room. It's one guy going out with a computer on the road for six months. Could it be that the kind of problems we're defining here are forcing us to look at solutions too narrowly? Maybe the solution is outside, in a different technology.

Osborne: But what's the problem you're trying to solve? Artificial intelligence, if that's what you're getting at, seems to be a solution in search of a problem.

What's so complicated about the information we're trying to process that we need AI to find it?

Raburn: AI is wrapped up in a lot of mysticism. It's really just a set of techniques, like writing an operating system or an application. It's all aimed at making computers understand or be more understandable. AI isn't going to revolutionize the world in the next 37 weeks, but you're going to see these techniques in more and more products. A lot of money has been plowed into AI research.

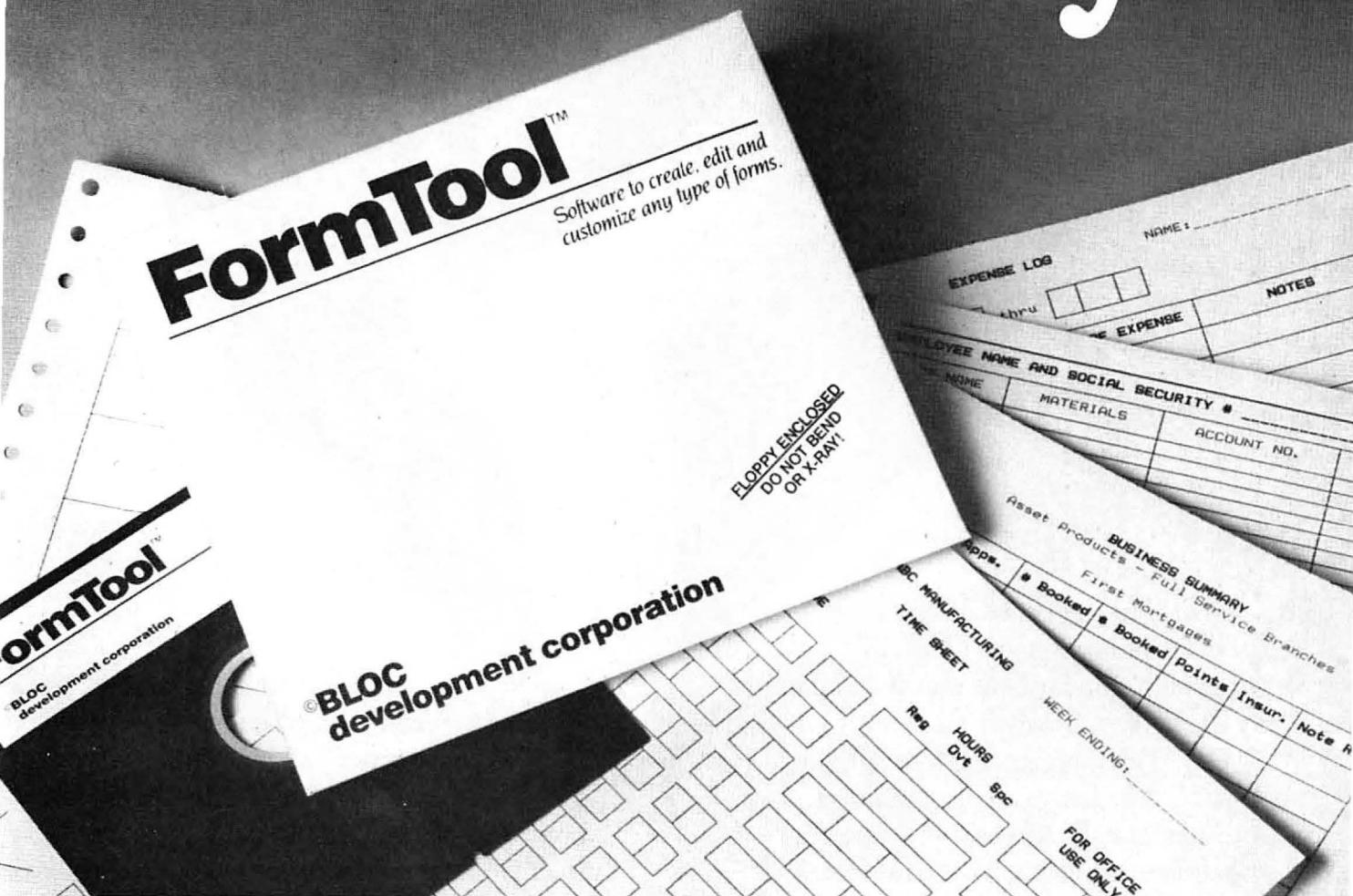
Jeffery: AI isn't a matter of having the machine think. The issue is more in terms of the interface—how you communicate with the machine. If you can talk to your computer in English, that means a hell of an improvement in productivity.

Morrow: You expect a computer to adapt to you, rather than the other way.

Raburn: We *will* be able to talk to computers in English.

(continues)

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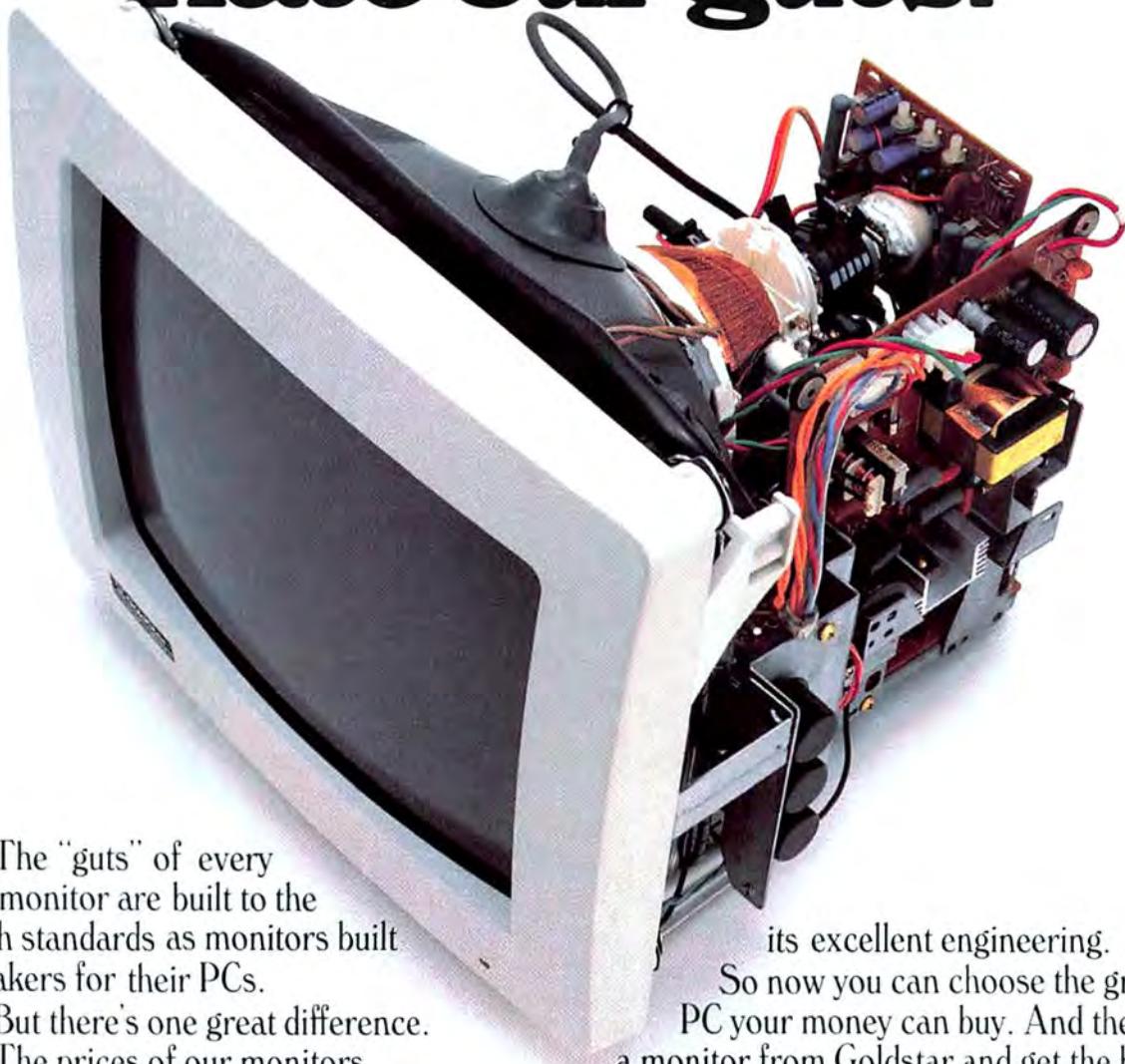
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■ PC World Forum**Morrow:** We wouldn't have to if we were computer literate.**Miller:** But we wouldn't have to be computer literate if we could speak to them in English!**Greenberg:** Stepping back just a moment, it seems like there's a tendency to take lessons about innovation and computer literacy from the mini and mainframe worlds. But the micro marketplace is substantially different; you can't buy a mainframe or a mini in a shopping center. Forcing people to adapt to the machine isn't going to fly.**Canion:** We're talking about making technology so simple that no one has to think of a computer as a computer—it's an information tool.**Raburn:** But isn't that a bit like Wilbur and Orville saying, "Wouldn't it be nice to be in Paris in two hours?" We can't do it today.**Miller:** We've been talking about innovation for its own sake. Returning to Rod's question, what do you have to do to help users solve real, everyday problems? That's clearly the way to keep the industry alive and growing.**■ Feeding the Animals****Morrow:** I don't think anyone wants innovation for its own sake, but rather as a means of getting deeper into the market, or expanding it, or exciting or satisfying some notion of where these machines might also be used.

I have this visual image of hardware manufacturers. Imagine a big fence. On one side is us, and on the other is a region of wild animals that we don't want to get too close to us. We just throw this hardware over, the animals gather

**Computer designer
and philosopher****George Morrow:** "The people in this room are not able to see what the next VisiCalc ought to be."

and eat it, and we don't have to do anything more. In other words, we produce solutions—we don't worry about the problems.

Esber: If you're referring to learning problems, I don't think that application software is the only source of trouble. I think of all the things I have to do to my DOS disk before I can even start.**Canion:** That's part of the total application problem. One of the nice things about the Macintosh is that you turn it on, and it's easy from there. We haven't done that—not that we couldn't, but for some strange reason, we haven't.*(continues)*

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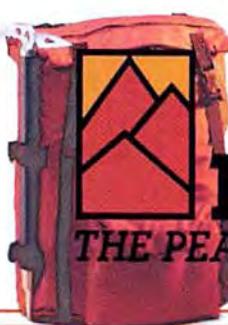
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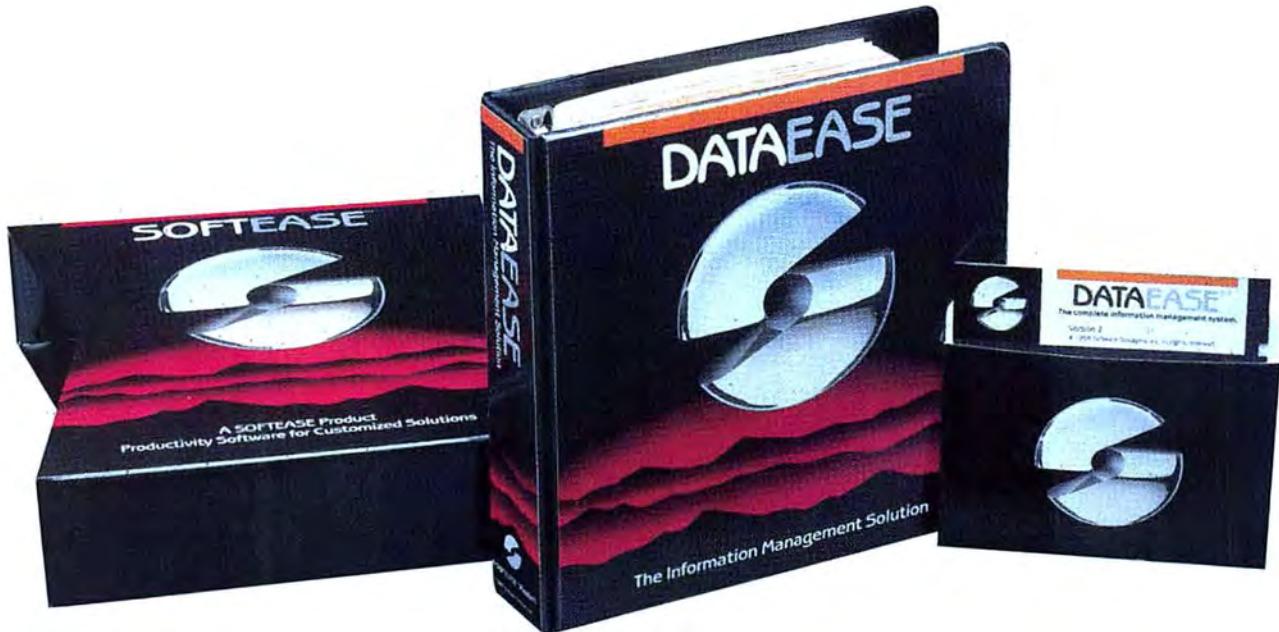
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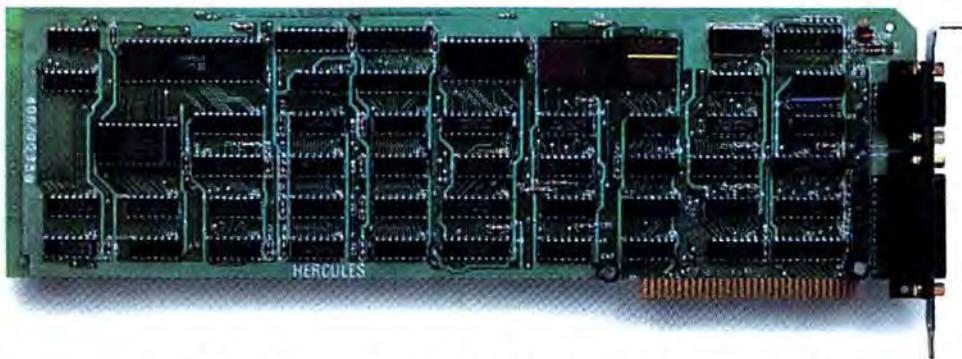
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issue."**

Osborne: You can do that now on the PC. There are all kinds of programs that take that junky interface and give you a clean one.

Raburn: How much effort should we, as an industry, and users generally, have to invest in computer literacy? You don't expect people to sit at a typewriter and immediately type 60 words per minute.

Esber: I'm not sure people won't put up with computers, but it's a matter of getting the educational system behind the technology. People have a preconceived notion that computers are complex.

Morrow: I don't agree. I've talked to customers standing in line to buy who didn't think they were difficult at all.

Esber: Were they buying Commodore 64s?

Morrow: No, they were buying ours, which I don't consider more or less easy to use than the average.

Esber: Have we lied to the people then, have we set up an expectation that computers are easy?

Morrow: No, not directly. After talking to these people, I realized that none of them knew what they would use the computer for. But they weren't convinced that it would be at all difficult.

Esber: I think they were standing in line for more reasons than ease of use. A lot of people thought the computer was a panacea. You know, "If I'm a bad manager, it'll make me a good manager." All a micro does is make a bad manager worse.

Raburn: I've always compared software companies to the Stanley Tool sort of operation—you make

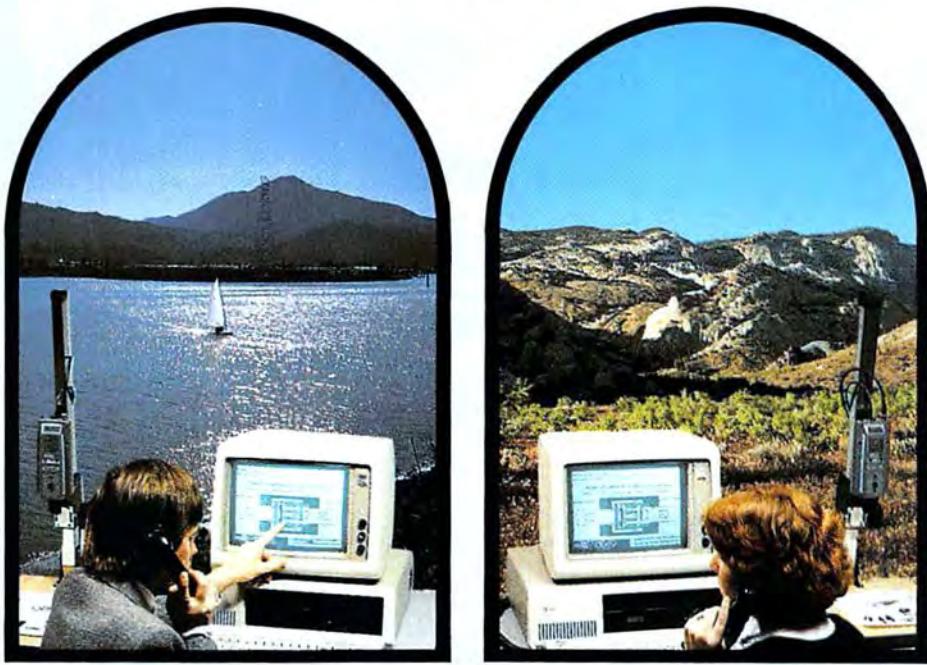
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■ PC World Forum

hammers that a guy uses all day every day to make his living, while another guy buys one to smash his thumbs on Sunday. Tools are wonderful devices, it's just that the guy who uses one for a living doesn't worry about his arm falling off at the end of the day. Everybody talks about vertical applications, making software easier, but so far we're not defining the solution for anybody; we're giving them the means to define it themselves.

Osborne: Absolutely right.

Esber: Don't we have a couple of crosscurrents here, if we keep adding features to our products—and at a rate that is probably faster than the population is absorbing computers?

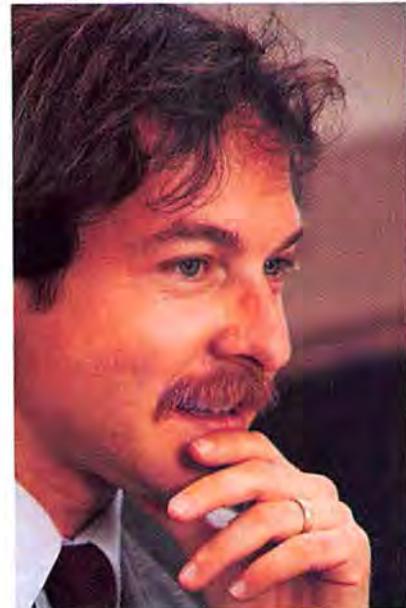
Morrow: A recent magazine article maintained that both *Symphony* and *Framework* contained too much. If a small smorgasbord is good, a huge one is better.

Esber: But some people accuse those products of not being enough. Too much in one sense—too broad in scope—yet lacking sufficient depth.

■ Data for the Asking

Jeffery: The PC and something like 1-2-3 provide the tools, but these tools don't deal with the problem of all the data a manager may need in the course of a day. That's a key issue here—actually delivering data to the manager, having the mechanisms to locate, say, 1972's accounts payable. When you start talking about that, you're dealing with something that's way beyond the context of the personal computer.

Raburn: For the first time in the history of mankind, we have



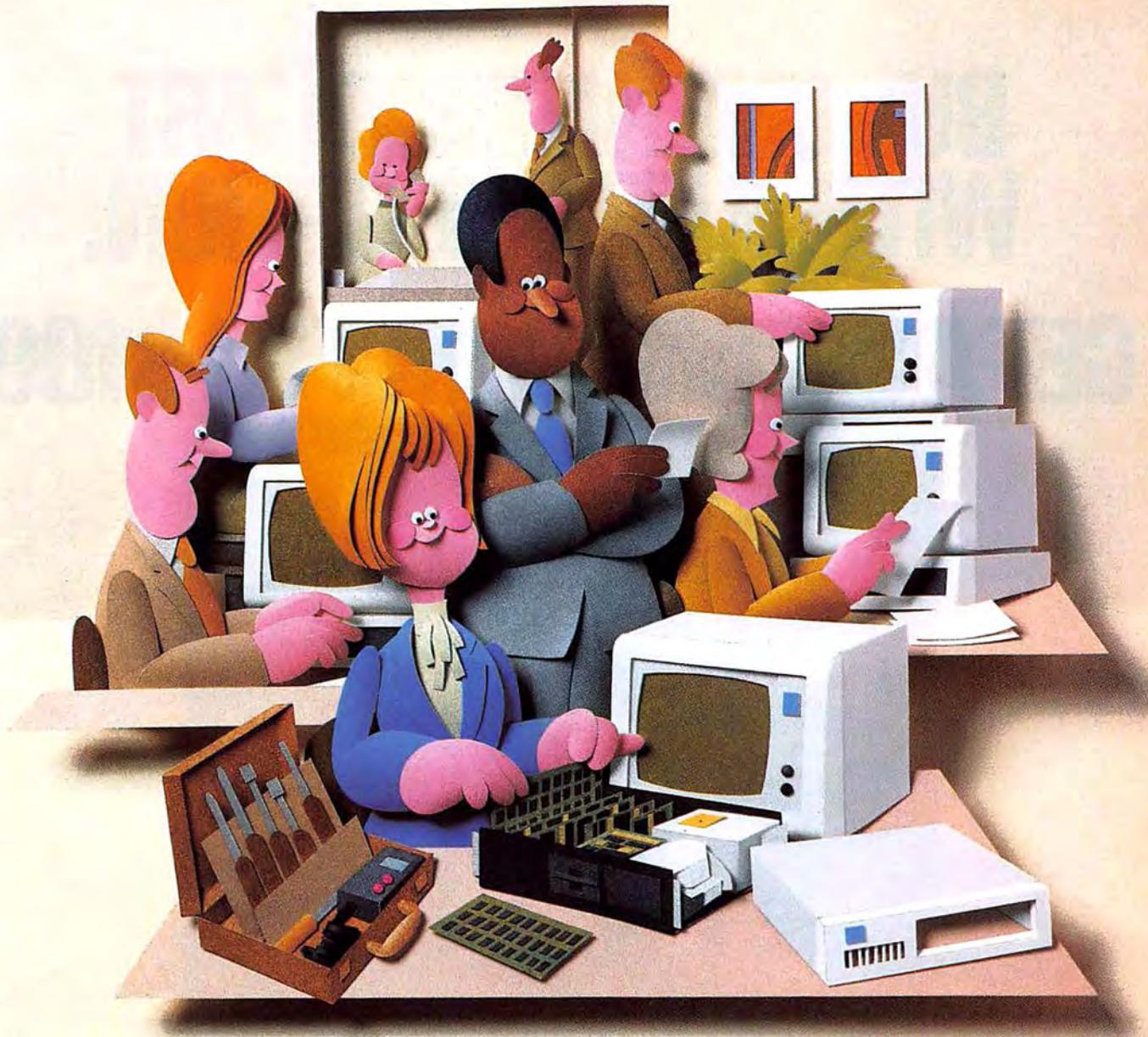
PC World senior editor Ken Greenberg: "Is it conceivable that success in the marketplace inhibits innovation, that as companies do well, they refuse to take risks?"

within our grasp the ability to make all data accessible. People wouldn't have talked this way even ten years ago. If you really want to get ethereal about it, Steve Jobs was right when he said we're dealing with a new medium here. It's a new kind of paper.

Morrow: That brings up communications, a very big area.

Osborne: It's a rats' nest. I'm not touching it until there's a standard, and I'm not going to pioneer one.

(continues)



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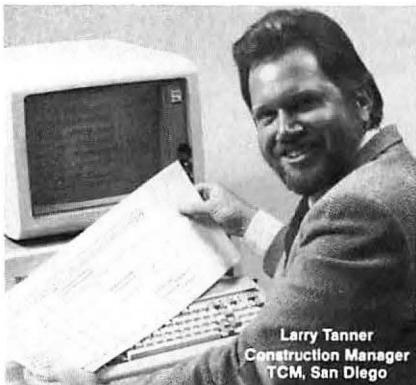
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1. PC World Magazine, Pub. No. 07378939
2. Date of Filing: October 3, 1985
3. Published monthly
- 3A. No. of issues published annually: 12
- 3B. Annual subscription price: \$23.75
4. Known office of publication: 555 De Haro St., San Francisco, CA 94107
5. Complete mailing address of the headquarters of general business offices of the publisher: PC WORLD COMMUNICATIONS, INC., 555 De Haro St., San Francisco, CA 94107
6. The names and address of the publisher, editor and managing editor are: Publisher: David Bunnell, PC WORLD COMMUNICATIONS, INC., 555 De Haro St., San Francisco, CA 94107 Editor: J. Kelley Younger, 555 De Haro St., San Francisco, CA 94107 Managing Editor: Harry Miller, 555 De Haro St., San Francisco, CA 94107
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10. Extent and nature of circulation

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Actual no. copies of single issue published nearest to filing date: A. Total no. copies (net press run), 353,000; B. Paid and/or requested circulation 1. Sales through dealers and carriers, street vendors and counter sales, 54,300; 2. Mail subscription (paid and/or requested), 235,510; C. Total paid and/or requested circulation (sum of 10B1 and 10B2), 289,810; D. Free distribution by mail, carrier or other means samples, complimentary, and other free copies, 7,513; E. Total distribution (sum of C and D), 297,323; F. Copies not distributed 1. Office use, left over, unaccounted, spoiled after printing, 1,977; 2. Return from News Agents, 53,700; G. Total (sum of E, F1 and 2)—should equal net press run shown in A), 353,000.

11. I certify that the statements made by me above are correct and complete. David Bunnell, Publisher

Esber: Right now you must have communications or your product won't sell. But still, very few people use it.

Miller: What will it take before more people use those capabilities?

Esber: You'll need software that from day one was built for both the PC end and the mainframe end instead of requiring Band-Aids like we use now.

Canion: The hardware is not what's holding it back. As soon as you add a network, by definition you're not tying two computers together, you're linking two people who have to agree on something.

Morrow: IBM has done everything possible to maintain the state of confusion in networks. They say, OK, you want a network, you buy our machines—and our machines only.

Canion: We have to figure out how to give users something when they say, "My problem is hooking my guys up and making them more productive than they are by themselves—what have you got?" If it's something they can understand in 30 minutes or less, then maybe we've got a product.

Greenberg: Is there a convergence of computing and communications?

Canion: Not yet.

Osborne: That's the direction, but it's way off.

■ Big Blue's Cruise

Bunnell: What about IBM? What about all the changes they made this year—what will be the impact of moving Entry Systems Division's [ESD] headquarters to

(continues)

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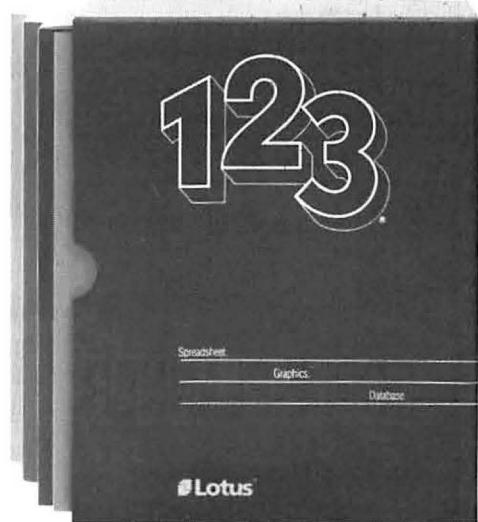
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New Jersey, and of trying to integrate the PC business with the mainframe business?

Canion: These changes will benefit IBM in the long term, but part of what creates opportunity for us is IBM's tendency to be slower despite being big and steady. You know the disk drive industry sprang up because IBM didn't apply the technology it invented to the problems that fast-moving smaller companies could solve more quickly.

Jeffery: Which is more dangerous, a steamroller or a motorcycle?

Canion: That's a good point. Some small companies would have been better off if IBM had never bought from them.

Bunnell: A key reason for the PC's success is believed to be IBM's decision to break its rules of traditional operation. Entry Systems was an entrepreneurial venture; now that the division has been folded into headquarters, will IBM continue its domination of the PC business?

Esber: I don't think IBM's success depended on its establishing an entrepreneurial unit to create the PC. It was a small group, willing to listen, willing to change—and to do so faster than before—but that had nothing to do with being entrepreneurial. Entry Systems was not a counter-corporate group; it was condoned.

Canion: ESD got advice from the industry. Had they done things other than the way they did, even slightly, I believe they would have been much less successful.

Osborne: It could just as easily have gone the other way. Around 1980, the bulk of the people within IBM were looking to emasculate their Series 1 mini, then



Brian Jeffery, veteran IBM-watcher: "IBM is pulling PCs back under corporate just as the market is moving in that direction. DP managers are now influencing PC decisions."

come out with this product featuring a unique operating system and unique software, while totally bypassing computer stores to sell it through their own sales force.

Jeffery: The PC family—what happened after that success?

Bunnell: IBM is not likely to break the rules in the future. What impact will that have?

Canion: That's an important question. I think IBM will be less of a leader in setting new standards. Others will be able to innovate around a standard and push forward with communications and

(continues)

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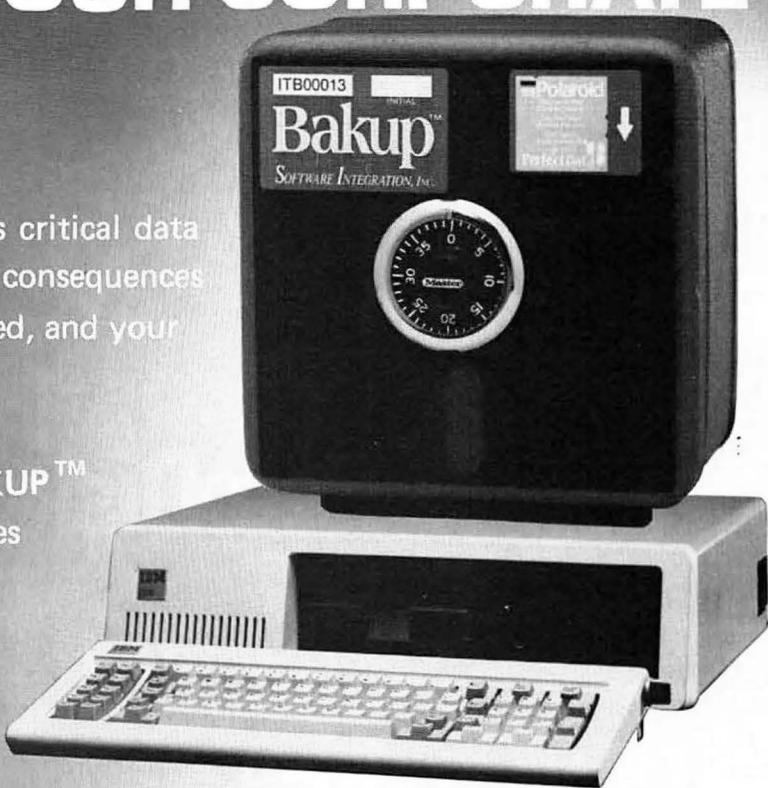
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networks. There's now a standard for software, and the hardware's almost secondary.

Morrow: How about IBM software that's been developed in a more traditional way?

Esber: I don't think they're going to be successful in software.

Bunnell: Why do you say that?

Esber: They just care about who moves iron, right? There's no money in it for them. IBM needs a higher margin than all of us. When IBM buys [from other software vendors], they get prices down. I think they'll make a major play in data bases—they'll have to if they're going to move corporations. In word processing, they're really fighting people like Multi-mate for market share. But so far they have not been successful in application software in any major way.

Osborne: As long as prices remain high, IBM will eventually steamroll over us all, because while prices are at the investment level, people are going to play it safe.

Jeffery: You might be mistaken in assuming that IBM thinks like a software vendor. [Former Entry Systems head Don] Estridge's people went after the PC software market as if they *were* a software vendor. The people now in charge think about it very differently. IBM is pulling PCs back under corporate just as the market is moving in that direction. The DP managers, the MIS people, information centers—all these guys are coming in now and influencing PC decisions.

(continues)

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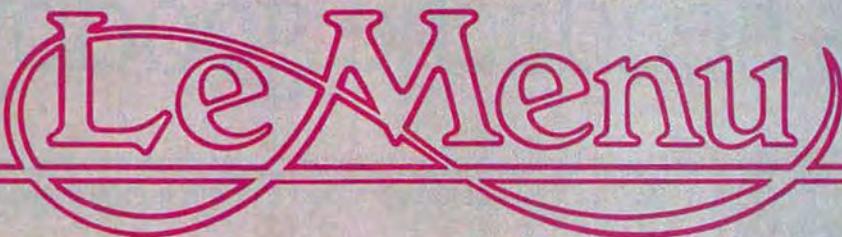
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The Graphics Go-Round

Esber: A lot of us are screaming that IBM has not moved to a graphics interface fast enough. For religion or sexy reasons or whatever, everybody's gone after the Mac—it's just a lot more fun to design software for.

Morrow: Tougher, though. What about the Enhanced Graphics Adapter and the Professional Graphics Adapter?

Esber: I hate to say this, but I think IBM is just now implementing some things the market has long told them were required. Having to buy a graphics card for the PC is ridiculous.

Morrow: How come with every new piece of software, you need 27 different versions for 27 machines? It just doesn't make sense. Who wants to innovate around that when you have to rely on application software developers and their whims?

Esber: We don't operate as much on whim as you think.

Miller: This is terrific—we've declared that standards are a deterrent to innovation, and lack of standards is a deterrent to innovation.

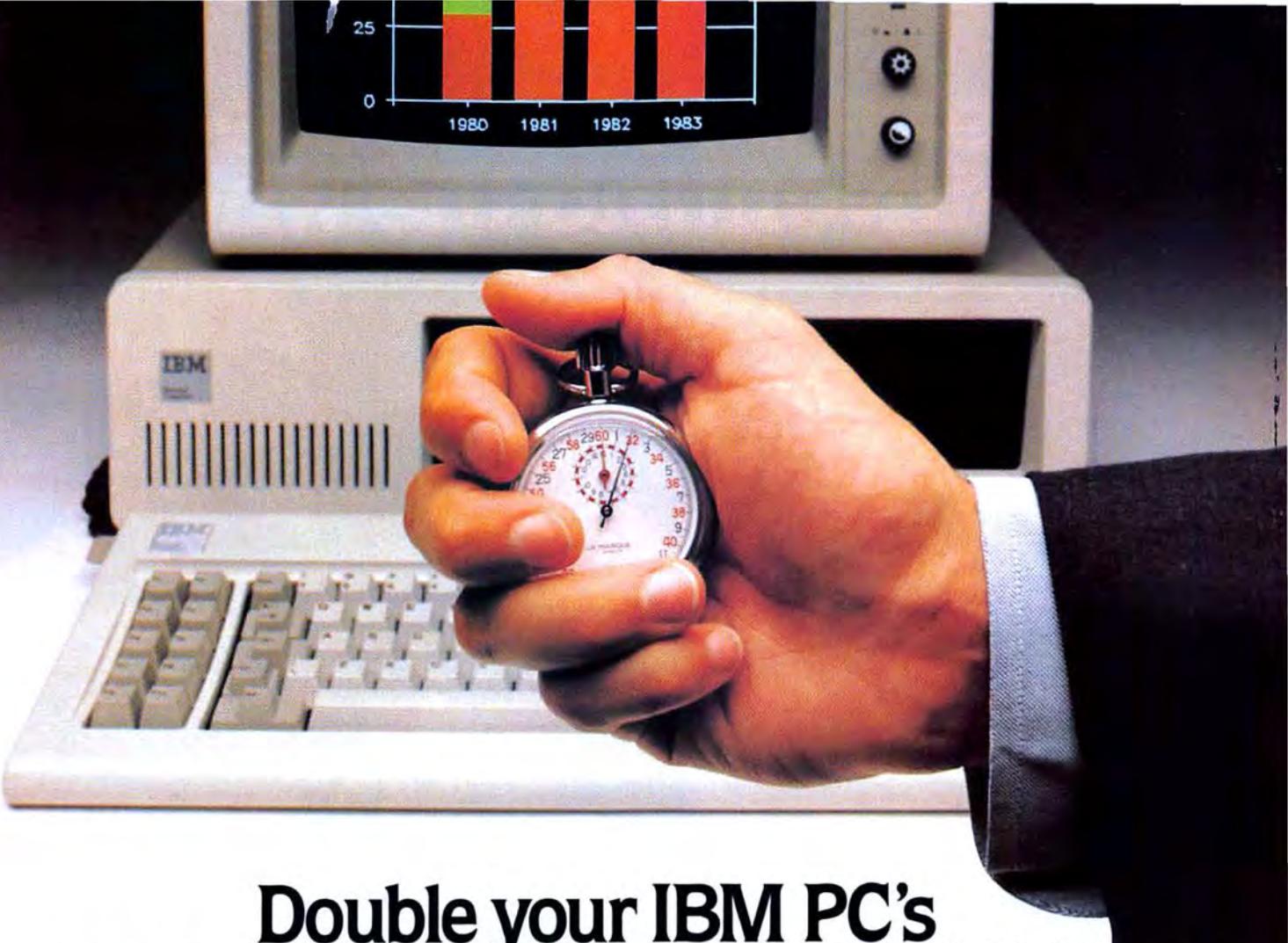
Canion: That's exactly right.

Miller: It's the only thing we've agreed on.

Osborne: I've always felt that there was about 10 percent of the buying public for whom hell will freeze over before they'll buy IBM, 70 percent who will buy nothing but IBM, and 20 percent who are undecided. That 10 percent is plenty to keep one or two other companies around and healthy.

Morrow: Rod, do you think the Macintosh is viable now, or will Apple have to open up the machine?

(continues)



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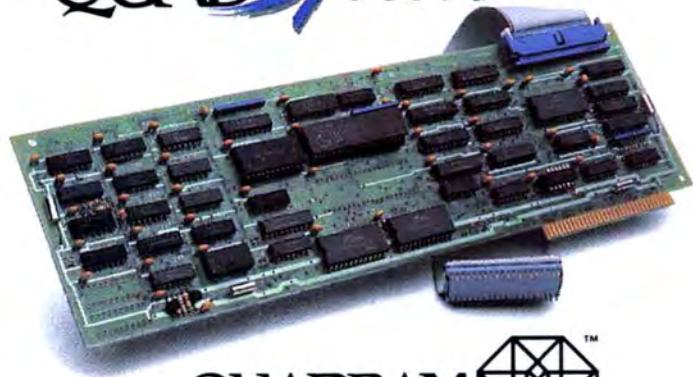
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widget, doesn't matter. If it did, IBM would have been out of business years ago.

Canion: But a [PC] standard helps to solve that problem. I'm not talking about mainframes changing, I'm talking about the ability to buy a box, instead of an IBM box, that does exactly what the DP guy needs: It connects and is fully compatible, it runs the software—and it gives him better something or other.

Bunnell: What bothers me about integrating the PC into the mainframe world is that the largest market for PCs is people who don't have mainframes.

Morrow: That's not true—not today.

Bunnell: For the long-term market it is—when the market moves into the small business arena. Are we going to leave the small guys behind?

Morrow: What are we producing today, in terms of utility, that a guy in a gas station, or a drugstore, or elsewhere in the Fortune 5 million would yearn to buy?

Osborne: Very simple. We're producing a tool that local value-added resellers [VARs] and value-added dealers [VADs], for a reasonable sum of money, in a very short space of time, can tailor to almost anyone.

Morrow: If we've sold them already, how come computer stores are going out of business in droves?

Miller: Because retailers are not addressing vertical markets, and they're not adding value.

Morrow: Who is, then?

Miller: Hopefully, value-added dealers and resellers.

(continues)

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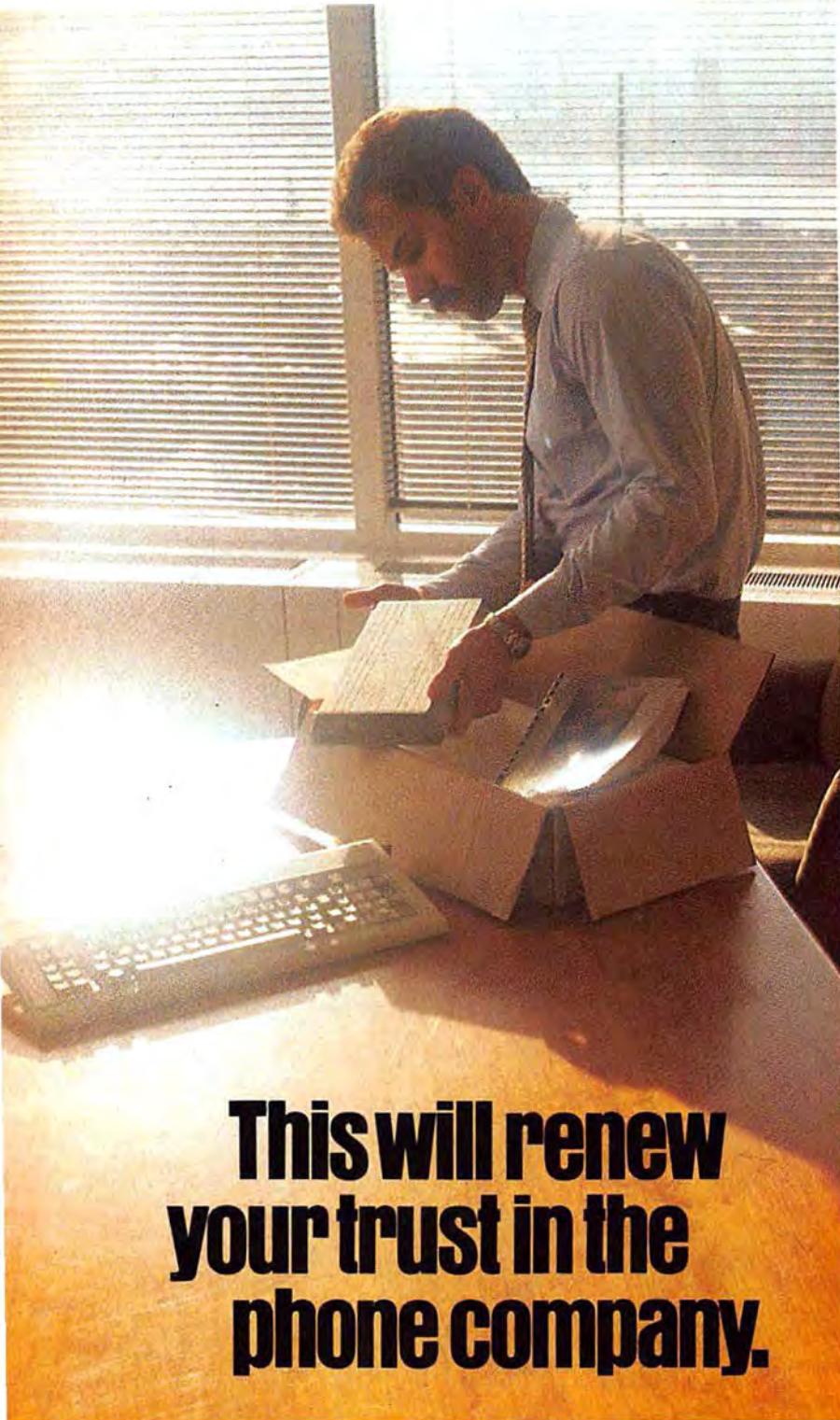
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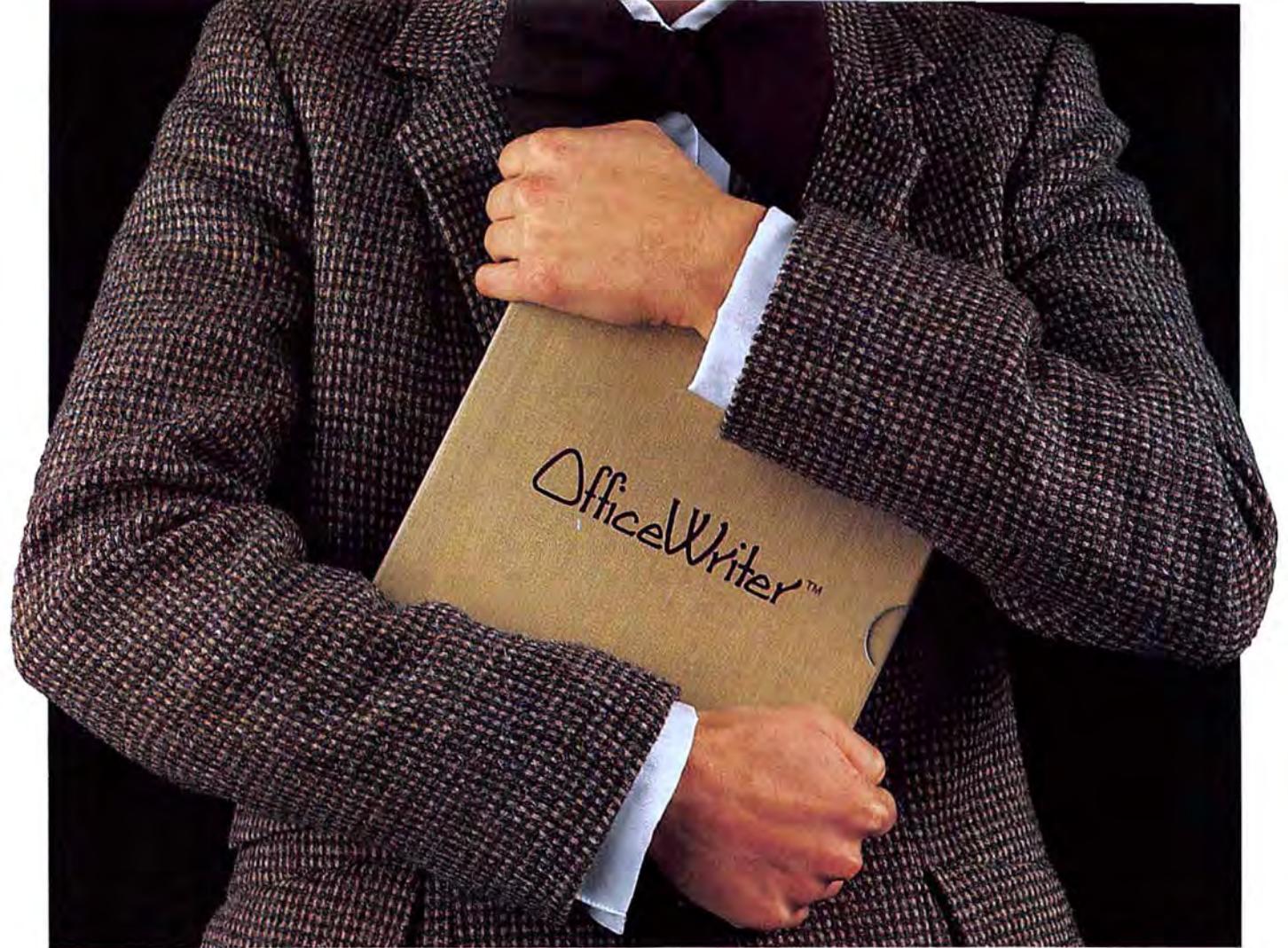
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Morrow: Nothing has happened with them—the volume of VARs hasn't changed appreciably in the last two years. Computer stores are losing sales, and VARs aren't growing by that much, so what's happening?

Esber: With the exception of places like Businessland, which puts everything on the hard disk for you so you can go home and power right up, the distribution channel is not carrying its weight.

Morrow: That's why they're having so much trouble.

Changing Channels

Miller: What will it take to get a distribution channel that serves both manufacturers and users? We clearly don't have that now—the distribution channel is not even serving itself.

Osborne: There's going to be a variety of channels, and the successful computer stores will fall into one of two categories. There'll be the mass merchandisers who just peddle iron. The bulk of them won't be computer stores, or if they are, they'll be big marts. Or they'll finish up in the end being VADs and VARs in one form or another, who don't just peddle hardware or software but sell an entire solution.

Canion: Why haven't software stores made it so far?

Osborne: Because the shrink-wrapped stuff is too high priced;

people still look at it as an investment rather than an impulse purchase.

Raburn: But software is an investment, and it has nothing to do with price. At Symantec we've spent a lot of time trying to find out what users think. The investment is in learning to use the product and in putting the data in it. Customers couldn't care less about how much it costs.

Osborne: Learning to use the product is only a problem when you give users software so complicated that they can't get the program to do the simple tasks most of them want to do.

Esber: Does anybody buy something for a business on impulse? I don't spend \$100 on impulse. I let my logic get looser when I buy things, but ...

Greenberg: Speaking of impulsive—and just to close this on a somewhat lighter note—is there any chance that IBM's competitors might press the Justice Department to reopen the old antitrust suit?

Morrow: They're immune to suit; they've proved that. I doubt that any government agency can get at IBM, because that takes paper, and they've demonstrated that not only can they outpaper, they can outlawyer.

Jeffery: The original antitrust suit sure slowed them up. IBM's running scared at the moment, primarily about who gets elected president in 1988.

(continues)

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Morrow: Two years ago I complained that no one told the truth about IBM, but I have to say that the industry has done an amazing job—far better than I could have imagined. ●

Ken Greenberg is senior editor for PC World.

Rod Canion, president and chief executive officer of Houston-based Compaq Computer, helped found the company in 1982. Canion, who holds B.S. and M.S. degrees in electrical engineering, worked at Texas Instruments for 13 years before coming to Compaq.

Edward M. Esber, Jr., has been president and CEO of Ashton-Tate since August 1984, when he moved up from executive vice president in charge of marketing and sales. Esber served in a similar marketing position with Visi-Corp. He holds an M.S. in electronic engineering, and an M.B.A. from Harvard University.

Brian Jeffery is research director and a principal of the International Technology Group, a consulting and information services firm for the computer and communications industries. Jeffery previously headed competitive analysis and market planning for Burroughs and Hewlett-Packard/France. He holds an M.A. from Cambridge University and an M.B.A. from the Paris Business School.

George Morrow, chairman and founder of Morrow Designs, is a former University of California Berkeley math professor and self-trained logic designer who began working with S-100 bus hardware in the late 1960s. Morrow founded Thinker Toys and Morrow Micro Stuff, the precursor to his current firm. He earned a B.S. in physics from Stanford University and an M.S. in mathematics from the University of Oklahoma.

Adam Osborne entered the personal computer business in the early 1970s, writing documentation and software. That activity evolved into a computer book venture, which he sold to McGraw-Hill in 1979. He founded Osborne Computer in 1981, marketing low-cost CP/M portables. Osborne Computer declared bankruptcy in 1983, and Dr. Osborne started Paperback Software International the following year. He holds a Ph.D. in chemical engineering.

Vern L. Raburn, president of Symantec in Cupertino, California, was formerly executive vice president and general manager of Lotus Development. Raburn also served as vice president of Microsoft's consumer products group. He holds a B.S. in industrial technology.



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Word Processing



Word Processing and the Three Bears

Established vendors selling three-tiered product lines currently dominate word processing, but the future looks toward personal publishing systems for laser printers and text data management systems that can harness optical storage.

Eric Brown

||||| The past year was not so much one of innovation in word processing as it was a time of marketing adjustments. After years of attempting to concoct sophisticated word processing programs that were also easy to use, most major word processing vendors realized that not all users are created equal and diversified their offerings accordingly. The top word processing companies—IBM, MicroPro, Multimate, Samna, and Satellite Software—have come out with three-tiered product lines, offering incremental features and prices to match. This Papa Bear, Mama Bear, Baby Bear approach indicates that a certain maturity has come to the industry; for the first time individual software companies can afford to fill everyone's porridge bowl.

On the high end, products like *DisplayWrite 3*, *WordStar 2000*, *MultiMate Advantage*, *Samna Word III*, and *WordPerfect 4.0* provide advanced features targeted at professionals who produce complex documents. These programs rival dedicated word processors in almost all categories except speed and offer features such as spelling checkers, mail merge, indexers, tables of contents, footnotes, and built-in math functions. However, with these word processing luxury liners you've got to pay to play—the prices are steep, and the programs require a plump investment in memory, storage, and training.

While updated versions of the original programs hold out in the middle range, inexpensive, menu-driven word processors aimed at new users cover the easy-to-use Baby Bear category. This year two word processing giants tested the low-end waters for the first time: MicroPro with its *Easy* package and Multimate with *Just Write*. Both programs emphasize simplicity while sacrificing extras such as column moves and mail merge.

Challenge from the Cheap

Easy and *Just Write* will be competing in a low-end market populated by such programs as *Bank Street Writer* (Broderbund Software), *Wordvision* (Bruce & James), *Paperback Writer* (Paperback Software), and the phenomenally popular *pfs:write* from Software Publishing. On the ludicrously low end, *Textra* from Ann Arbor Software and *PC-Write* from

Quicksoft are giving everyone a run for their money by offering packages for \$10.

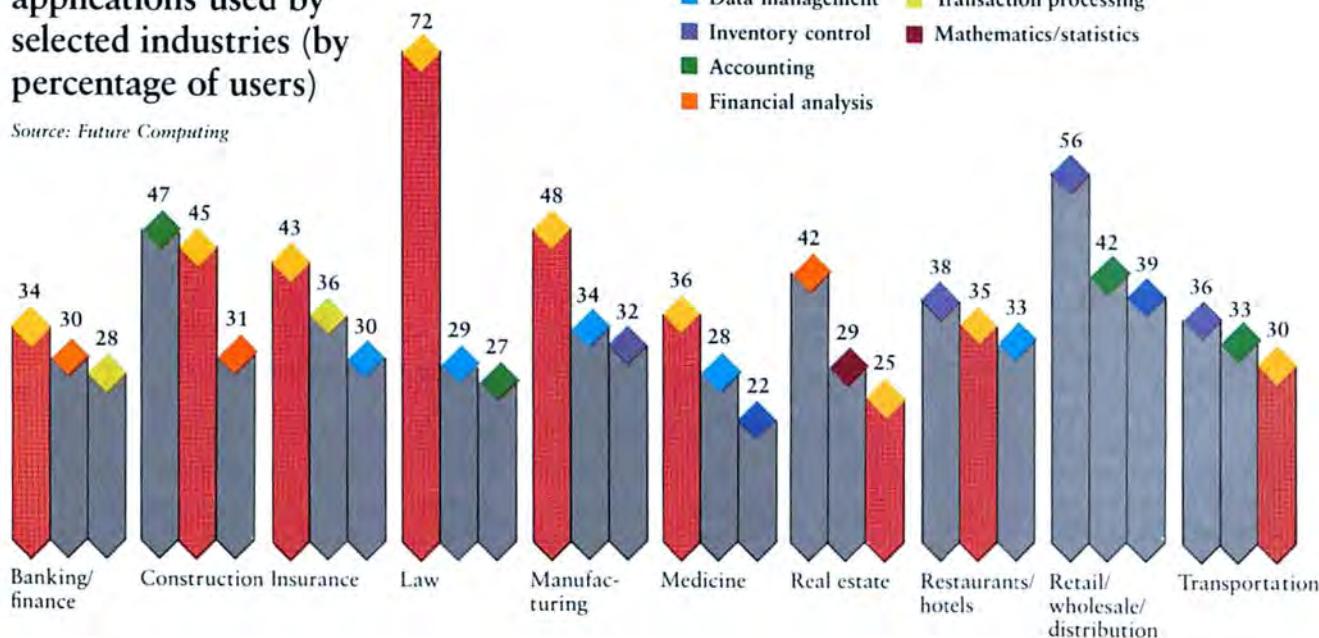
This year Quicksoft surprised the industry by generating over \$750,000 in sales using an innovative marketing approach called shareware. Quicksoft sells the *PC-Write* program disk for \$10 and encourages users to share copies with others. Each user can register for \$75 and receive a manual, phone support, and other services. A \$25 commission is paid to registered users who enroll new users. In 1985 Quicksoft registered 6000 users and catapulted into corporate fortresses such as AT&T, Exxon, Boeing, and even IBM.

"Shareware started as a way to get the software out there," says Bob Wallace, president of Quicksoft. "At the time I was looking for a publisher, but now we're doing very well on our own."

According to Peter Watkins, director of product management for MicroPro, his company originally tried an à la carte approach to marketing, selling adjunct programs as separate options, but found that including extras as standard was a better strategy. "People don't go back and buy a mail merge or indexing program," says Watkins. "You have to get them at the point of purchase. Two models sell best—your base model and your deluxe model." Starting from this assumption, MicroPro updated *WordStar*, came out with the mammoth, non-copy-protected *WordStar 2000*, and then went on to gamble with the introduction of its low-end *Easy*.

Leading software applications used by selected industries (by percentage of users)

Source: Future Computing



Discount Price Wars

The most dramatic price cuts came not from the manufacturers but from an increasingly rivalrous discount retail business. As anybody who has scanned the back pages of computer magazines or has been to the latest computer fair can tell you, software bargains abound, and vendors' list prices can be deceiving.

"This year was much more competitive," says W. E. "Pete" Peterson, executive vice president of Satellite Software International (SSI), the maker of *WordPerfect*. "The real changes came with the distributors who were willing to work on lower margins and the full services dealers who had to face the reality that they couldn't always sell at list price. We haven't seen the need to lower our prices, since the prices are going down anyway."

SSI was one of the first companies to diversify, establishing a three-tier product line last year with *WordPerfect Jr.*, *Personal WordPerfect*, and *WordPerfect*. Yet this year the company found itself moving away from diversification and concentrating on its successful high-end product, updating *WordPerfect* to the highly-acclaimed 4.0 and 4.1 versions. Version 4.0 added features such as indexing, a table of contents function, and paragraph numbering; and version 4.1 introduced memory caching, column wrapping, split screens, and an on-line thesaurus.

"We diversified last year, but we were not at all pleased with the results," admits Peterson. Especially troublesome was the low-end product targeted at PCjr users. "With the Jr dropping out of the marketplace, we have a product without a machine."

This year the feature-laden high-end packages are selling better than ever. Many business managers who last year experimented with *pfs:write* now want more features and are willing to grapple with greater complexity. Once offered as options, mail merge programs, spelling checkers, and footnoters are now standard on most mid- and high-level word processors. Still, *pfs:write*, which recently added a spelling checker of its own, continues to sell well as new users discover word processing.

On a Wang and a Prayer

While discounters and start-ups began to put pressure on exorbitant list prices, an entirely different kind of challenge came from the top: Companies selling software in the mainframe and dedicated word processing fields finally admitted that the PC was the place to be. Last year IBM converted its popular dedicated system, the DisplayWriter, into the PC software incarnations *DisplayWrite 1* and *DisplayWrite 2*.

After assuring itself a place in the PC market by practically giving these programs away in IBM Product Centers, this year IBM introduced *DisplayWrite 3*.

Meanwhile, Big Blue's version of *pfs:write*—IBM *Writing Assistant*—has also sold well on the low end.

Prominent on the PC party guest list (and arriving noticeably late) was the formidable Wang, which only a few short years ago ruled supreme over word processing with its dedicated systems. After stumbling with its halfway gesture to personal computer word processing—the somewhat-MS-DOS-compatible Wang Office Assistant—Wang saw profits dwindle and realized that dedicated word processing was on the wane.

This year Wang decided to compete with its many PC-based imitators and announced *Wang Word Processing for the PC*. Still, the giant refused to completely sever its commitment to hardware-based word processing: The Wang software requires a dedicated keyboard, and an optional expansion board provides Wang emulation so PCs can fit into a Wang network.

Wang's most successful imitator, Multimate, also came out with a dedicated keyboard that works with its high-end program, *MultiMate Advantage*. The move toward dedicated keyboards is a response to word processing professionals' criticism that the PC keyboard is just not designed for efficient word processing. Despite this widely held perception, it's doubtful that many companies will invest in specialized keyboards when the PC's keyboard is good enough to do the job.

MicroPro updated WordStar, came out with the mammoth, non-copy-protected WordStar 2000, and then went on to gamble with the introduction of its low-end Easy.

"Special keyboards are kind of a step backwards," says SSI's Peterson. "The keyboard is only one consideration. The number of keystrokes and how quickly it does something are more important. I don't think a dedicated keyboard is going to change that."

Wang imitators such as *MultiMate 3.3* (Multimate), *NBI Word Processing* (NBI), *The Leading Edge Word Processor* (Leading Edge), and *Office Writer* (Office Solutions) still comprise a sizable portion of the market, but the popularity of dissenting products such as *Microsoft Word*, *WordPerfect*, and Lifetree Software's *Volkswriter Deluxe* may indicate a trend toward new word processing philosophies.

"This year Wang lost its luster, and Wang look-alikes are not especially attractive," says Peterson. "Wang was in a situation where it came out first and had to remain compatible with itself. But it's no longer necessary to have different modes for creating and editing. The Wang interface has run its course."

Quicksoft's Wallace believes that increasing RAM has changed word processing interfaces. "The

orientation of the Wang reflected the limited memory computers had," says Wallace. "Keeping one page in memory made a lot of sense then, but it sets a strict page memory that we don't need now. Wang-oriented programs are still important, but they occupy a specialized niche."

■ Migrating Up and Out

While mainframe and dedicated word processing companies are descending into the PC marketplace, one established PC company has decided to move up. This year Multimate announced it would be marketing software to compete with IBM on the mainframe level. In a much publicized vote, Multimate let its employees decide whether to play the role of David against IBM's Goliath. Multimate was once again in the news this summer when the company was acquired by Ashton-Tate. Multimate will maintain a good deal of autonomy in its new role, but the alliance with Ashton-Tate augurs future integration with dBASE products.

Other word processing vendors plan to sit on the sidelines before migrating upward. "We're in a wait-and-see mode," says SSI's Peterson. "You're not going to get 'what you see is what you get' on an IBM

terminal. We're hoping that people will do word processing locally. By supporting DCA formats, we give them the flexibility to move their documents without having to write a new version of *WordPerfect*."

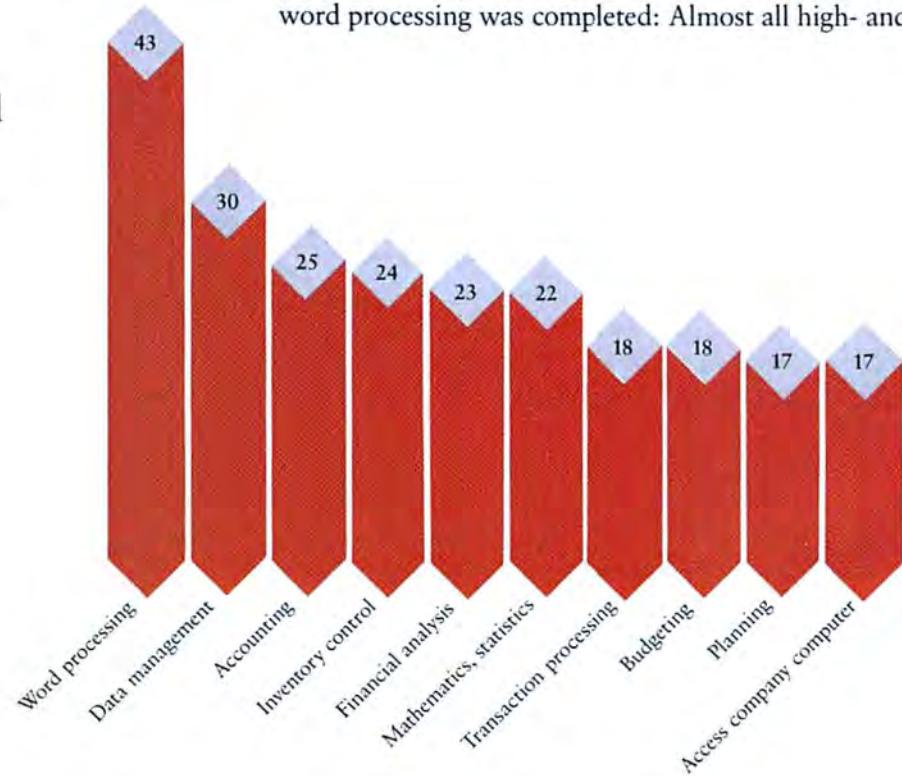
When local area networks (LANs) first arrived for the PC, many observers felt that data management or spreadsheet programs would be the first to move into the new environment. Yet word processing companies were the first to announce multiuser and LAN versions en masse. MicroPro, Multimate, Microsoft, and Samna have all announced multiuser versions of their software, and other companies are expected to follow suit. One reason may be the balanced competition in this segment of the industry—none of the handful of major word processing vendors could afford to be left out. "We're much more competitive than in other product categories," says MicroPro's Watkins. "On the other hand, when you own the market in spreadsheets, you decide when and what you want to do."

■ Casting a Spell from RAM

In years past, spelling checkers and other word processing adjunct programs were usually offered separately by third-party vendors. This year, the trend toward tighter integration between spelling and word processing was completed: Almost all high- and

Leading applications of personal computers in all industries combined (by percentage of users)

Source: Future Computing



medium-level word processors now come with a spelling checker, and some include an on-line thesaurus.

Although more easily accessible due to integration, spelling checkers still tend to be slow and inflexible. Seizing upon these weaknesses, independent vendors experimented with new approaches to spell-checking. This year several companies introduced RAM-resident spelling checkers that check words one

Before and after the actual writing stage, people need help in organizing their thoughts and text.

at a time and work with a wide variety of word processors. For example, the *Random House Electronic Reference Set* (Reference Software) provides an 80,000-word spelling checker and a 50,000-word thesaurus. As you're writing or editing a document, you can highlight a word, press a two-key command, and receive either a list of synonyms or, if you choose the dictionary, an indication of whether or not the word is spelled correctly. Another popular RAM-based thesaurus is *Word Finder* from Writing Consultants. *WordFinder* draws on a 90,000-word dictionary and is compatible with most of the major word processing programs.

Taking a bolder, more obtrusive tack, several companies recently announced spell-as-you-go spelling checkers that warn you of a misspelling the moment you type the word. *The Resident Speller* from S&K Technology offers a 49,000-word instant spelling checker in addition to a traditional stand-alone model. *Whoops!* from Cornucopia Software offers a 50,000-word spell-as-you-go checker that emits an audible signal if you make a mistake.

Meanwhile, little progress has been made in software that checks grammar, syntax, and style. Although currently available programs can spot problems such as double words, they cannot adequately analyze grammar, and little market demand has materialized—people may be willing to admit their spelling

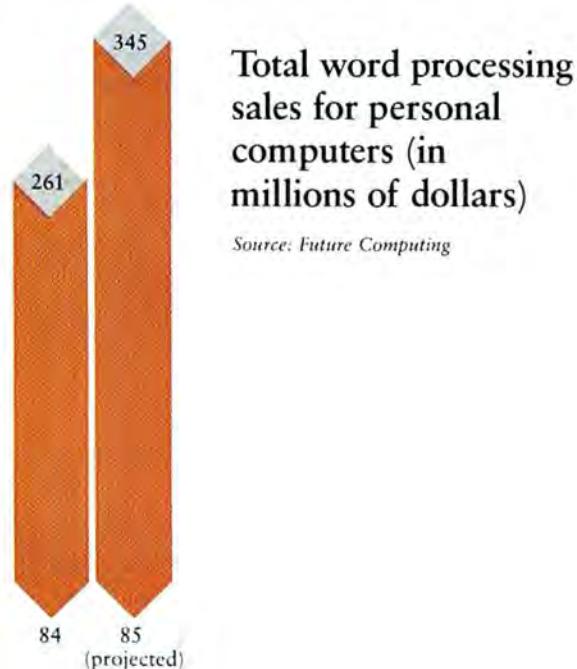
is bad, but few will acknowledge that they are bad writers. Syntax checkers that can truly evaluate a user's writing style await future breakthroughs in artificial intelligence.

Outlining and Searching: Innovation as a Side Dish

Most word processing innovations came from new companies that realized the market was too crowded to make room for any new full-featured word processors. Searching for related problems that needed solutions, program designers discovered that before and after the actual writing stage, people need help organizing their thoughts and text.

In 1983 the "before" process was addressed by Living Videotext's *ThinkTank*, an outlining program that has remained successful through several updates. Sporting only a bare-bones word processor, *ThinkTank*'s main mission lies in organizing and re-organizing outlines and creating first drafts that can be sent to a word processor for formatting.

Following *ThinkTank*'s lead, outline processors such as InfoStructure's *Fact Cruncher*, Summa Technology's *Freestyle*, MaxThink Inc.'s *MaxThink*, and Computer Personalities' *Eazy* added features that aid in the creation and organization of ideas. For example, *Freestyle* and *Fact Cruncher* add improved word



Source: Future Computing

Word Processing

Most of the breakthroughs in word processing this year occurred in adjunct programs rather than complete word processors. Yet one full-featured giant stands out from the crowd. As the most influential product of the year, *PC World* picks ...

■ Word Processing: Microsoft Word 2.0

When *Microsoft Word* appeared two years ago it was immediately recognized as the state of the art in word processing. With its style sheets, comprehensive set of features, and elegant interface, *Word* outclassed the competition. There was only one problem—the program's complexity, coupled with abysmal documentation, made *Word* extremely difficult to learn.

After several updates, Microsoft finally got it right. Version 2.0 improved the documentation and added

smoothly integrated spelling and hyphenation programs. A Library feature has been installed for calling DOS and other programs, and *Word* now supports IBM's Enhanced Graphics Adapter.

Among other improvements, setting up style sheets has been simplified without sacrificing any of their advanced formatting capabilities. *Word*'s sophisticated style sheets hold the keys to the power of laser printers. As a graphics-oriented word processor designed from the beginning to support and display the variable fonts provided by laser printers, *Word* continues to be the best of the major word processing programs for laser printer support.

processing along with other innovative twists, and *MaxThink* and *Eazy* provide operations for collecting, comparing, randomizing, and prioritizing ideas, emphasizing modes that allow writers to play around with the thinking and planning process.

An outline program similar to *ThinkTank* was incorporated as the core of Ashton-Tate's *Framework*, and the company has drawn upon this strength to upgrade and highlight the program's word processor in *Framework II*. Now some high-end word processing products include outlining and may add other writing adjuncts as standard features.

The "after" process—organizing files once they've been created—was first addressed by *ZyIndex* (ZyLAB Corporation) and *The Idea Processor* (Idea Ware). The former is a full-text indexing program, the latter, a word processor incorporating a text data management system (TDMS) that searches files by keywords. Both products and their imitators use the Boolean search operators AND, OR, and NOT. This year *The Idea Processor* was repackaged as the low-priced *Executive Writer/Executive Filer*, sold by Paperback Software.

Because the pluripotent text management field abounds in unique features, comparing programs is difficult. However, you can generally divide products

into full-text indexing programs designed for file organization, and TDMSs that use field searches for brainstorming and merging notes into finished documents. For example, Summa Technologies' 4-1-1 is an indexing/retrieval program along the lines of *ZyIndex*, while Pro/Tem Software's *Notebook II* and Fastware's *THOR* are keyword-oriented TDMSs somewhat similar to *Executive Writer/Executive Filer*.

As you near the frontiers of idea processing, you find yourself on the fringes of data management. A prime example of the blurring borders between word processing and data management is *askSam* from Seaside Software, a text-oriented data base management program that permits free-form searches on a variety of textual information. *askSam* employs an access language for batch retrievals and a full-screen editor for merging and editing text data.

A new line of expensive full-text products anticipates the coming age of optical disk storage. Group L Corporation's *Textbank/PC* is a text/retrieval program that uses flexible search "zones" instead of structured fields. Reference Technology's *CLASIX STA/F* is a series of programs designed for searching large text data bases stored on CD ROM (compact disk read only memory) disks (see "Critical Mass" in this issue). Both packages provide complex free-text and structured search operatives borrowed from mainframe search/retrieval software.

The Promise of Hypertext

As mass-storage technology improves and text data bases grow in size, TDMS software will undoubtedly develop into a major software category. New ways of organizing text information may also affect the way we write. Currently, IBM is investing in a research and development project at Brown University to develop a sophisticated bit-mapped graphics workstation. In conjunction with this project, Andy Van Damm, professor of computer sciences at Brown, is working on a new type of word processing system based on a concept called hypertext. First proposed by Douglas Englebart (inventor of the mouse) at Stanford Research Institute in the 1960s, hypertext underwent experimentation at Xerox PARC and was

hailed by computer philosopher Ted Nelson as the coming revolution in writing.

Hypertext would break free of linear writing and provide an unstructured writing environment. With a hypertext word processing system you could

The biggest obstacles to full laser printing support are the complexity of the command strings necessary to fully tame the current models, and the lack of standards.

click a word with a mouse to open a window explaining the word; this window in turn would contain references to other information and so on *ad infinitum*. Connected to a mass storage data base such as a read/write optical disk, you could chain information several levels deep, with every concept tagged and containing references to other concepts. A document could be expanded and contracted somewhat like a science fiction *ThinkTank*, revealing additional levels of information.

In the optimum system, the hypertext data base would also contain graphics and even video segments. In a network situation, a number of writers could work on a document together, producing a seamless whole. In Ted Nelson's vision the entire world will eventually be connected to one large hypertext data base, and all writing will be contained in one fluid electronic book.

Although Nelson's Utopian vision may sound like rose-colored day-tripping, IBM is not a company to throw its money at a flight of fancy. "IBM is very interested," says computer writer Jeffrey Young. "The key issue of hypertext is that you can have multiple versions. You aren't limited to one final draft."

Currently, a primitive version of hypertext is available on a Tymnet bulletin board called Augment, but a number of technological barriers need to be scaled to attain a workable system. Read/write optical drives, advances in multitasking, faster processing speeds, and innovative programming are required before hypertext approaches reality.

■ Personal Publishing

One major event of 1985 was a giant leap forward in printer output quality, made possible by the new generation of desktop laser printers. Their higher resolution—typically 300 dots per inch—has allowed the use of fonts modeled after those employed in commercial typography. Although true typeset quality eludes the desktop laser printer because it still prints on plain paper instead of film, laser printers nevertheless represent a great improvement over dot matrix and letter quality machines.

By creating a middle ground between commercial typography and impact-based printing technologies, the laser printer has given a big push to the field of personal publishing. With a laser printer and a compatible word processing program, you can approach typeset quality at significant overall savings. Although several word processing programs provide font selections that support such low-cost laser printers as the Hewlett Packard LaserJet, *Microsoft Word* has gone the furthest in supporting laser printing (see the sidebar "PC World Pacesetters—Word Processing").

This year you can take full advantage of the text and graphics capabilities of laser printers with a new category of software called page-makeup programs. Packages such as *Do-It* (Studio Software), *Scenicwriter* (Scenic Software Systems), and *Type Processor One* (Bestinfo) are essentially word processing programs with advanced formatting capabilities that allow you to create camera-ready pages without manual pasteup. Using an interface similar to a graphics program, you can design and preview a page of text, choose from a variety of type styles and sizes, and create and rearrange columns and boxes for pictures. Most of these programs allow you to import graphics files from digitizers and graphics software.

Once the page has been previewed you can print it on a laser printer or, in some cases, send it to

a commercial phototypesetter. The typical application for page-makeup software is the merging of text and graphics to generate small newsletters, bid proposals, business reports, instructional manuals, and forms. Personal publishing allows small organizations to achieve a typeset look at a fraction of the cost of the real thing.

When a typographical programming language becomes prevalent in PC applications, it will signal a dramatic shift away from character-oriented text and toward graphics-oriented text.

Thus far, these programs are somewhat limited in typographical features and are difficult to use. The biggest obstacles to full laser printing support are the complexity of the command strings necessary to fully tame the current models and the lack of standards between various optical printers.

One solution to these problems is the Apple LaserWriter's built-in graphics command language PostScript. Developed by Adobe Systems, PostScript describes all aspects of the appearance of text, images, and graphics material on a printed page. A program written in PostScript communicates to the printer's built-in PostScript interpreter, which in turn instructs the particular output device. Since PostScript is device-independent, one driver can handle any output device that contains a PostScript interpreter, whether it be a laser printer, a phototypesetter, or a dot matrix printer.

The laser printers targeted at the PC marketplace have yet to include PostScript interpreters, and PostScript drivers are only beginning to appear in PC application software. (*Microsoft Word* and *ScenicWriter* both contain PostScript drivers.) How-

ever, it's only a matter of time before PostScript, or another typographical programming language such as TeX, becomes prevalent in PC applications. When this occurs, it will signal a dramatic shift in the way word processors handle the formatting of words—away from character-oriented text and toward graphics-oriented text. This technology may be propelled by the increasing desire of businesspeople to economically integrate text and graphics on one page.

Asked what the major trend in word processing was this year, Peter Watkins of MicroPro quickly replied, "Graphics. With better processors and higher speeds coming to personal computers, we're going to have to change to a graphics-oriented approach." SSI's Peterson agrees: "I think the page printer will become the standard of the future, and we're going to have to support PostScript. Five years ago when you worked on a word processor, you did everything possible to make the page look like it was typed on an IBM Executive typewriter. Now it's a status symbol to make it look like it's being done on a computer."

One Day at a Time

Developments in optical storage and printing are already stretching the boundaries of word processing, and more can be expected over the coming years. The proliferation of larger text data bases

Installed base of word processing software packages (in millions of units) *

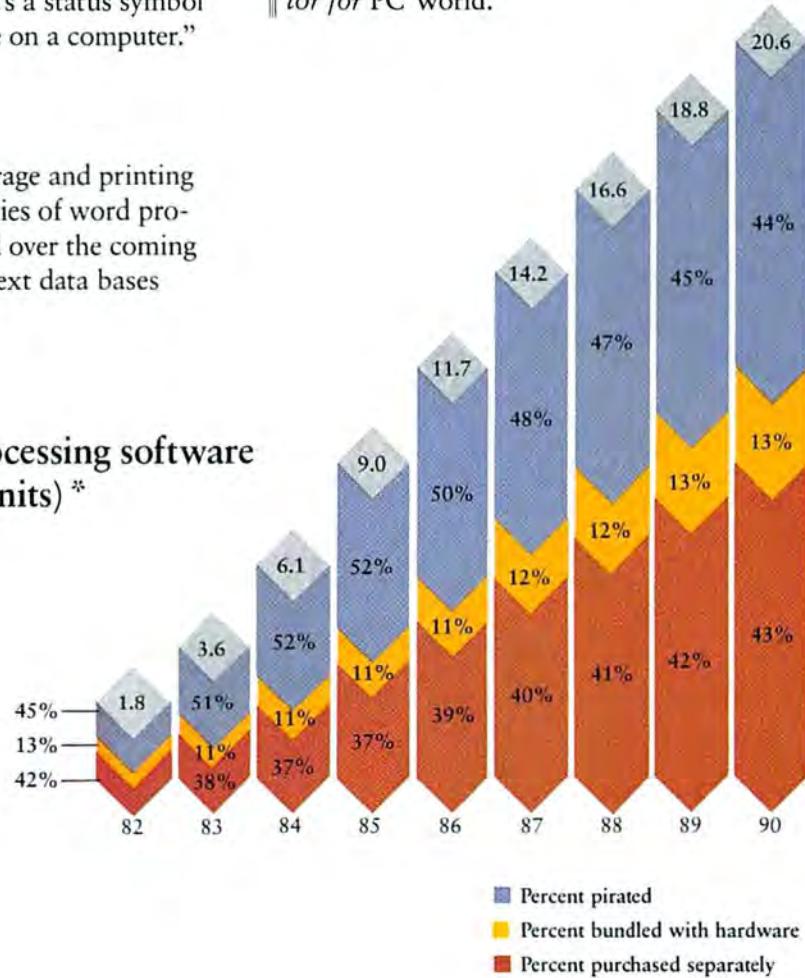
Source: Future Computing

* 1985 through 1990 projected

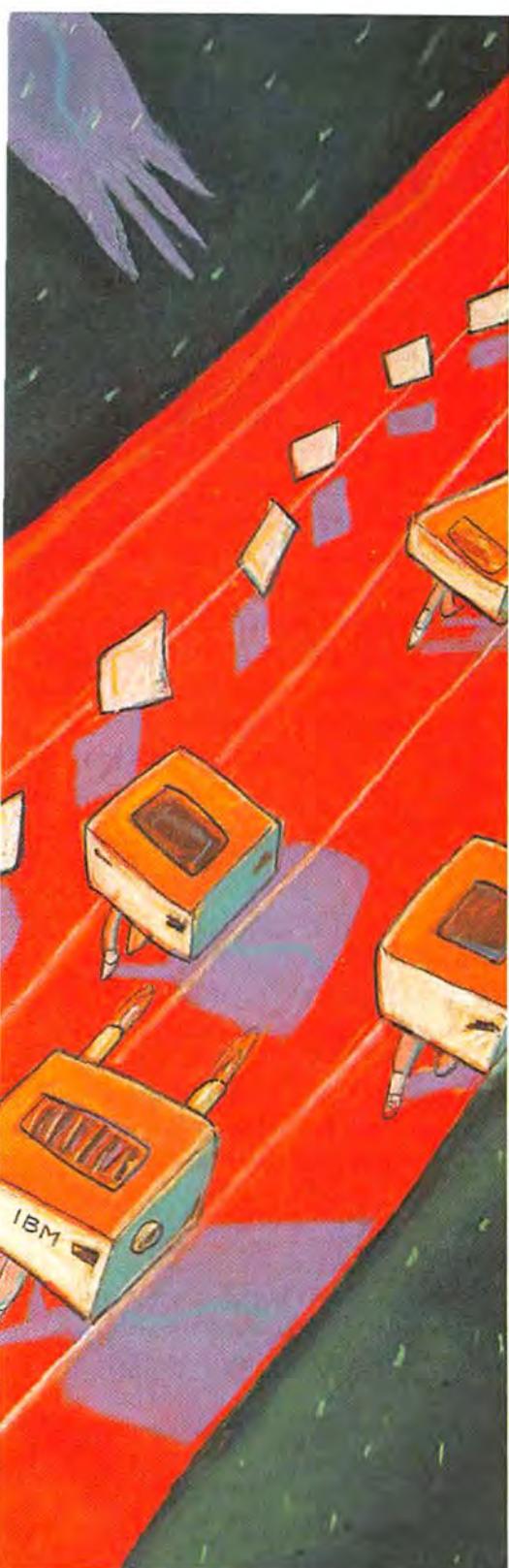
stored on optical disks will require innovative approaches to text management. As printing technology improves, word processing will shift from manipulating words on the character level to expressing them on the pixel level. Typography will increasingly be emphasized, and further integration with graphics programs can be expected.

Meanwhile, the major word processing vendors are taking it one day at a time. Locked in competition to provide more functions without sacrificing speed and ease of use, they will add features carefully. In attempting to please everybody, they will probably continue to offer programs at different levels of sophistication. So far, everybody seems pretty satisfied with the three bears' wares—in fact it feels juuuust right. ●

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Printers' Progress

Patience has its virtues—especially if you want the most printing power for your dollar. Printer makers in 1985 offered products to fit every need, desire, and pocketbook. While technologies and companies jostled for market position, the consumer made the biggest gains.

Wes Nihei

||||| It was almost impossible *not* to buy a printer in 1985. Riding on the supersonic coattails of the 1984 personal computer market, Japanese printer manufacturers saturated the market with products. Hard copy, it seemed, was at the top of everyone's shopping list.

But the era of no-holds-barred growth in the PC industry came to a screeching halt in 1985 as IBM clamped down on competitors and experienced its own problems moving enough PC ATs out the door. Although printer manufacturers were not greatly affected by the slump—unlike hard disk vendors—they were nonetheless obliged to deal with slipping profits.

In true free-market fashion, printer companies did the only logical thing: slashed prices in an attempt to empty bulging warehouses. Retail outlets and mail-order firms suddenly had deals to make, and prices plunged. Dot matrix machines offering near

letter quality output, graphics, and Epson compatibility could be had for as little as \$250. Letter quality printers that had once carried \$1500 price tags cost less than \$1000. Even laser printers followed the downward trend.

But the printer price nosedive is a symptom of more important changes. At the high-priced end, laser printers have come to the fore with their quick and quiet operation, ability to mix text and graphics, and print resolution approaching near typeset quality. Meanwhile, with the aid of 24-pin technology the formerly humble (and inexpensive) dot matrix printer is increasingly assuming letter quality talents and offering speed and graphics to boot.

As laser technology gets cheaper and dot matrix printers successfully pursue the letter quality standard, the daisy wheel printer is being squeezed into the low end of the market. When the two trends converge, daisy wheel printers may discover what it's like to be extinct.

The plight of the daisy wheel hasn't been lost on the printer industry; companies discern that marketing only one printing solution is the shortest path to bankruptcy. Accordingly, Japanese and American vendors alike are enhancing existing machines, expanding their product lines, and considering other technologies—particularly lasers.

■ Bottom Lines

The general outlook for the printer industry is anything but bleak. Market prognosticators expect an annual growth rate approaching 13 percent for the next five years. According to a report published by International Data Corporation (IDC), 5.6 million printers were shipped in 1985, with 14 million units predicted for 1989. Gross sales estimates for the same period are equally optimistic: \$4 billion in 1985, jumping to \$8 billion by 1989.

Despite these heady figures, all is not peaceful in printerland. The IDC report goes on to note that while printer shipments were up 72 percent over 1984, 1985 revenues rose only 45 percent. In short, more printers were sold, but they cost less.

■ An Empire Secure?

This trend can be laid mostly at the doorstep of Japanese companies. Instead of focusing on short-term profits at the outset, the Japanese invested heavily in automation and high-volume production. Epson, leading the way for Okidata, C. Itoh, Star Micronics, and others, tore into the under-\$1000 printer market with a vengeance; by 1985, the Japanese owned 80 percent of the market outright.

Now Japanese companies essentially compete with one another, slashing prices and packing more features into the same products. Some analysts believe the low end is forever in the hands of the Japanese. But IBM thinks otherwise. Big Blue became a serious threat this year when it terminated its purchasing agreement with Epson and introduced some inexpensive homegrown printer products. The Wheelwriter daisy wheel and the Quietwriter thermal ribbon printers hit the market in 1984, followed by the Quietwriter II, the Color Jetprinter, and the Proprinter dot matrix printer in 1985. "IBM is challenging what has become a given fact of life," says Jonathan Dower, vice president of market watcher Datek Information Services. "It's the only American company that could."

■ The Daisy Dilemma

Whether the daisy wheel printer is headed for the same fate as the manual typewriter is unclear, but it is undoubtedly approaching a crossroads. "The daisy wheel market is definitely not going to grow," observes Jim Minervino, an IDC printer analyst. "If it stays stable, it will be doing well." With traditional leaders Diablo and Qume still reeling from last year's layoffs and crumbling prices, little relief is in sight for these battered platen punchers.

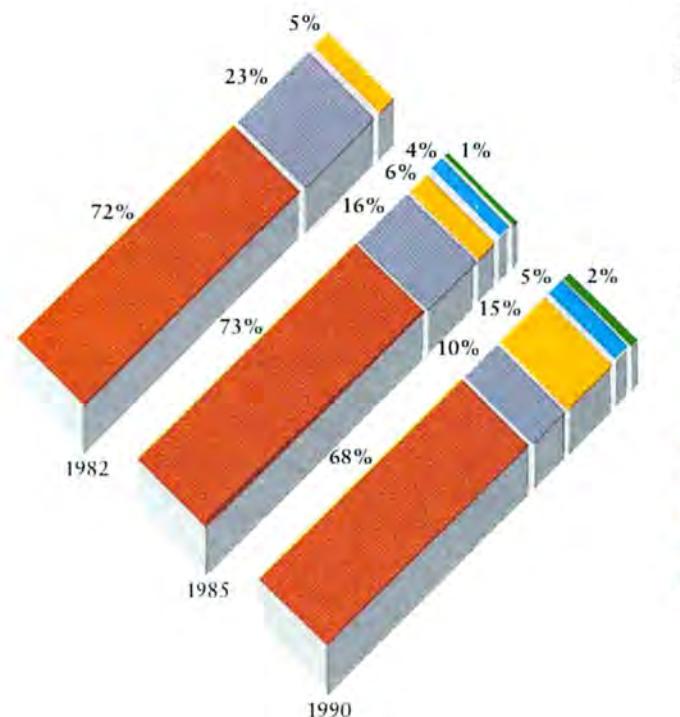
The future of the daisy wheel printer hinges in part on corporate America's acceptance of dot matrix correspondence quality. For some businesses and professions, the typewriter-like text of a daisy wheel printer is a must. Alex Schibanoff, a national accounts manager for Brother International, believes that even 24-pin dot matrix output will not be an acceptable daisy wheel replacement. "The daisy wheel printer is not in danger until something comes along to replace it at a comparable price," he argues, his statement punctuated by the diminutive \$349 price

tag carried by Brother's recently released HR10 daisy wheel printer.

For the moment, daisy wheels are down but not out. The market was vital enough to motivate dot matrix giant Epson to release two daisy wheel products for under \$500. Other manufacturers point to the large established user base and low prices as reasons to believe that there's still life in the market.

The formerly humble (and inexpensive) dot matrix printer is increasingly assuming the talents of letter quality.

Being in the price basement may have saved the daisy wheel printer—at least for now. But even companies with new daisy wheel offerings are branching out. Brother is covering its bets with a \$1495 24-pin dot matrix machine, the 2024L, and the \$499 9-pin M1509. Computer and terminal maker TeleVideo is also backing the daisy wheel with its TP 760 and 780—60-character-per-second (cps) and 90-cps daisy wheel printers aimed at the high-volume business user who can afford the respective \$1195 and \$1395 price tags.



Brother's Schibanoff concedes that expensive daisy wheel printers fly in the face of market realities, particularly given the declining costs of laser technology. Brother's solution? The Twinwriter 5, a hybrid that shoehorns both a 140-cps dot matrix printhead and a 36-cps daisy wheel into the same box—for \$1295. According to Schibanoff, "It does what a laser does without being a laser."

However, most daisy wheel manufacturers are facing the coming denouement a bit more conservatively. TeleVideo, despite its advocacy of the daisy wheel, is preparing a laser printer for 1986 release. Daisy wheel old-timer Qume is likewise hitting the market with a laser printer in 1986, as are NEC, Toshiba, Citizen America, and Facit. Diablo, yet another daisy wheel pioneer, is expanding into dot matrix and ink jet technologies as its former preeminence in the daisy wheel market continues to erode.

Printer manufacturers haven't given the daisy wheel its notice yet—but the output is on the wall.

Dealing in Dots

Long before "PC" formed on everyone's lips, Japanese printer giant Epson was making news with its MX-80 printer. Released in 1979, the MX-80 offered high-speed (read: 80-cps) dot matrix printing for the then unheard-of price of \$800. Breaking the \$1000 barrier did much to make the Epson printer the number one choice of personal computer users. When the IBM PC finally came along in 1981, it was accompanied by the MX-80 under Big Blue's sticker. Suffice it to say, Epson's stock with printer users rose

Changing market share by printer type

- Dot matrix
- Daisy wheel
- Thermal
- Ink jet
- Laser

accordingly, and in short order it captured the lion's share of the dot matrix market. Today Epson's comparable printer, the Spectrum LX-90, is faster and includes graphics for only \$329.

In general, times have been good for dot matrix manufacturers. According to IDC, 2.8 million dot matrix printers were shipped in 1985; 1986 sales are expected to increase by 12 percent. For Epson, the picture in 1986 may not be so bright. Besides IBM's recent severance of ties with the company, Japanese competitors are scuffling for Epson's position as low-end potentate. In an attempt to capture new users and MX graduates, Epson has beefed up existing machines and promoted more capable (and more expen-

Overall improvement in dot matrix technology enables even the lowly 9-pin printers to vie for letter quality kudos.

sive) printers. Epson's 24-pin, near letter quality LQ-1500 is an example of the latter, but the \$1295 printer has hardly taken the industry by storm. It faces stiff competition from products that jumped on the 24-pin bandwagon first and delivered better output.

Given the public's continuing thirst for letter quality printing, plus the desire for laserlike flexibility—different fonts and styles, text and graphics integration—it was fortunate that 24-pin technology ripened and RAM chip costs dropped in 1985. As a result, dot matrix printers of all stripes and prices offer faster printing (up to 200 cps), bigger print buffers (8K), single-sheet feeders, downloadable fonts, and last but not least, near letter quality printing.

But is near letter quality near enough? In the business market, it's not official unless it looks typewritten. This conceptual hurdle has until recently kept the dot matrix printer from muscling in on the daisy wheel's turf. But some believe that 18-pin and newer 24-pin printers made the breakthrough in 1985. Other analysts contend that just the presence of dot matrix printers over the years has lessened resistance—and lowered expectations. David Glidewell,

a printer specialist at the market research firm Dataquest, observes: "The dot matrix printer has been part of the PC office environment for so long that people now perceive its output as correspondence quality."

No doubt, 24-pin printers are largely responsible for furthering this perception in 1985. Created in Japan to print the kanji characters of the Japanese alphabet, 24-pin machines migrated to the U.S. to do battle with the daisy wheel. Printers premiered by C. Itoh and Brother in early 1985 were quickly joined by Toshiba's P351, Epson's LQ-1500, and Fujitsu's Dot-Max 24. NEC, playing catch-up, promises to replace its 18-pin Pinwriter P5 with a 24-pin machine in 1986. As in other hardware markets thoroughly dominated by the Japanese, dot matrix prices are expected to decline in 1986. Toshiba unveiled a lower-priced version of the P351, tantalizingly dubbed the P341, for \$1345. Fujitsu, ever the price innovator, has hinted that a 24-pin machine for under \$1000 is in the works.

While 24-pin printers snatch the limelight, overall improvement in dot matrix technology has enabled even the lowly 9-pin printers to vie for letter quality kudos—and give Epson a run for its traditional market. By slightly shifting the printhead and making a very precise second pass—in effect, filling in the gaps between dots—a 9-pin printer produces much denser images. The trade-off for quality, of course, is speed, since the printer must repeat all of its efforts. But letter quality clout coupled with a 9-pin price is hard to beat.

Notable among such printers is the German-made Mannesmann Tally 86 (see the sidebar "PC World Pacesetters—Printers" for more information). The MT 86 produces text superior to that of several 24-pin machines. The \$599 printer also takes advantage of downloadable fonts, uses font cartridges, offers seven printing styles, and pounds out drafts at 180 cps and letters at 45 cps.

Another 9-pin contender is IBM's Proprinter, which churns out near letter quality text at 40 cps and drafts at 150 cps. It also features a front-loading sheet feeder that handles single sheets and envelopes without compelling you to remove the tractor feeder. IBM's price tag: \$549.

Printers

Our picks for the two outstanding printers of 1985 may elicit both a raised eyebrow and a knowing nod. While quality and craftsmanship were key factors, *PC World's* editorial board also had to sift through a massive jumble of product features and decide which were innovation and which novelty. At the high end of the printer spectrum we chose a market leader that's making a good thing better; at the low end, a little-known contender that has stepped decisively out from behind Epson's shadow.

■ The High End: Hewlett-Packard LaserJet Plus

The LaserJet Plus will help HP build upon its commanding lead in the laser printer market. While the Plus physically resembles the LaserJet, its inner soul has changed considerably. In the place of 64K of RAM is 512K (395K of which is available to the user) plus a pumped-up controller board.

The extra memory gives the Plus three distinct advantages: greater use of 300-dpi graphics, more flexibility in using downloadable fonts stored on disk, and the ability to save command sequences (called macros) that let you create electronic forms and letterheads. The Plus can manipulate a half page, 300-dpi graphic or a full page at 150 dpi. (The LaserJet is limited to a quarter page at 300 dpi.) HP has also blessed the Plus with a switch that lets you reset the printer

without removing fonts or macros currently in memory. The Plus wisely supports software developed for the LaserJet.

■ The Low End: Mannesmann Tally MT 86

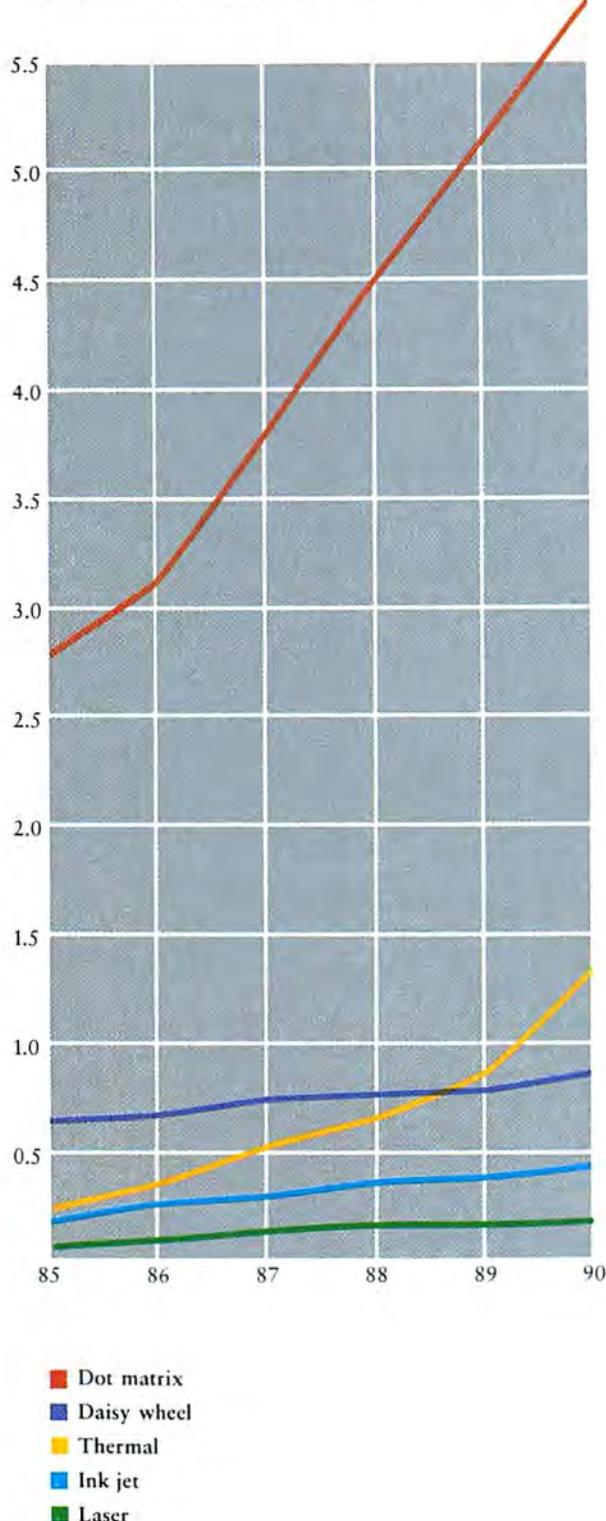
In an era when printers almost always come from the Far East, Mannesmann Tally, a German company, has brought to market a wide-carriage dot matrix machine that might teach Epson a few lessons. The MT 86's 9-pin printhead skips along at 180 cps for draft quality text and graphics, 90 cps for enhanced mode, and 45 cps for daisy wheel-like letter quality.

The MT 86 touches the necessary bases, emulating both the Epson FX series and IBM Graphics Printers. You have a choice of condensed, bold, enlarged, and enhanced printing styles, plus elite, pica, and proportional spacing. If you have DIP switch phobia, relax: All printer modes are accessible from the MT 86's control panel. The MT 86 also takes a cue from the laser world, utilizing both downloadable fonts (stored in a 3K buffer) and cartridge fonts. Compared to older Mannesmann Tally machines, the MT 86 is positively stylish and includes a plastic cover that acts as a sound baffle.

Mannesmann Tally considers the MT 86 its entry level, lowest priced, lowest performance product—a label that belies the high degree of craftsmanship that went into this machine.

Printer sales (in millions of units)

Source: International Data Corporation



The talk in the boardrooms of dot matrix manufacturers nonetheless centers around laser technology. Epson, Toshiba, and Mannesmann Tally have all announced laser printers for 1986, and the consensus is that IBM will follow suit. The dot matrix field is crowded with players. The companies that survive next year may have to switch leagues.

■ Lasers: Set to Stun

The leap from photocopier to laser printer took almost 15 years, but when the price of laser technology finally came to earth in 1984, the PC printer world was cast anew. The company responsible for the revolution is Canon, foremost photocopier manufacturer and developer of the LBP-CX laser engine. Costing only \$1000 in quantity, the Canon engine combined the photoelectric process common to copiers with the searing light of the laser. The first available product to be built around the engine was the Hewlett-Packard LaserJet—which has since dominated the still-nascent laser market.

Though the LaserJet was hotly pursued by other Canon-based machines such as Corona's Laser Printer, Apple's LaserWriter, and Quadram's Quad-Laser, getting a laser printer in 1985 was still no easy task. Demand wildly exceeded supply, and even Canon dedicated some of its overtaxed facilities to the production of its own laser printer, the LBP-8 A1. It's not surprising that analysts have billed the laser market as "explosive."

If nothing else, laser printers have set new standards. For less than \$5000, users get 8- to 12-pages-per-minute print speeds, the ability to mix text and graphics, 300-dots-per-inch (dpi) resolution, top-notch letter quality output, and much quieter operation. Laser printers are adept enough to satisfy the budding publisher who isn't too fussy, the network administrator desperate for a high-speed printer to serve 10 PCs, or the office manager seeking resuce from the dull thudding of a daisy wheel printer.

In the face of a horde of Japanese and European vendors brandishing lasers, HP lowered the price of

the LaserJet in August by \$500 and introduced the LaserJet Plus. The Plus adds another 448K of RAM, which allows it to juggle 32 fonts at once (in point sizes from 6 to 30) and lay down any 16 on a page. The memory boost also lets the Plus hold an entire page in memory at 150 dpi or half a page at twice that resolution.

Of course, there are those who accuse HP of suppressing the potential of the Canon engine. "The market is still growing," counters Roger Archibald, HP's manager of printer marketing. "We didn't want to introduce features before customers needed them."

Apple took a different tack and pushed PC-based laser printing to the maximum with its LaserWriter. The printer's Motorola 68000 microprocessor, 512K of ROM, and 1.5MB of RAM provide more

'Any printer company that deals in a single technology will be in trouble next year.'

computing punch than some desktop computers. Currently the only laser with the talent for manipulating a full page at 300 dpi, the LaserWriter is equipped with the PostScript page-description language (used primarily to combine images, text, and fonts), a full range of typefaces, and the ability to download a virtually unlimited number of fonts. However, Apple's \$6995 price tag has probably given purchasing departments pause—and sent them running to the nearest HP dealer. As competition heats up in 1986, Apple may be forced to cut prices; at that point Archibald's dictum may be disproved.

While HP pulls its wagons into a circle, Canon is girding itself for a similar onslaught. Companies such as Xerox, Ricoh, and Kyocera are producing their own laser engines and printers; laser printers from Epson, Fujitsu, and Toshiba will also reportedly rely on proprietary engines. But Canon's Koichi Kadokura, manager of the laser printer division, says his company's two-year head start gives it an edge. "Our expertise in lasers comes from experience in the market. This helps our quality and our reliability."

Analysts and manufacturers alike agree that laser prices will fall in 1986 as more companies see the light. For Kadokura, it's a matter of basic economics: "More competition means there's going to be a price war." If laser printers edge into the \$2000 range, it could spell trouble for other print technologies, particularly high-end daisy wheel and dot matrix devices.

■ Drawn Lines

If the printer market was a game show, it would be called "Diversity for Dollars." From Epson to Mannesmann Tally, success and survival hinge on a shotgun market strategy. As Jim Minervino of IDC points out, "Any printer company that deals in a single technology will be in trouble next year."

Except for Alphacom, 1985 witnessed few casualties among printer manufacturers, but Diablo, Printek, Infoscribe, Centronics, and Anadex, to name a few, face an uncertain 1986. Daisy wheel manufacturers are likely to have a particularly tough year. The 24-pin dot matrix printer may convert many daisy wheel owners and entice first-time buyers; inexpensive 9-pin dot matrix printers offering graphics and near letter quality text will bite even deeper into the daisy wheel market.

How quickly the market compresses depends largely on how soon cheap laser printers arrive. If the past is any indication, as many as ten Japanese firms will flood the market with laser printers by mid-1986, turning a seller's market into a buyer's paradise. Whatever the technology—laser, daisy, or dot matrix—the price scramble is on. Go buy a printer. ☐

|| Wes Nihei is Editorial Assistant for PC World.

It was a dark and stormy night.

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✓Printer Boss 5.0	99.

Dac Software

✓Dac Easy Accounting 1.0	45.
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Decision Resources

✓Chart-Master 6.1	237.
✓Diagram-Master 5.0	207.
✓Sign-Master 5.1	157.

✓GEM Desktop 1.1	30.
✓GEM Draw 1.0 (includes Desktop)	93.
✓GEM Collection 1.0 (includes Desktop, Paint, Write)	119.

Dow Jones

Market Manager +	\$145.
✓Spreadsheet Link	145.
Membership Kit	19.

Enertronics

✓Energraphics 1.3	165.
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Evergreen

✓One Write Plus 1.0	169.
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Financial Software

✓Financier II 2.1	59.
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Friendlysoft

✓Friendly Writer 3.2 (w/Friendly Speller)	55.
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Funk Software

✓Sideways 3.0	39.
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Graphic Communications

✓Graphwriter Combo Set	305.
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Freelance

✓Freelance	189.
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Harvard Associates

✓PC LOGO 2.0	89.
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Harvard Software

✓Harvard Project Manager 1.16	209.
✓Harvard Total Project Manager 1.0	279.

Human Edge

✓Mind Prober	27.
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IMSI

✓PC Paintbrush 2.8	35.
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Infocom

✓Cornerstone 1.0	279.
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Lifetree

✓Volkswriter Deluxe 2.2 (with TextMerge)	159.
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Living Videotext

✓ThinkTank 2.0	109.
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Ready 1.0

✓Ready 1.0	49.
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Micro Education (MECA)

✓Jim Fixx Running Program 1.2	49.
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Managing Your Money 2.0

✓Managing Your Money 2.0	99.
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Micropro

✓Easy 1.0	97.
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WordStar 3.31

✓WordStar 3.31	179.
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WordStar Propak 3.31

✓WordStar Propak 3.31	259.
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Hard disk recommended for Wordstar 2000 & Wordstar 2000 Plus

✓WordStar 2000 1.01	259.
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WordStar 2000 Plus 1.01

✓WordStar 2000 Plus 1.01	299.
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Microrim

✓Extended Report Writer 1.2	85.
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Clout 2.0

✓Clout 2.0	135.
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R:base 5000 1.0

✓R:base 5000 1.0	369.
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Upgrade Kit to R:base 5000

✓Upgrade Kit to R:base 5000	129.
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Microsoft

✓Multiplan 2.0	119.
----------------	------

✓Microsoft Word 2.01 (w/Ready)	call
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PC CONNECTION®

On the 13th floor of headquarters, a desperate Vice-President struggled valiantly to crunch his disastrous year-end figures into the plus column.

Both of the following Microsoft mice now come with PC Paintbrush 3.0 software

✓ Microsoft Bus Mouse with software 5.0	\$135.
✓ Microsoft Serial Mouse with software 5.0	135.
✓ Microsoft Project 2.0	call
✓ Microsoft Chart 2.0	call
LANGUAGES	
✓ Quick Basic 1.0	69.
✓ Pascal Compiler 3.31	175.
✓ Fortran Compiler 3.31	205.
✓ Basic Interpreter 5.28	205.
✓ Basic Compiler 5.36	235.
✓ C Compiler 3.0	235.
✓ Business Basic Compiler 1.10	258.

Microstuf

✓ Crosstalk XVI 3.6	95.
✓ Remote 1.2	95.
✓ Infoscope 1.02	129.
✓ Transporter 1.3 (includes Crosstalk)	169.

MultiMate International

✓ Just Write 1.0	79.
✓ MultiMate 3.31	call
✓ Multimate Advantage 3.5	call

Peter Norton

✓ Norton Utilities 3.1	59.
Nantucket Software	

✓ Clipper	349.
Powerbase Systems	

✓ Powerbase 2.1	197.
Rosesoft	

✓ Prokey 4.0	89.
Satellite Software	

✓ WordPerfect 4.1	239.
Scarborough Systems	

✓ Your Personal Net Worth 1.1	59.
Simon & Schuster	

✓ Webster's New World Speller 1.2	39.
Software Digest	

Ratings Newsletter

This publication is unparalleled for its comprehensive, reliable evaluations. 1985's issues evaluate the following programs: word processors, file mgt., database mgt., spreadsheets, graphics, integrated acctng., project mgt., communications, integrated productivity.

Single copy	24.50.
Year subscription	245.00.

Softstyle

✓ Printworks 1.05	39.
Software Group	

✓ Enable 1.1	299.
Software Publishing	

✓ PFS:Proof B:00	59.
✓ PFS:Report B:01	77.

✓ PFS:Access A:00	\$84.
✓ PFS:File B:01	84.
✓ PFS:Graph B:01	84.
✓ PFS:Plan A:01	84.
✓ PFS:Write C:00 (w/PFS:Proof)	84.
✓ First Success (Combo Pack includes PFS:Write, Proof, Plan, File)	229.

Sorcim/US

✓ SuperCalc 3 2.1 (w/Sideways)	199.
Unison	

Art Gallery 1	22.
Printmaster 1.1	37.

United Software

✓ Einsteinwriter 7.2 (w/coupon for free Speller)	99.
✓ In-House Accountant 2.05	109.
✓ ASCII Pro 4.23	69.
Xanaro	

✓ Ability 1.0	call
---------------	------

TRAINING

ATI

SKILL BUILDER PROGRAMS

Intro and How To Use:	
Word Processing	MS-DOS
Business Software	PC-DOS
Data Bases	Typing Tutor
Compaq	BASIC
IBM-PC	each 38.

TRAINING POWER PROGRAMS

How To Use:	
dBase II	dBaseIII
MS Word	Supercalc 3
Multiplan	Wordstar
Wordperfect	Symphony
	Displaywrite 3
	each 49.

Friendlysoft

✓ PC Intro Set	35.
INDIVIDUAL SOFTWARE	

✓ The Instructor II	39.
✓ Professor DOS	47.
✓ Tutorial Set (both items above)	75.
✓ Professor Pixel	47.
✓ Typing Instructor	39.
✓ Training for Lotus 1-2-3	special
✓ Training for dBase III	special
✓ Training for Project Management	49.

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6 Mill St., Marlow, NH 03456
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For the IBM-PC Exclusively.

Scarborough Systems

MasterType	\$26.
Simon & Schuster	
✓ Typing Tutor III	33.

EDUCATIONAL

Barron's

Computer SAT	59.
Designware	

Spellicopter (ages 6 to adult)	25.
Mission Algebra (ages 13 to adult)	27.

European Nations (ages 9 to adult)	27.
Grammar Examiner (ages 9 to adult)	27.

States and Traits (ages 9 to adult)	27.
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Digital Research

Diagnostic Test (PSAT)	14.
OwlCat SAT (15 hours)	63.

OwlCat SAT (60 hours)	169.
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Eduware

Algebra 1	22.
Algebra 2	22.

Algebra 3	22.
-----------	-----

Harcourt Brace Jovanovich

Computer SAT	49.
Computer GRE	57.

Scarborough Systems

Build-a-Book	19.
Simon & Schuster	

Lovejoy's SAT	39.
Spinnaker	

All Spinnaker products now work with DOS 2.x and 3.x.	
Educational Games for Young Computer Users. (All require graphics board)	

Face Maker (ages 3 to 8)	18.
Kids on Keys (ages 3 to 9)	18.

Fraction Fever (ages 7 to adult)	18.
Kinder Comp (ages 3 to 8)	18.

Alphabet Zoo (ages 3 to 8)	20.
Kidwriter (ages 6 to 10)	20.

Trains (ages 3 to 8)	20.
Snooper Troops I (ages 10 to adult)	23.

Snooper Troops II (ages 10 to adult)	23.
In Search of the Most Amazing Thing (ages 10 to adult)	23.

Delta Drawing (ages 4 to adult)	27.
President's Choice (ages 4 to adult)	27.

Springboard	
Fraction Factory (ages 8 to 14)	19.

Make A Match (ages 2½ to 6)	19.
Piece of Cake Math (ages 7 to 13)	22.

Early Games for Young Children (ages 2½ to 6)	22.
Music Maestro (ages 4 to 10)	22.

"It's not a bad command!"

he screamed at his gasping micro.
But the PC refused his advances, no matter how he
pushed, pulled, or rebooted.

Springboard (cont.)	
✓Easy As ABC (ages 3 to 6)	\$24.
✓Newsroom	30.
✓Clip Art Volume 1 (for Newsroom)	19.
Stone (requires graphics board)	
✓Across the U.S.A. (ages 5 and up)	22.
✓My Letters.Numerics.Words (ages 1 to 5)	29.
✓Kids Stuff (ages 3 to 8)	29.
✓Memory Master (ages 3 to 8)	29.
The Learning Company	
✓Addition Magician (ages 6 to 10)	23.
✓Magic Spells (ages 6 to 10)	23.
✓Word Spinner (ages 6 to 10)	23.
✓Reader Rabbit (ages 5 to 7)	26.
✓Moptown Hotel (ages 8 to 13)	26.
✓Number Stumper (ages 6 to 10)	26.
✓Moptown Parade (ages 8 to 12)	26.
✓Rocky's Boots (ages 9 and up)	32.

RECREATIONAL

Blue Chip	
✓Baron	32.
✓Millionaire	32.
✓Squire	32.
✓Tycoon	32.
Broderbund	
Lode Runner	25.
Ancient Art of War	27.
CBS	
Murder By The Dozen	21.
Electronic Arts	
✓Pinball Construction Set	25.
✓Dr. J/Larry Bird One-on-One	28.
✓Music Construction Set	28.
Friendlysoft	
✓PC Arcade	35.
Funtastic	
Among the finest arcade style games available.	
Cosmic Crusader	27.
Snack Attack II	27.
Big Top	29.
Master Miner	29.
Hayden Software	
✓Sargon III	35.
Infocom <i>Difficulty levels shown in italics</i>	
✓Seastalker (junior)	25.
✓Enchanter ✓the Witness ✓Planetfall	
✓Cutthroat ✓Wishbringer ✓Zork I	
✓Hitchhiker's Guide (standard)	25.

✓Zork II	✓Zork III	✓Infidel
✓Sorcerer	✓Suspect	
✓A Mind Forever Voyaging (advanced)		\$29.
✓Deadline	✓Starcross	✓Suspended
✓Spellbreaker (expert)		31.
Invisicles (hint booklets) are available for most Infocom games. Specify game.		
6.		
Microleague Sports		
Microleague Baseball		
Microprose		
✓F-15 Strike Eagle		
Microsoft		
✓Flight Simulator 2.12 (now works with Hercules Mono Card)		
32.		
1Step Software		
✓Golf's Best		
Origin Systems		
✓Ultima III		
Parlor Software		
✓Bridge Parlor		
PCSoftware		
✓Championship Blackjack		
23.		
✓Chess 2001		
27.		
✓Armchair Quarterback		
Professional Software		
✓Trivia Fever		
22.		
✓Trivia Fever II		
15.		
✓Super Sports Trivia		
18.		
SEGA		
Spy Hunter		
29.		
Sierra On-Line		
✓Championship Boxing		
24.		
✓Frogger		
24.		
✓Ulysses		
24.		
✓King's Quest		
33.		
✓King's Quest II		
33.		
Sir-Tech		
Wizardry		
42.		
Spectrum Holobyte		
✓GATO		
27.		
✓Art Studio		
32.		
Sublogic		
✓Night Mission Pinball		
29.		
✓Jet		
33.		
✓Six scenery (airport) disks are available for Jet—all western airports		
15.		
Telarium		
✓Rendezvous with Rama		
27.		
✓Amazon		
27.		
✓Fahrenheit 451		
27.		
Amdek		
✓Video 300G composite monitor (green)		
129.		
✓Video 300A composite monitor (amber)		
139.		
✓Video 310A monochrome monitor (amber)		
169.		
✓Color 600 - RGB monitor		
399.		
✓Color 700 - RGB monitor		
439.		
Compucable		
Plastic Keyboard & Drive Cover Set		
17.		
✓IBM Mono Screen Enhancement		
17.		
Cuesta		
Uninterruptable power backup units		
Datasaver 240 WATT		
call		
Datasaver 400 WATT		
call		
Curtis		
ACCESSORIES		
✓PC Pedestal (for IBM Mono or Color)		
37.		
Portable Pedestal		
47.		
System Stand		
19.		
System Stand for IBM-AT		
37.		
✓Low Profile Tilt and Swivel Pedestal		
37.		
✓Crystal 300-watt (line conditioner)		
159.		

HARDWARE

AST Research

All AST Boards come with full one year warranty.

SixPakPlus 64k upgradeable to 384k, with clock calendar, serial and parallel ports & now includes Sidekick version 1.5 (non-copy protected) game port optional 225. 384k (fully populated) \$239.

MegaPlus II 64k upgradeable to 256k (or more with MegaPak) with clock calendar and serial port (parallel, game, or second serial port optional) 249.

I/O Plus II with clock calendar and serial port (parallel, game, or second serial port optional) 125. Parallel, game, or second serial port for any AST board (specify board) 35.

AST-5251-11 597.

AST-3780 589.

Reach Modem (half card 300/1200 baud internal modem includes Crosstalk XVI) 389.

Advantage 128k upgradeable to 1.5 Meg (or more with Piggyback Card), with serial, parallel ports, now includes Sidekick version 1.5 (non-copy protected). Game port, second serial port optional 399.

RAMpage! Upgradeable to 2Mb, fully supports LOTUS/INTEL expanded memory specification (EMS).

call

Amdek

✓Video 300G composite monitor (green) 129.

✓Video 300A composite monitor (amber) 139.

✓Video 310A monochrome monitor (amber) 169.

✓Color 600 - RGB monitor 399.

✓Color 700 - RGB monitor 439.

Compucable

Plastic Keyboard & Drive Cover Set 17.

✓IBM Mono Screen Enhancement 17.

Cuesta

Uninterruptable power backup units

Datasaver 240 WATT

call

Datasaver 400 WATT

call

Curtis

ACCESSORIES

✓PC Pedestal (for IBM Mono or Color) 37.

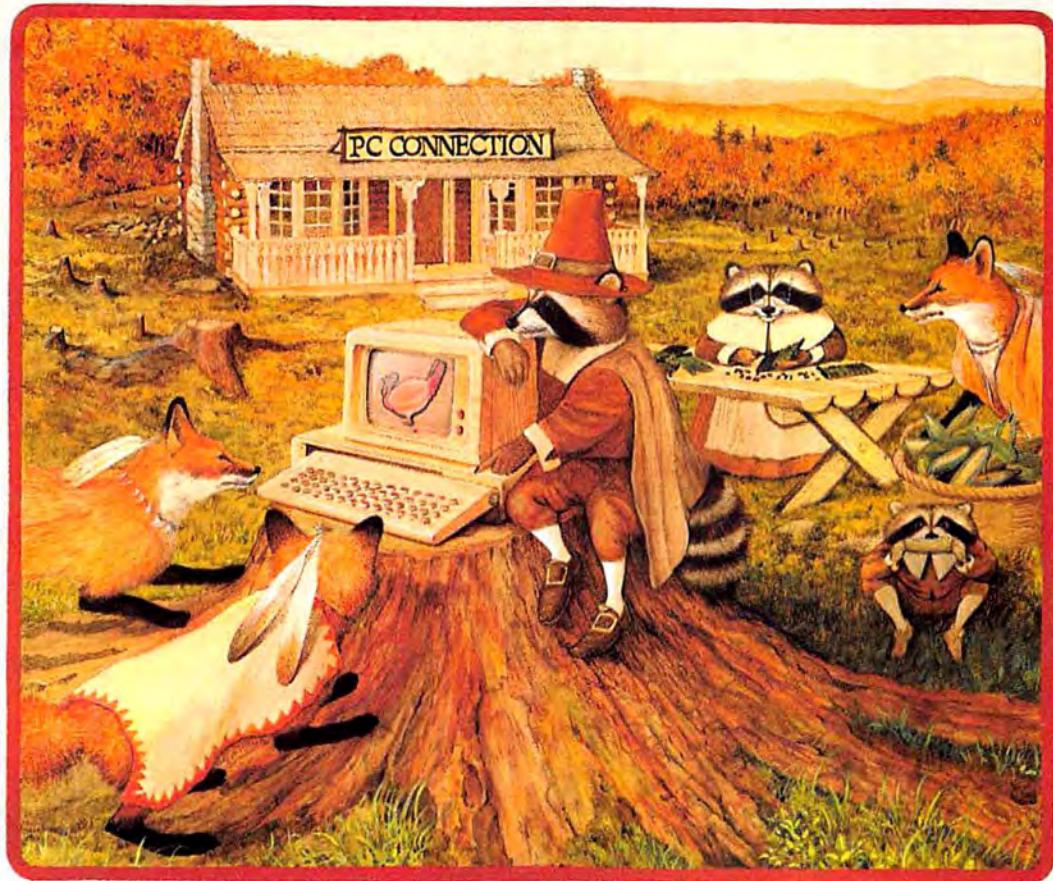
Portable Pedestal 47.

System Stand 19.

System Stand for IBM-AT 37.

✓Low Profile Tilt and Swivel Pedestal 37.

✓Crystal 300-watt (line conditioner) 159.



PC Pilgrim.

Feast or famine.

Many moons ago, a small band of pioneers fled from the persecution of high prices, and established a foothold in the uncharted waters of IBM-PC add-ons and software. They settled on the banks of the Ashuelot River in the remote outpost of Marlow, NH (present pop. 548).

They faced many hardships, these early mail-order pioneers. Especially during that first winter, when there was little food, less heat, and even fewer orders. But, thanks to their own indomitable spirit and the support of the native intelligent population (pictured above), our heroes survived and thrived.

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Because if you own an IBM-PC (PCjr, XT, AT) we can help you assemble the entire system you need, from soup to nuts. At what, even we admit, are rather ungodly savings.

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Now when you buy from PC Connection you can really feel warm all over. Because we're giving away a free New England survival cap and scarf to everyone who places a \$500 order between now and December 31.

Just call 1-800/243-8088 or 1-603/446-3383, M-F 9:00 to 9:00; Saturday to 5:30. If you're planning to visit, call ahead to make sure what you want is in stock. The showroom closes at 8:00 M-F and at 5:00 on Saturday.



The PC Connection cap and scarf, featuring our very own native American mascot. Offer available to customers of every race, color, and/or creed—but not to commercial accounts. Limit one per customer.

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“Call 800/243-8088,” said the ad.

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Happy Holidays!

Quadram (cont.)

Liberty Board 64k upgradeable to 2Mb, fully supports LOTUS/INTEL expanded memory specification (EMS) \$287.
Quad Sprint w/8086 processor. Increase the speed of your PC by one-half 479.
Short Ram Card 64k 169.

✓Microfazer Printer Buffer (parallel) w/copy
MP 64 (64k) upgradeable to 512k 159.

✓Quadcolor 1 197.

✓Quadchrome Monitor 469.

SMA

PC-Documate Keyboard Templates available for:
DOS/Basic 1.1 Supercalc 3
DOS/Basic 2.0-2.1 Wordstar
✓DOS/Basic 3.0-3.1 Wordstar 2000
✓Lotus 1-2-3 Turbo Pascal
✓Symphony WordPerfect
Multiplan (IBM) dBase II
Multiplan (Microsoft) dBase III
Framework Multimate
Volkswriter Deluxe each 12.

Toshiba

All Toshiba printers listed are 24 pin dot matrix.
✓P1340 printer (80 column) 469.
✓P341 printer (136 column) call
✓P351 printer (136 column) w/serial and parallel interfaces 1129.

WICO

✓Joystick 35.

DRIVES

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

Control Data (CDC)

(5 1/4") half-height drive (DS,DD) 75.

IOmega

✓Bernoulli Box 20 Meg 2349.
✓10 Meg cartridge 48.
✓Head Cleaning Kit 69.
✓Standard Interface (PCØ) Card 129.

Seagate

20 Meg Internal Hard Drive w/controller, cables, and manual 479.

Shugart

10 Meg Internal Hard Drive w/controller, cables, and manual \$379.

Tallgrass Technology

TG 5025-25 Meg Hard Drive w/controller and 60 Meg Backup Unit call

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- We accept VISA and MASTERCARD.
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- UPS Next-Day-Air available.
- COD max. \$1000. Cash or certified check.
- 120 day guarantee on all products.*
- To order, call us anytime Monday thru Friday 9:00 to 9:00, or Saturday 9:00 to 5:30. You can call our business offices at 603/446-3383 Monday thru Friday 9:00 to 5:30.

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Continental US: For monitors, printers, and drives, add 2% for UPS ground shipping. Call for UPS Blue or UPS Next-Day-Air. For all other items, add \$2 per order to cover UPS shipping. We will automatically use UPS 2nd-Day-Air at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii: For monitors, printers, and drives, actual UPS Blue charge will be added. For all other items, add \$2 per order. **Alaska and Outside Continental US:** Call 603/446-3383 for information.

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PC Connection 170W
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For the IBM-PC Exclusively.

Tandon

TM 100-2 (5 1/4") full-height drive (DS,DD) \$95.

TEAC

FD-55B (5 1/4") half-height drive (DS,DD) 85.

Toshiba

360k half-height drive for IBM-AT 99.

MEMORY

64k Memory Upgrade Set for IBM-PC or XT system board (9 chips)
64k Memory Upgrade Set for any memory board specify make of board (9 chips)
150 nanosecond (set of 9) 6.
200 nanosecond (set of 9) 5.
Install memory upgrades & run diagnostics at time of board purchase only 10.
✓128k Memory Upgrade Set for IBM-AT System Board (9 chips piggybacked) 29.
✓256k Memory Upgrade Set for any IBM-AT memory board (9 chips) 29.

DISKS

DS/DD Disks for the PC & XT (40 TPI).
10 Disks per box.
Maxell MD-2 19.
Verbatim Datalife 19.
DS/High Density for the AT (96 TPI).
10 disks per box.
✓Fuji 39.
✓Maxell 39.
✓Verbatim 47.
✓Flip Sort (holds 75 disks) 15.

INFORMATION SERVICES

Compuserve

✓Compuserve Information Service (includes subscription, manual, 5 hours of connect time, monthly publications) 19.
Dow Jones
✓Membership Kit 19.
Source Telecomputing
✓The Source (subscription & manual) 39.

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PC CONNECTION®

“Can’t anyone help me?”

he cried. Suddenly, the storm increased in fury, shaking the building and knocking a magazine off his desk. It fell open to a critical page . . .

CABLES

- ✓ AC Plug Adapter (any monitor to your PC) 8.
- ✓ Smartmodem to IBM Cable \$17.
- ✓ Keyboard Extension Cable (3 to 9 feet) 27.
- ✓ Extension Cables for IBM Mono Display 33.

SURGE SUPPRESSORS

- All surge suppressors have an on/off switch.

- ✓ Diamond (6 outlets) 28.
- ✓ Emerald (6 outlets; 6 ft cord) 34.

- ✓ Sapphire (3 outlets; EMII/RFI filtered) 44.

- ✓ Ruby (6 outlets; EMII/RFI filtered; 6 ft cord) 50.

DataProducts

- ✓ 8050 color printer call
- ✓ 8070 color printer call

Epson

All Epson dot matrix printers have built in graphics capability. In addition, the LX-80, FX-85, FX-185 and LX-90 can all print in near letter quality (NLQ).

- ✓ DX-10 call
- ✓ DX-20 call

- ✓ FX-85 (replaces FX-80+) call
- ✓ FX-185 (replaces FX-100+) call

- ✓ LX-80 call
- ✓ LX-90 call

- ✓ LQ-1500 (letter quality dot matrix) call
- ✓ SQ-2000 Ink Jet call

- Epson Books call
- Printer-to-IBM cable 15.

We are an authorized Epson repair center.

Ask about extended service plan.

FTG

- ✓ Light Pen 195.
- ✓ Demo Disk for Light Pen 39.

Hayes

- ✓ Smartmodem 300 149.
- ✓ Smartmodem 1200 389.

- ✓ Smartmodem 1200B (w/Smartcom II) 349.
- ✓ Smartmodem 1200B (no software) 289.

- ✓ Smartmodem 2400 579.
- ✓ Smartcom II 2.1 (software) 89.

- ✓ Transet 1000 289.
- ✓ Accessory Kit for Transet 1000 (cable and software) 29.

Hercules

- ✓ Hercules Color Card (parallel port) 169.
- ✓ Hercules Graphics Card (parallel port) 299.

- Hercules Graph-X Software 2.0 42.

Innovative Concepts

- ✓ Flip n' File 50 12.
- ✓ Flip n' File 50 w/lock 18.

- ✓ Library Case (holds 10 disks) 4.

PC Connection Hardware Special

through December 31, 1985

AST

- ✓ Advantage Board
- An AT Multifunction Card.

Includes:

- Parallel and serial ports (2nd serial and game port optional)
- uses both 64k and new 256k RAM
- 1.5 MB parity checked memory on one single card (or up to 3MB with piggyback option)
- Comes with Sidekick non-copy protected

For the IBM-AT \$379.

Kensington Microware

- ✓ Masterpiece 94.
- ✓ Masterpiece Plus 129.
- ✓ Printer/portable computer stand 17.

key tronic

- 5150 keyboard 139.
- Deluxe keyboard (KB 5151) 169.
- 5153 keyboard (with touch pad) 289.
- ✓ AT Converter (allows any Key tronic keyboard to work with the AT) 12.

Kraft

- ✓ Joystick 29.
- ✓ Executive Cursor Control (w/Joystick) 47.
- ✓ Software only 27.

Mouse Systems

- ✓ PC Mouse (w/software, pad, & PC Paint) 139.
- ✓ NEC
- ✓ Pinwriter P2-3 (IBM, 80 column) 559.
- ✓ Pinwriter P3-3 (IBM, 132 column) 759.
- ✓ Pinwriter P5-3 (132 column) 899.
- ✓ Spinwriter 2050 (letter quality 17 cps) 679.
- ✓ Spinwriter 3550 (letter quality 32 cps) 1099.
- ✓ Spinwriter 8850 (letter quality 50 cps) 1489.

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For the IBM-PC Exclusively.

Circle 136 on reader service card

Orchid Technologies

All Orchid Boards come with PCnet Drive (Ram disk), PCnet spool (print spooling), disk caching & partitioning.

Conquest Multifunction Board \emptyset k upgradeable to 2Mb. Fully supports LOTUS/INTEL expanded memory specification (EMS).

Includes clock calendar, serial port, and parallel port. A PCnet Daughter Board can be added \$289.

PCnet Daughter Board (piggybacks to Conquest) with networking software call

✓ PC Net (stand alone card) call

✓ PC Turbo 186 w/256k and Turbo Daughter Board expandable to 640k. Increase the speed of your PC call

✓ Ecel Multifunction Card for the AT \emptyset k upgradeable to 1 Meg, fully supports LOTUS/INTEL expanded memory specification (EMS) and Error Correction Code (ECC). (serial and parallel ports optional) call

Paradise Systems

✓ Modular Graphics Card 275.

✓ Backpack for Modular Graphics Card \emptyset k (upgradeable to 384k) 225.

✓ Multidisplay Card 195.

✓ Five Pack w/384k 149.

PC Designs

✓ FD 1000 Computer 789.

Please call for more information about this computer.

Princeton Graphics

✓ HX-12 RGB monitor (690 x 240) 449.

✓ HX-12E RGB Monitor (EGA compatible) 589.

✓ MAX-12E Amber monochrome monitor 179.

✓ SR-12 RGB Monitor (690 x 480) 597.

✓ ISM Scan II Board for SR-12 149.

Quadram

Expanded Quadboard with clock calendar, parallel, serial & game port, I/O bracket, and Quadmaster software.

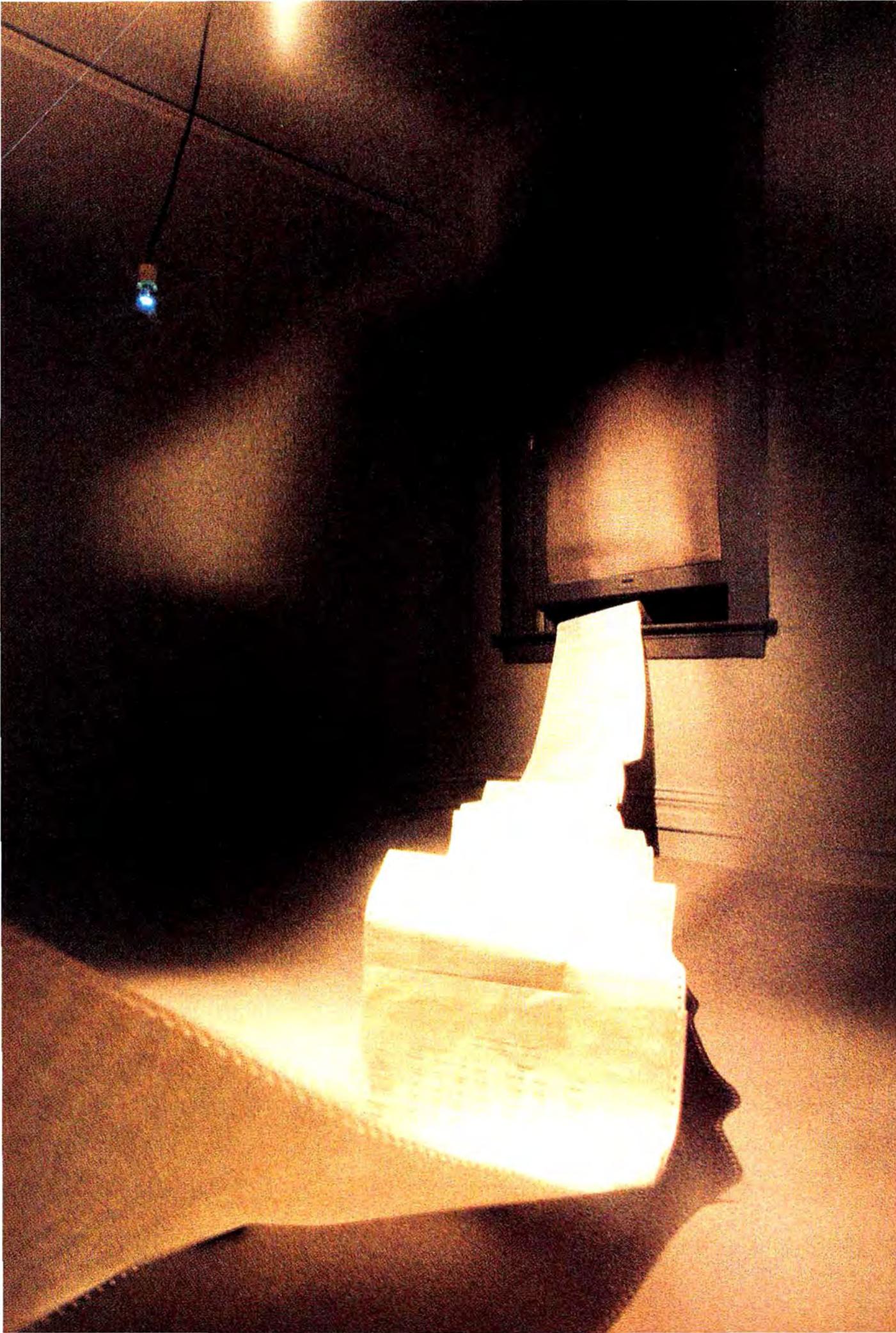
384k (fully populated) 219.

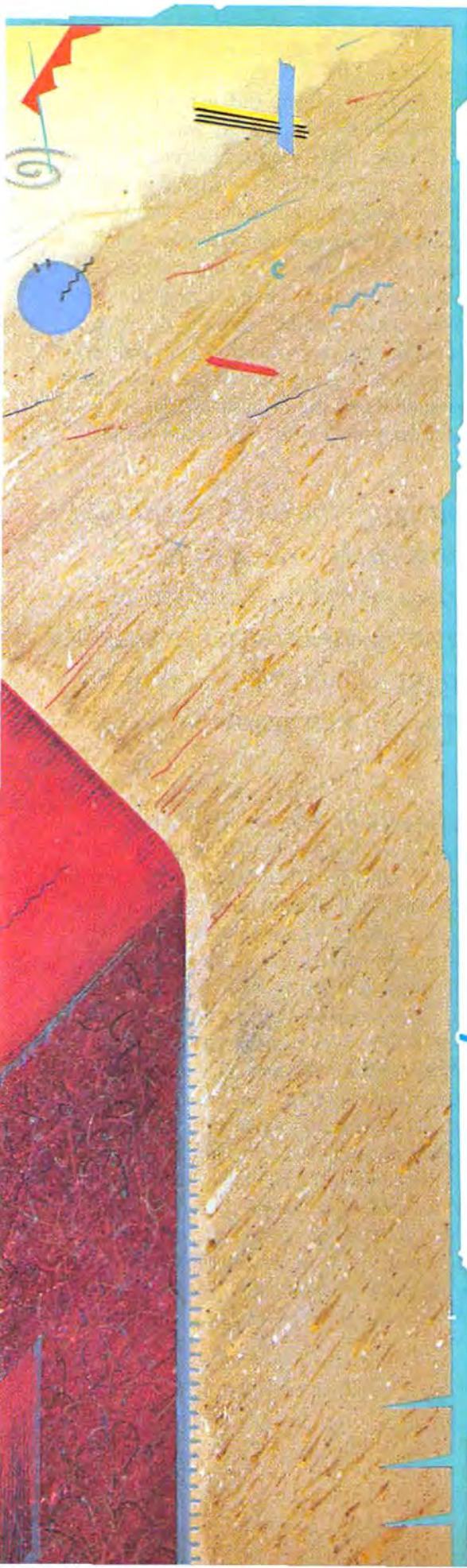
\emptyset k upgradeable to 384k 189.

Gold Quadboard \emptyset k upgradeable to 640k, includes Quadmaster III software, clock calendar, serial port, parallel port, and IBM compatible color graphics (second serial or parallel port optional) 387.

Silver Quadboard \emptyset k upgradeable to 640k, includes Quadmaster III software, clock calendar, serial port, parallel port, and game port (second serial port optional) 215.

PC CONNECTION





Committed to Memory

While a new generation of hardware and software waits to be served, users are improvising and improving on existing technology—and striving relentlessly to expand the work space.

Ken Greenberg

When IBM introduced the PC AT during the summer of 1984, the instant consensus was that the machine had tremendous potential. The dominant personal computer from the dominant computer manufacturer *still* has tremendous potential.

The lag in bringing the AT up to full power has frustrated the software development community, which depended on this second generation PC to provide the speed, extended memory, and rapid-fire disk access that increasingly sophisticated programs require. But delayed gratification has had its greatest impact on users—particularly power users and so-called early adopters—who've been forced to milk what they can from an ambiguous technology.

This wait for Godot—in particular, for an operating system to unleash the AT's potent 80286 processor and thereby open new vistas in software—shaped the state of personal computer systems during 1985. It's not that the industry's principal suppliers

have been fiddling while users contemplated the future; it's more that power users have taken the future into their own hands, inspiring an impressive array of quick fixes based on an architecture they understand. The anthem of the year, as conveyed by an Intel ad, trumpeted, "Help for the Overachiever."

The cliché is that software determines hardware; in 1985, a software *company* determined perhaps the biggest hardware story of the year. Lotus Development, godfather of the power-user ethic, persuaded Intel and Microsoft to underwrite a means of breaking the 640K memory barrier; the result is Intel's AboveBoard (and its fellow bank-switching travelers). It's the stuff of which standards are made, however inelegant the implementation and transitory the solution.

AboveBoard, its clones, and its quasicompetitors actually may be more symptoms of technological limits than they are enduring solutions. Had Microsoft or IBM or anyone with enough clout delivered a DOS-compatible means of tapping the so-called "protected" side of the 80286—the gateway to multitasking, multiple-use applications and 16MB of RAM—AboveBoard would have remained a twinkle in some developer's eye. In that sense, necessity was the mother of this flock of expanded memory products. Shattering the 640K roadblock seems likely to hasten the arrival of an overdue era of bigger, smarter, easier-to-use programs capable of wooing hordes of new users.

This was also the year the AT suddenly had more company than it may have deserved, the PC's venerable chassis was at least temporarily rejuvenated via turbo-board mania and dirt-cheap memory, and the boisterous forces of supply and demand put an end to the industry's innocence. Meanwhile, IBM reformulated its personal computer strategy, defining power in terms of bigger machines and tacking the suffix *workstation* on to its PC line.

This Is a System?

Hardware manufacturers often refer to their creations colloquially as "iron." But systems aren't merely hardware; they represent a harmonious orchestration of processor, systems software, memory, input and output devices (like keyboards and monitors), other peripherals (like disk drives), and expansion boards. For the purposes of this essay, the term

system is defined broadly: ATs, PCs, and their admirers; portables of all weights and dimensions; intriguing sideshows like Commodore's Amiga, Dayna's MacCharlie, and Compaq's Telecompaq; multiuser expansion units like those from Anex Technology and bona fide multiuser machines like AT&T's UNIX PC; expansion boards other than those dedicated to communications or graphics; and chips, whether existing or incipient, such as the 80386 microprocessor and the 1-megabit RAM chip.

In the beginning, there was IBM's commitment to open architecture—a direction that has encouraged not only compatibility with the basic article, but expansion and improvement of it. Part of the virtue of

Shattering the 640K roadblock seems likely to hasten the arrival of the overdue era of bigger, smarter, easier-to-use programs capable of wooing hordes of new users.

the open approach is the assurance that systems can graduate in performance without foreclosing existing designs. The AT's 80286 CPU is essentially a superset of the PC's 8088, and then some. In its so-called real mode, the 286 emulates the 8088/8086, but the AT derives substantially better throughput than the PC thanks to its 16-bit data bus and 6MHz clock speed. In protected mode, the 286 derives its ability to manage up to 16MB of real memory and a gigabyte of virtual memory (that is, disk space) from integrated memory management circuitry not found on the 8088. This hefty addressing capability is essential to supporting multiple users or performing multiple tasks. Currently, only the DOS VDISK utility and Xenix provide entrée to the chip's protected mode.

This year did see one notable attempt to probe the 286's dark side with a DOS-compatible product. During testing of Concurrent DOS 286, Digital Research discovered just how trying a task that can be.

DRI reportedly encountered flaws in the CPU itself—flaws chip-maker Intel vowed to rectify. But George Colony, an analyst with Forrester Research in Cambridge, Massachusetts, says the problem doesn't lie with hardware. Colony suggests that Microsoft's inability to move DOS to the 286's protected side "is holding IBM's strategy hostage."

Success Among the Ruins

Perhaps mirroring the industry, it's been a particularly enigmatic year for IBM's flagship PC. The enhanced AT was on allocation to dealers in January but available in surplus by July, even before a rash of reasonable facsimiles could hit the streets. For much of last year and a good deal of this, the AT confirmed the adage that deprivation makes the heart grow fonder.

Sentimentality aside, the AT is in fact succeeding—in spite of itself. Had a major machine from any other major manufacturer experienced the AT's kind of year, the obituaries would be ricocheting off the boardroom wall. (According to some analysts, the machine's end is near, but the AT is selling briskly

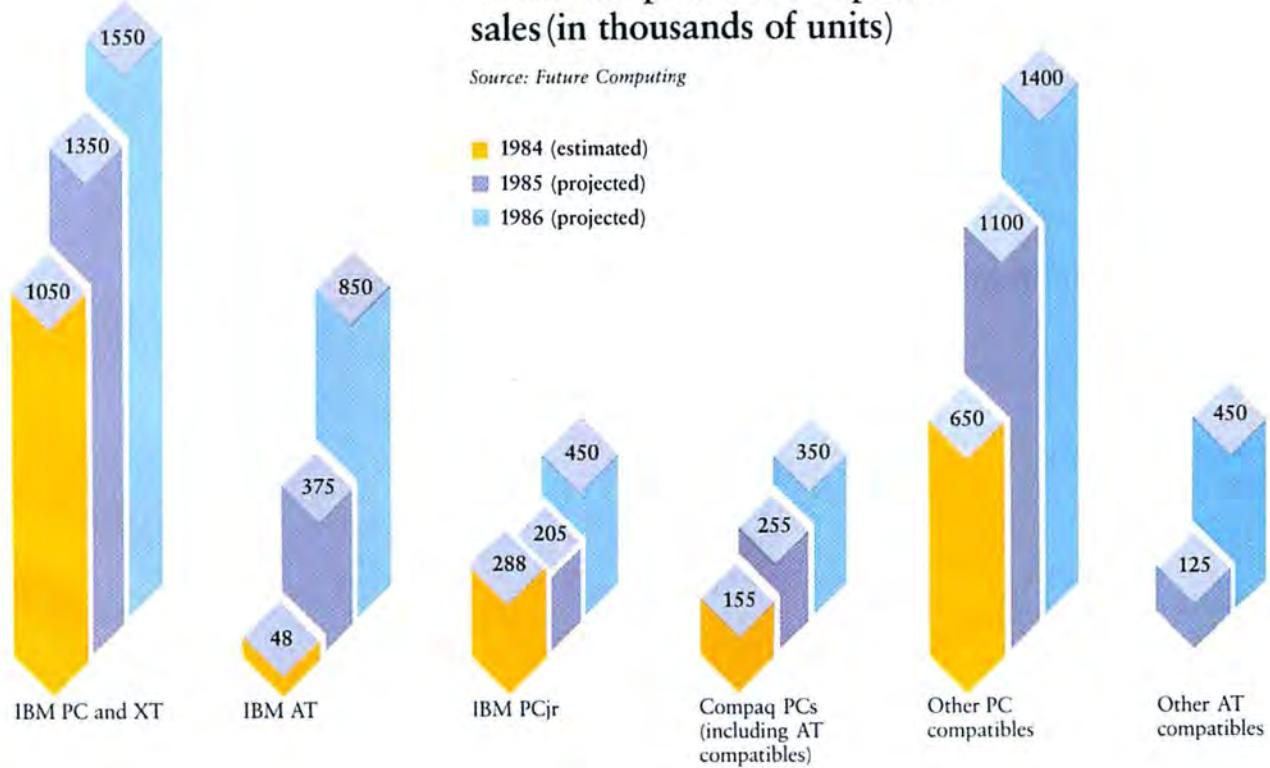
nonetheless.) The AT's litany of past and present woes is troubling: a faulty hard disk controller, a wayward hard disk, lingering uncertainty about market position (and concern about what was truly ailing the machine), one operating system that doesn't do the AT justice and another that much of the business market would rather leave to AT&T.

Early adopters treated the AT as a super PC, a designation that continues to sit well with corporate America. A Newton-Evans Research poll of the Fortune 1000 confirmed overwhelming interest in the AT as a powerful single-user system. Says Kevin Ellington, senior vice president of Compaq, "IBM released a multiuser architecture with no multiuser software, so the company positioned the AT as a super PC. Today's 286 machines are a subset of the PC market." But the machine's second wave—marked by volume shipments of the enhanced model—enabled such VARs and OEMs as Daisy Systems and Personal CAD Systems to turn it into a CAD workstation or multiuser supermicro living under Xenix. Last summer IBM dressed the AT in the usual guises, releasing

Worldwide personal computer sales (in thousands of units)

Source: Future Computing

- 1984 (estimated)
- 1985 (projected)
- 1986 (projected)



the 3270 AT, the AT/370, AT-based graphics workstations, and—as if to remind the world of the business Big Blue is in—desktop versions of System/36 and Series/1 minicomputers. The local area network market, slower to take off than some anticipated, has thus far kept the AT's role as a server to a minimum.

The AT's ability to bring the future a bit closer hasn't been advanced by upheavals at headquarters, including the arrival of William Lowe as Entry Systems Division (ESD) head, the imminent move of ESD to New Jersey, and the general squeeze on IBM's corporate profits. "There have been very serious changes in the PC's direction this year," says Brian Jeffery, research director for Silicon Valley's International Technology Group. "You can't underestimate the fact that it's a whole new ball game." What has helped is Lowe's candor in playing to IBM's strengths (workstations again) and in not playing around (quashing PCII rumors and giving Microsoft a public vote of confidence).

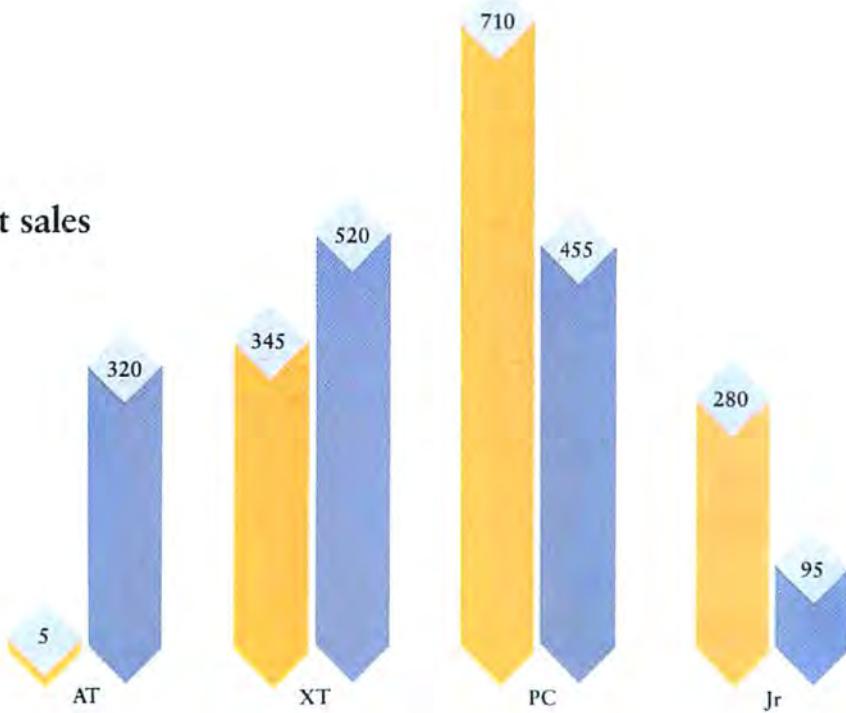
If the phantom PCII proved that a product could be influential without officially existing (67 percent of respondents in one survey admitted delaying purchases pending its release), the PCjr epitomized existence without influence; these days, IBM's Portable PC enjoys neither existence nor influence.

It's been that kind of year.

IBM PC product family unit sales (in thousands)

Source: International Technology Group

■ 1984 (total 1.37 million)
■ 1985 (total 1.41 million)



Such optimistic prognoses kindled an energetic, if initially tentative, AT-compatibles market. AT look-alikes proliferate despite continuing uncertainty about the role of the 286 and despite the lack of a software base that uses the chip to its optimum.

The criteria for compatibility haven't changed much from PC clone days, and those time-tested shibboleths still apply. A chastened cadre of manufacturers knows too well the price of attempting to improve on (read: diverge from) the IBM standard; many are sitting this one out, although not by choice. The vendors with the familiar logos tend to seek redemption in the AT-compatibles realm, although often via OEM and VAR arrangements rather than retail sales.

These players generally have deep pockets, the better to keep the window of opportunity from shutting too soon. Corona's Bob Harp admitted entering the game out of a sense of obligation to the market rather than a commitment to the AT's stubbornly amorphous niche. There is, of course, risk in hitching the company star to the AT. If the AT proves to be a stopgap machine, the obligatory rush to duplicate may instead be a rush to oblivion. Meanwhile, the AT-compatibles roster continues to grow: Compaq, Texas Instruments, Zenith, NCR, TeleVideo, Kaypro, Sperry, Hewlett-Packard, AT&T, and Wang, plus a host of second- and third-tier companies—STM, Basic Time, Tomcat, Ivy, Micro Five, Kyocera (of Model 100 fame), PCs Limited, Mitsui, Core International, and Gulfstream Micro Systems. Word is that even Apple momentarily considered releasing an AT look-alike.

Improvising on Big Blue's tune means differentiating a product by striking additional, but never discordant, notes. AT compatibles uniformly run under DOS 3.00; boast identically functioning BIOS ROMs; and mimic the AT's keyboard layout, 16-bit bus structure, and video mapping. Indeed, there's an almost slavish adherence to the fundamentals, down

to currently meaningless keys, keylocks, and a disk drive format no one particularly likes. Compatibles add value by cranking up the clock speed to 8MHz and even 10MHz (some vendors provide switch-selectable speed) and by supplying 8 to 14 slots, up to 15MB of system RAM, no-wait-state memory, as many as six or eight storage compartments, and prodigious mass storage: 120MB hard disk drives and 60MB tape drives are not uncommon. The beefiest box, not surprisingly, hails from Texas. Fully loaded, TI's Business Pro approximates a small mini, with 14 slots, up to 3.5MB of motherboard RAM, and 144MB of disk storage. Price and availability remain

Demand among power users remains robust, which may account for that segment's increasing influence. Compaq determined that 75 percent of its buyers were PC veterans.

less potent selling points, in part because the AT marketplace isn't yet as price-sensitive as the PC-compatibles arena. That trend too may be fleeting. PCs Limited has priced its AT look-alike at \$1995, sans monitor.

Compatibility itself has become a commodity item, freeing vendors from the R&D headache of emulating the AT's BIOS. These are boom times for "compatibility houses," among them OEMTek, Award Software, Faraday Electronics, MNC, Atronics International, Quam, and Phoenix Software. Says Phoenix's Richard Levandov, "What's changing is the way in which manufacturers are positioning their products. You can add value without being a clone—compatibility is just an added feature." Levandov says Phoenix's business has increased fivefold,

(continues on page 240)



Systems

To avoid mixing prunes, pimentos, and pork chops, we sliced the systems category three ways. This trio of signal offerings includes a quick fix that may achieve permanence, a major improvement on an emerging standard, and the first machine to credibly claim the title "full-function portable."

■ Memory Product: Intel AboveBoard

A case could be made that AboveBoard, Intel's implementation of the Lotus/Intel/Microsoft expanded memory specification (EMS), isn't the most sprightly way to leapfrog the 640K memory hurdle. AboveBoard's windows on expanded memory aren't large enough, it slows operations by 2 or 3 percent, and it doesn't purport to foster multitasking (that is, the concurrent operation of two or more programs). Microsoft boss Bill Gates has even been known to characterize bank-switching—the technique AboveBoard employs to delve into massive memory—as "kludgey."

But AboveBoard's impact on the market speaks for itself. The once untenable is now feasible: RAM-based and data-intensive applications (like spreadsheets and graphics packages) can have the megabytes of work space they demand. Accordingly, AboveBoard looms as a key catalyst for software development during the next few years. But even if it merely inspired a better bank-switching protocol or less expensive bank-switching

boards, the product would have earned its spurs. The box in which AboveBoard is packaged bears the stamp "Genuine Intel," perhaps signifying the clout needed to transform a new product into a de facto standard.

AboveBoard evolved from an interim to a long-term solution in a matter of weeks; all the product—or technically, the EMS—needed, it seemed, was the public endorsement of Gates' Microsoft. And that's certain to make all the difference: Expect the spec to show up in future iterations of DOS. That's also clout.

AboveBoard/PC can carry a maximum of 2MB per board; a piggyback board for AboveBoard/AT provides an additional 2MB, for 4MB in a single 16-bit slot; both support memory expansion up to 8MB. AboveBoard/AT works with the AT's extended memory mode via DOS 3.00, VDISK, or Xenix. Both versions of the board include a RAM disk and a print buffer. At press time, a 2MB board listed for \$1395. The PC version with 64K starts at \$395; the AT offering with 128K lists for \$595. Intel sources report that AboveBoard is currently finding its way into twice as many ATs as PCs.

AboveBoard is only the second product release from Intel's new Personal Computer Enhancement Operation, which has signed up 1000 retailers and is en route to 1500. Might Big Blue preempt the party? Perhaps, but for now IBM's silence on AboveBoard is golden for Microsoft, for Lotus, and, most of all, for Intel.

■ 80286 Computers: Compaq Deskpro 286

Compaq is AT it again. The Houston-based upstart is an upstart no more. Its Deskpro 286 adheres to the letter of IBM compatibility but enhances its spirit via added speed, memory, storage capacity, and more. It is, in short, a better AT.

But offering a more efficient, more flexible, and this time, more reliable solution isn't the full story. Compaq, conservative concern that it is, bet the company on its second-generation PCs—and succeeded in its bid for entrenchment on corporate desk tops. With 300,000 machines installed, Compaq has obtained the critical mass and the credibility needed to secure its place as the prime alternative to IBM.

The Deskpro 286 extends Compaq's three-year-old "tradition" of adding value through creative packaging and attention to detail. On the latest Deskpro, these refinements mean a novel system board design that moves memory out to an expansion slot—but allows up to 2.2MB on single board. The Deskpro 286's four 16-bit slots and one 8-bit short slot hold a maximum of 8MB of RAM, substantially more than the AT's 3MB. Ditto for disk storage: Hard disk options begin at 20MB, move to 30MB, and top out at 70MB. The Deskpro 286 is roomy enough for two hard disks, but you won't find the AT's problem-prone Western Digital controller inside.

For Compaq, compatibility and performance are almost inseparable. The Deskpro 286 runs at a quick 8MHz but can be slowed to the AT's 6MHz rate when talking to 8-bit boards. Similarly, according to senior vice president Kevin Ellington, Compaq considered and vetoed no-wait-state RAM. "The potential for future incompatibility was too great," he says. "There's going to be software that will confound the no-wait-state strategy."

The company knew when to leave well enough alone; the Deskpro 286 boasts the familiar Compaq dual-mode monitor, standard serial and parallel ports, and integrated tape-backup option.

"The phrase 'multiuser personal computer' is a contradiction in terms," says Ellington. "The PC industry grew because people wanted their own resources. Compaq is satisfying that need."

■ 8088/8086 Computers: GridCase 3

True portability used to mean enduring a few small sacrifices—doing without a readable screen, doing without disk drives, doing without lunch money for the remainder of the year.

Grid Systems, the company that cut its teeth on government contracts, bubble memory, and electroluminescent displays, has managed to keep sacrifices to a stunning minimum with its GridCase line of laptop portables. At the head of the class is the

(continues)

GridCase 3, an elegant 12-pound machine distinguished by its crisp 25-line crimson-on-black gas plasma display. Grid's screen, decisively clearer than AC-powered red-on-red plasma displays from Panasonic and Ericsson, confirms that flat-panel displays can be readable, lightweight, and battery-driven.

The 80C86-based GridCase 3 can be expanded to a maximum of 512K RAM and 512K of user-installable ROM, and it features a single built-in 720K 3½-inch floppy disk drive, 640 by 200 screen resolution, and serial and parallel ports; an internal 1200-bps Hayes-compatible modem is optional. The unit's slim chassis includes connectors for a PC keyboard, a PC expansion unit, and a color monitor, along with a compartment for a rechargeable battery pack. A sleek external 5¼-inch drive and a 10MB hard disk drive are also available.

Obtaining a GridCase 3 does require a fair bit of lunch money (prices start at \$4000), and its pop-in nicad battery supports a continuous charge only an hour or so. The 57-key GridCase keyboard duplicates PC functions but asks for some digital dexterity. That's about it for trade-offs, though.

For John Keegan, head of systems and programming for Merck, Sharp & Dohme in West Point, Pennsylvania, the trade-offs are negligible. Keegan acquired GridCase 3s for 200 Merck field reps engaged in domestic pharmaceuticals sales. The machines are equipped with custom software and now give reps the chance to provide vivid on-site presentations to physicians. The moral? Perhaps, better red than unread.

principally from AT look-alikes, and he counts 17 pending contracts for AT-compatible system software. Chips and Technologies, a start-up master-minded by Seeq Technology founder Gordon Campbell, may shrink the AT's size-16 footprint—and do so on the cheap. Campbell's firm has introduced CHIPSet, an AT-compatible stable of semiconductors that distills 63 AT chips—including the 80286—to just 5. (Today OEMs—tomorrow, a laptop AT?)

Portables exhibited the year's highest level of ingenuity, widest array of new features, greatest flexibility in packaging and pricing—and managed to finesse what still may be unacceptable compromises.

Compaq, the perennial compatibility champ, was one of the few vendors not to sign with Phoenix or Faraday. In releasing its Deskpro 286 and Portable 286 lines, Compaq managed to be out early and to outperform the AT. Increasingly, the Compaq logo imparts the assurance once evoked only by IBM machines. The 286 families repeated and extended 1984's Deskpro story with improvements in storage, speed, and memory, augmented by unparalleled flexibility and a raft of ingenious touches (see the sidebar "PC World Pacesetters—Systems").

Still, analysts are generally unenthusiastic about the AT marketplace. Forrester's George Colony calls that market "limited, unlike the PC marketplace, which has been expanded by casual users." Colony suggests vendors have been late out of the gate—perhaps too late to compete. ITG's Jeffery excoriates AT-compatibles manufacturers for heeding a "pack instinct," suggesting that "there's too much competition. Companies seem to be engaging in mass suicide."

Teaching New Dogs Old Tricks

If AT look-alikes are engaged in a dogfight over a confined market, most PC-compatible dogs have already eaten the more vulnerable canines. While Colony suggests there is "no life left in the PC-compatibles market," ITT's novel Xtra XP (Extra Power) may have harnessed whatever energy remains. The XP appears to have scooped IBM on the PCII and stolen a bit of the momentum from the hot-selling hard-diskless XT.

Under the XP's hood is a 6MHz 80286 CPU, but otherwise there's nothing AT-like about the machine. All slots are 8 bit, save one 16-bit channel for no-wait-state system RAM. In tandem with software that serves as disk cache and print spooler, the XP emerged as a supercharged XT compatible—and perhaps foreshadowed IBM's unreleased successor to the PC.

Elsewhere in the PC-compatibles world, those who endured—to say nothing of flourished—this year proved they could master the knack of vertical marketing, and, if necessary, iron out the kinks of incompatibility (even if doing so meant scrapping old products in favor of sleek new ones). Still among the living are Victor, NCR, Leading Edge, Epson, Sanyo, Hitachi, Xerox, and Olivetti (the last two with chips off an old clone, the AT&T PC 6300). Born-again competitors include Tava USA and Eagle. Eagle plans to butt heads with DEC over a new supermini and jazz up its Turbo line to joust with the AT. Actrix emerged from Chapter 11 with a line of portable compatibles that it claims can be retrofitted as XTs or ATs.

These stalwart PC look-alikes feature faster processors (the 8MHz 8088-2 and 8086-2 are the CPUs of choice) and greater storage options, but they hang on by dint of lower price tags. Indeed, the VCR phenomenon has afflicted PC compatibles, and a \$750 system price is no longer unthinkable.

The other trend of note this year finds the PC serving as a workstation in budding office automation strategies. Harris Business Information Systems unveiled its Concept 2000 line of PC compatibles, Data General (DG) followed suit with its Dasher/One series, and Wang and Tandem likewise moved to satisfy users interested in tapping the PC's enormous software base. Offerings of this ilk tend to be on the cusp of PC compatibility, often with nonstandard media (like DG's 3½-inch microfloppy disk drives) or proprietary coprocessors.

Compatibles famous for 15 minutes include the Magnum Computer, whose manufacturer decries the inability of any PC compatible to gain "significant market share"; the Raven XT, a coal-black box that includes a dot matrix printer and accepts a 60MB hard disk; the Ivy DT-20, an XT compatible that purportedly acts like an AT; the \$1199 Calpak Series 85; and the UNIX-compatible Challenger PC from Megadata.

The market bid adieu this year to Seequa, Columbia Data Systems, and Intertec. For Columbia, the beginning of the end came during Spring COMDEX with the first bankruptcy petitions. Seequa, although insolvent, was awarded a \$100 million Navy contract for 36,000 8088-based machines, which TeleVideo won the right to manufacture. Just as Commodore's Amiga hit the streets, Mindset Computer—builder of the great graphics hope of another year—filed for Chapter 11 protection. Farewell as well to the Sanyo 550 series and the DEC Rainbow (what facelift?).

Carrying On

Perhaps IBM's conspicuous absence from the laptop portables market, combined with the realization that there's still room to maneuver in the laptop business, is why 1985 proved notable for pint-size PCs. This class of system exhibited the year's highest level of ingenuity, widest array of new features, greatest flexibility in packaging and pricing—and managed to finesse what still may prove to be unacceptable compromises.

Input, a market research firm based in Mountain View, California, estimates laptop sales will grow from 140,000 this year to 700,000 by 1987 and 1.1 million by 1989—figures that encompass both notebook-size "productivity aids" and full-function machines. Both components of that market should benefit from Intel's enhanced line of low-power, high-performance 80C88 and 80C86 chips, which debuted this year.

But ITG's Jeffery suggests that sanguine projections about laptops "belong in the twilight zone—laptops are a ridiculously overhyped market, in part because the trade-offs are too great." Not so for Forrester Research's Colony. Although he maintains that

lightweight portables will "always be second machines" and should be priced "10 to 15 percent below desktops," Colony is counting on IBM to "open the floodgates. Laptops could be the next major step in this market."

Colony anticipates readable, affordable displays, practical power supplies, and acceptance of the 3½-inch disk drive as a standard—features that are largely incorporated in Grid's GridCase line of laptops. Indeed, Grid comes closest yet to wrapping full functionality in a single attractive package. The GridCase series also epitomizes trends throughout the portables market: the arrival of crisp-looking plasma displays and truly readable LCDs, full PC compatibility, the prevalence of internal 1200-bps modems, and the growing popularity of user-installable ROM software. What Grid's product family lacks is lower-than-desktop prices. Says Alan Lefkof, Grid's vice president of marketing, "People have assumed that because a computer is smaller and lighter, it'll sell by itself, but it's costly to put this much electronics in a box."

The innards of the average PC currently contain around 400K of RAM, and power user machines routinely move out with 512K and 640K. The abundance of fully loaded PCs in part reflects the tumbling price of memory.

Although Grid had some very respectable company this year—including the \$2000 Kaypro 2000, the 25-line HP Portable Plus, and a revamped, slightly more readable DG/One—laptops didn't make much of a retail splash. For the more muscular power user, Corona's ATP and Compaq's Portable 286 wrapped AT oomph in a luggable package.

Portables did prove to be a hit among government agencies and vertical markets. "The surprising growth is in applications geared to a single class of field professional, whether salespeople, auditing

teams, or engineers," says Lefkof. "It confirms that most portables aren't used to reduce costs or improve productivity, but to create opportunities in a direct way and to provide remote access."

There were few screens of anguish this year; Panasonic and Ericsson released AC-powered transports with identical, extremely readable plasma displays. Similarly, the Sharp 7000 and the Morrow Pivot both feature high-contrast 25-line LCDs, backlit with electroluminescent panels.

Finally, Mitsui quietly entered the market via Zenith's Heath subsidiary. Its long-awaited 7-pound, 16-line ZP-150 laptop contains *Microsoft Works* in 224K of ROM. *Works* consists of *Word*, *File*, *Calendar*, *Plan*, *Telecom*, and *GW BASIC* modules, all of which are subsets of other Microsoft products.

■ RAMbo Gets to Win

At an industry roundtable earlier this year, Microsoft chairman Bill Gates proclaimed the quest to satisfy the memory appetites of major applications "the most important innovation taking place in personal computing right now."

Gates's timing was perfect. The innards of the average PC currently contain around 400K of RAM, and power user machines routinely move out with 512K and 640K. The abundance of fully loaded PCs in part reflects the tumbling price of memory; 256K-bit RAM chips that once commanded \$20 wholesale now retail for \$4 each. Cheap memory, in turn, has fueled a push among power users to expand the 640K work space.

Gates probably wasn't alluding to bank-switching, a time-tested if somewhat convoluted means of sneaking past memory blockades. Yet it was with a bank-switching spec that three of personal computing's biggest guns—Lotus Development, Intel, and Gates's Microsoft—fired off a de facto standard last spring. By placing its Expanded Memory Specification (EMS) in the public domain, the triumvirate issued a virtual license to breed memory-hungry software.

Intel's AboveBoard/PC and AboveBoard/AT are the first products built around the EMS. This new species of expansion board provides access to three

kinds of memory: conventional, up to 640K; expanded—that is, bank-switched or paged—up to a theoretical maximum of 64MB; and, for the AT only, extended memory above 1MB and below 16MB, an area currently accessible in DOS only by VDISK (see the sidebar "Below AboveBoard").

With provision for the spec included in new releases of Lotus Development's 1-2-3 and *Symphony*, Ashton-Tate responded in kind, tossing AboveBoard support in with the latest retooling of *Framework*. Also falling in line behind the spec were Computer Associates' *SuperCalc 3*, Innovative Software's *The Smart System*, and The Software Group's *Enable*. Intel promised backing from as many as 100 software vendors by year's end.

AboveBoard's immediate influence didn't stop at software; indeed, the product seemed almost to beg for a response. Within weeks, board makers released a rash of compatible—and competing—paged memory boards.

Battle of the Boards

Foremost among the contenders is RAMpage! from AST Research—and not merely because it's a product of AST, which owns 35 percent of the expansion board market. The EMS sparked an alliance of two otherwise fierce competitors, AST and Quadram, who, with Ashton-Tate, collaborated on an Enhanced Expanded Memory Specification (EEMS), a superset of the EMS. Tony Paradiso, senior project manager at AST, terms the alliance "unprecedented." AST has also received pledges of support from Digital Research, Computer Associates, and Borland International.

Both the EMS and the EEMS combine hardware and software standards. Both require that program memory address routines be rewritten for paged memory boards. Both employ a CONFIG.SYS device driver called the Expanded Memory Manager (EMM), which loads when you start the PC and serves as the intermediary between applications and expanded memory. Bank-switching is invisible to the user and useless for unmodified programs and disk-based applications.

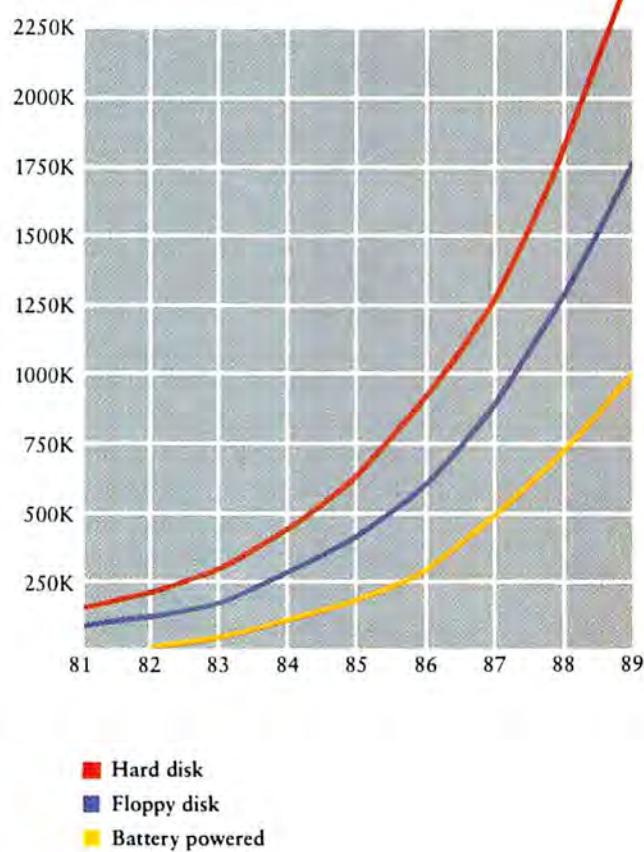
The EMS relies on four 16K windows in any contiguous, unused 64K bank of memory addresses between 768K and 960K. Each of four memory management chips controls one 16K window, which contains data in expanded memory (above 1MB). Each

window reveals different portions of expanded memory, as needed by the "EMS-aware" application. An application's support of the EMS requires monitoring the location and content of each 16K window. Because executable program code would have to be viewed in 16K increments, this protocol is best suited to parking banks of data rather than programs themselves.

The EEMS emulates the EMS scheme in locating a contiguous 64K range of memory addresses. It then ferrets out the remaining unused 16K memory address ranges between 640K and 960K and makes a 16K window of each one. These windows need not be contiguous, which means the spec allows much more expanded memory to be viewed at once, thus speeding up program operation. With larger portions

Main memory capacity

Source: Future Computing



Below AboveBoard

William Urschel

The need could not be clearer: You've got a massive spreadsheet but, in the words of a Motown classic, it's got nowhere to run. While your 80286-equipped AT can contain nearly 16MB of RAM, you can't access most of it. Under DOS 2.10 (or 3.00), which uses the chip in its real mode to emulate the 8088/8086, you can address only slightly more than 500K for your 1-2-3 worksheet.

The most publicized solution for working with larger spreadsheets is hardly economical: You'll need to spend a few grand for a 2MB version of Intel's AboveBoard, which supports the Lotus/Intel/Microsoft expanded memory specification (EMS), and the new version of 1-2-3 to run on it. You can save a few bucks on hardware by acquiring an AboveBoard clone at about \$500, but you'll still require the rewritten 1-2-3.

Enter *The Extender* for 1-2-3, from Uniform Software Systems of Santa Monica, California. *The Extender* is a \$99 utility that enables 1-2-3, release 1A, to run in the 80286's protected mode and thereby create nearly 1MB spreadsheets. (Although the protected mode permits the 80286 to address 16MB of RAM, release 1A won't support spreadsheets larger than 1MB.) "We're finding quite a few people with extended memory [AT RAM above 1MB] already installed," says George Strong, vice president of Uniform Software. "That surprised us, because there wasn't much you could do with it aside from making a RAM disk."

Strong describes *The Extender* as an alternative to the AboveBoard's bank-switching approach, although for the moment *The Extender* works only with 1-2-3 and only on 80286 machines. "What we suggest, although don't promise, is that additional products will allow other programs to use the protected mode of the AT," Strong explains. Uniform is reportedly at work on versions for *Symphony*, *Framework*, and *TopView*.

The Extender does have its drawbacks. The original version cut into 1-2-3's execution speed by a factor of three (although Uniform claims the speed problem has now been fixed). Neither will *The Extender* work with other memory-resident programs (like *SideKick*) or with local area network software. According to Strong, the network problem is no problem at all. "You have to close [the network] down in order to operate your extended Lotus program. But with net software in memory, your effective maximum spreadsheet size is really only 200K to 300K anyway. We've relaxed the restraints for you, giving you up to 920K."

In the future, Strong says, Uniform plans to foster a "kernel" approach. In addition to selling versions of *The Extender* for other packages, Uniform will offer "tool kits" to software developers. "We will hand out a set of rules and say, write your software to obey these rules, and together

with our tool kit you can expand your memory," he explains. These software routines will ultimately grant off-the-shelf DOS applications entrée to the 286's protected mode. What happens when a new, multitasking, multi-megabyte version of DOS appears? "Of course, if DOS 5.00 comes out," Strong says, "that may change the game entirely." For the time being, however, sales are brisk.

There is, of course, more than one way to seize an oversize spreadsheet—without venturing onto the 80286's protected side, and without having to shell out for a bank-switching board. Syscomp's solution is a \$75 bank-switching utility called *Vmsym*, which enables *Symphony 1.1* to address up to 4MB of RAM sans AboveBoard or any of its kin. *Vmsym* relies instead on the PC's hard disk or RAM disk to hold data that would otherwise be parked in an expanded memory board. The program employs virtual (or simulated) memory techniques in conjunction with *Symphony 1.1*, which includes support for the EMS—a process Syscomp says results in performance only slightly slower than bank-switching with AboveBoard.

Syscomp is frank, however, about *Vmsym*'s Achilles' heel. Seems that the program simply can't tolerate data base sorting: While AboveBoard/PC completes the 530,000 bank-switches needed to sort an 8000-record *Symphony 1.1* data base in 12 minutes, *Vmsym* requires about two days.

of expanded memory available, program code can reside in high memory; in this way, the EEMS supports concurrent applications.

The EEMS also allows 16K windows to exist in RAM below 640K on an expanded memory board that supports split-memory addressing; that is, one that fills in RAM below 640K for those machines not "fully loaded."

More Compatible Than Thou

AST and Quadram contend that their superset is fully compatible with the EMS, although both acknowledge that software must be written specifically for the EEMS in order to benefit from its attributes. Vinkat Mohan, Quadram marketing manager for board products, calls the distinction between the two specs small and says compatibility is "a nonissue." Oddly enough, Quadram's first release of Liberty II, ostensibly an EEMS product, adheres only to the EMS, although Mohan says a future release will incorporate the AST spec. Quadram, however, appears to be hedging its bets. "Defense of a standard doesn't justify sacrificing compatibility," Mohan admits. "We're not dogmatic. We'll wait to see how many customers see the potential benefits and how software companies react to user needs."

For AST's Paradiso, the issue revolves around the ability to handle multiple programs. "Our spec is much more conducive to generating multitasking software," he says. Quarterdeck's *Desqview*, which supports RAMpage!, would seem to validate that claim. Together, the program and the board enable users to run programs concurrently, allotting each application 640K, up to a maximum of 8MB. Intel's Rich Bader counters that the EMS isn't intended to solve the "multiple program problem," but only the "big data problem." But *Microsoft Windows*, which contains its own memory manager, may resolve both problems. Working with AboveBoard, *Windows* tolerates concurrency.

EEMS compatibility with EMS is not in fact moot. Intel and Microsoft have hinted darkly that future versions of DOS won't tolerate the AST spec's intrusion into the 640K area. When Microsoft formally added its name to the Lotus/Intel spec last summer, the price of support was a change in the EMS device driver. This modification to AboveBoard reportedly will permit it and a future DOS to create a multitasking environment (see "Environmental Impact" in this issue).

A Solution for the Moment

Pundits and some software developers have reacted to both specs with scorn. Analyst Brian Jeffery calls AboveBoard "a palliative, not a major factor in the market." Alan Cooper, longtime software author, recalls that bank-switching "raised its ugly head in the last days of the Z-80 [CPU]. Bank-switching is a tremendously inelegant solution and isn't viable in the long run. It's too hardware dependent." But Scott

Brown, technical public relations manager for Ashton-Tate, doesn't expect hardware specificity to be a problem. "Developers like the spec because they dislike the RAM limit," Brown says.

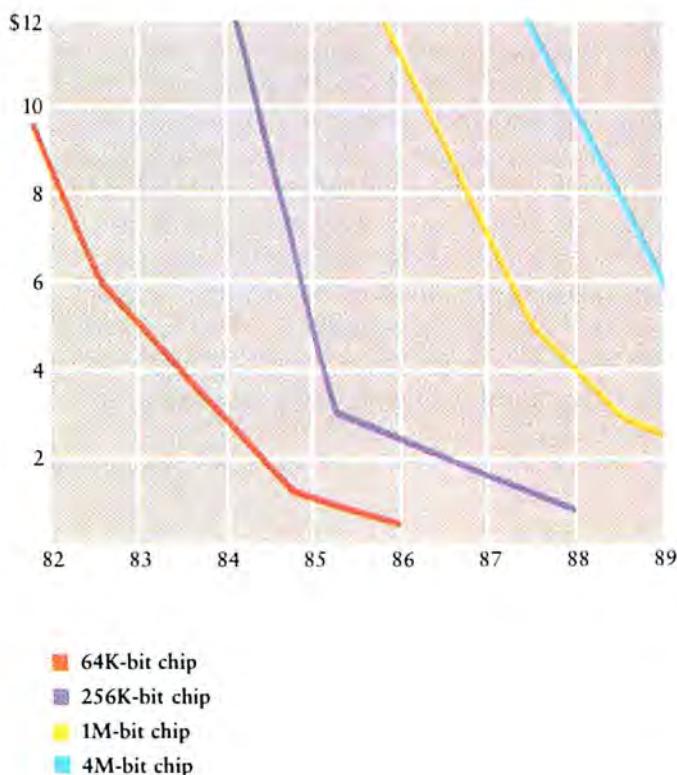
For now, the hills are alive with paged memory boards. Like compatible computers, some add value, others merely shave prices. Standard fare includes RAM disk utilities, split-memory addressing, and print spoolers.

In addition to Quadram's Liberty II, the EMS market includes Persyst's Stretch multifunction board, which uses custom VLSI (very large scale integration) chips; STB Systems' Memory Companion/PC and PC Accelerator, a board that is said to enable unmodified packages to use expanded memory; Accent from Maynard Electronics; Tall Tree Systems' JRAM-3, a Lotus-certified EMS board that supports the addition of ports, a disk controller, and a clock; Thesys Fastcard IV, a \$649 2MB multifunction board; the portless Mega-Omega, the bargain of the bunch at \$480 for 2MB; and Tecmar's Captain 2, which places all 16K window management on a single chip.

Is AboveBoard apt to give programmers carte blanche to write plodding and ungainly code? One developer doesn't think so. "Users don't need to be concerned that programs are grabbing more space," says Alan Cooper. "Software needs to be big in order to do what users want it to do. Overall, we should be pleased—user-friendliness consumes a lot of space."

Memory chip cost trends (in dollars)

Source: Future Computing



Jekyll and Hyde

The memory spec debate has diverted attention from the growth of "conventional" expansion boards and shifted the spotlight from accelerator boards, an increasingly popular way to close the speed gap between PC and AT—and an even quicker fix than bank-switched memory.

According to the soothsayers at the market watch firm Future Computing, the expansion board market represents just 7 percent of a projected \$15.6 billion peripherals pie for 1986. That slice can be further subdivided into so-called vanilla boards, which are limited to memory and maybe a port or two; multifunction boards, which typically sport parallel and serial ports, a clock/calendar, memory, and RAM disk software; accelerator boards, featuring substitute CPUs or coprocessors and disk caching; and bank-switching boards.

For the 4 million PCs chugging along at 4.77MHz and transferring data in 8-bit chunks, accelerator boards promise renewed vigor. Such boards provide the PC's 8088 with company and usually a rest as well. Typically, an on-board 8086, 80186, or 80286, often cruising at 8MHz or 10MHz, assumes central processing chores, relies on its own high-speed RAM, and apportions a few kilobytes for disk caching. When the 8088 and an additional processor work in tandem—as they do in Orchid Technology's PCTurbo-186—the 8088 handles only input and output, leaving the thinking to the 80186.

Joining Orchid in this burgeoning market are Quadram's Quadsprint, Univation's PC Turbocharger, MicroWay's Number Smasher, PC ElevATor from Applied Reasoning, Kamerman Labs' SuperFlight, Pfaster 286 from Phoenix Software, Earth

While their processing speeds may equal or exceed the AT's, turbo boards don't offer the PC a complete facelift.

Computers' Turbo-Accel 286, and PC Accelerator from Titan Technology.

While their processing speeds may equal or exceed the AT's, turbo boards don't offer the PC a complete facelift. There remains no physical way to accelerate contact with the outside world, and thus encounters with peripherals, conducted via 8-bit slots, remain sluggish. Committed power users not interested in junking the PC or popping for a \$1000 turbo board are reportedly pulling their 8088s and replacing them with blistering 8086-compatible NEC V20 and V30 CPUs.

For some, however, souping up the PC is little more than a fad. "The whole concept of 'turboizing' is temporary and, with a new generation of software, will become pointless," says Colony of Forrester Research. AST's Paradiso hints that his firm is awaiting a price drop before entering the market but may then couple paged memory capability with turbo power.

Beyond Speed

Multifunction board vendors, like integrated software firms, now yearn to specialize. As PCs roll off the assembly line with an increasing complement of standard equipment and as memory prices continue to plunge, some suppliers are choosing to focus on communications, graphics, coprocessors, even hard disks on a board (as Plus Development has done with Hardcard; see "Critical Mass" in this issue). AST, for example, is cozying up to the micro-mainframe market, while Quadram is endorsing an all-in-one approach. Quadram's Gold Quadboard supplies multifunction and color graphics on two boards that fit into a single slot. Other vendors are investing in custom chip development to save real estate and, ultimately, money.

When is a board not just a board? When it's bundled with a program—and bundling clearly came into its own this year. AST's SixPakPlus multifunction board is packaged with Borland International's *SideKick* and, since last summer, so are AST's Advantage and RAMvantage boards for the AT. Ditto for Polytron's *PolyWindows DeskPlus*, now standard equipment with Quadram's Quad, Silver, and Gold boards. But an offer from Symantec, a start-up software firm in Cupertino, California, provides an even better sign of the times. For \$50 above the price of *Q&A*, its data management program, Symantec includes in a 256K short-slot memory board, the better to boost you up to the program's 384K requirement. (Turner Hall Publishing, a Symantec division, sells an enhanced version of that board for \$99.)

Still, the bundling bonus of the year could well be Option Board from Central Point Software in Oregon, publisher of *Copy II PC*. At \$95, it's supposedly the first peripheral that enables you to duplicate copy-protected software. The board comes with a special version of Central Point's popular program.

■ Back to the Future

The future of systems lies exactly where its recent past began—the laboratory. The ongoing miracle of miniaturization continued unabated this year, as Intel released early versions of its 32-bit 80386 microprocessor and AT&T began production of the 1-megabit RAM chip.

The 80386, which is a superset of both the 8086 and 80286, is by all accounts a stunning piece of work. The CPU is capable of directly addressing 4 billion bytes of memory, manipulating 64 trillion bytes of virtual memory (typically disk storage), supplying genuine multiuser and multitasking performance, and with its 16MHz clock rate, tripling 80286 speed. The CMOS 80386 is packed with 300,000 transistors, twice the number contained on the 80286. Indications are that Intel and Microsoft may have collaborated more closely on this chip's design than on the 286—good news for software developers and users alike.

The year in semiconductors also confirmed that speed is to a power user what kibble is to a Great Dane. Intel formally entered the retail market with its 8087 and 80287 math coprocessors, and later began shipment of its 10MHz and 12.5MHz 80286 CPUs. No sooner did those new arrivals hit the market than

Buzzwords International—whose own buzzword could be “speed thrills”—began selling crystals that can rev up the 286's ticker to 14.5MHz.

The 1-megabit memory chip, meanwhile, promises to double processing speed, cut memory costs by a factor of four, and substantially shrink the PC's already modest footprint. Single memory boards will carry a maximum of 8MB of RAM—memory capacity that, in the words of semiconductor industry analyst Howard Dicken, will help spur “a real revolution” in computing. Toshiba and IBM reportedly also have 1-megabit products in the works.

Both chips may be instrumental in the *next* generation of IBM personal computers. When an 80386 PC does arrive, count on it to be at least as downwardly compatible as the AT and to more effectively use its processor's virtual memory and multitasking capabilities.

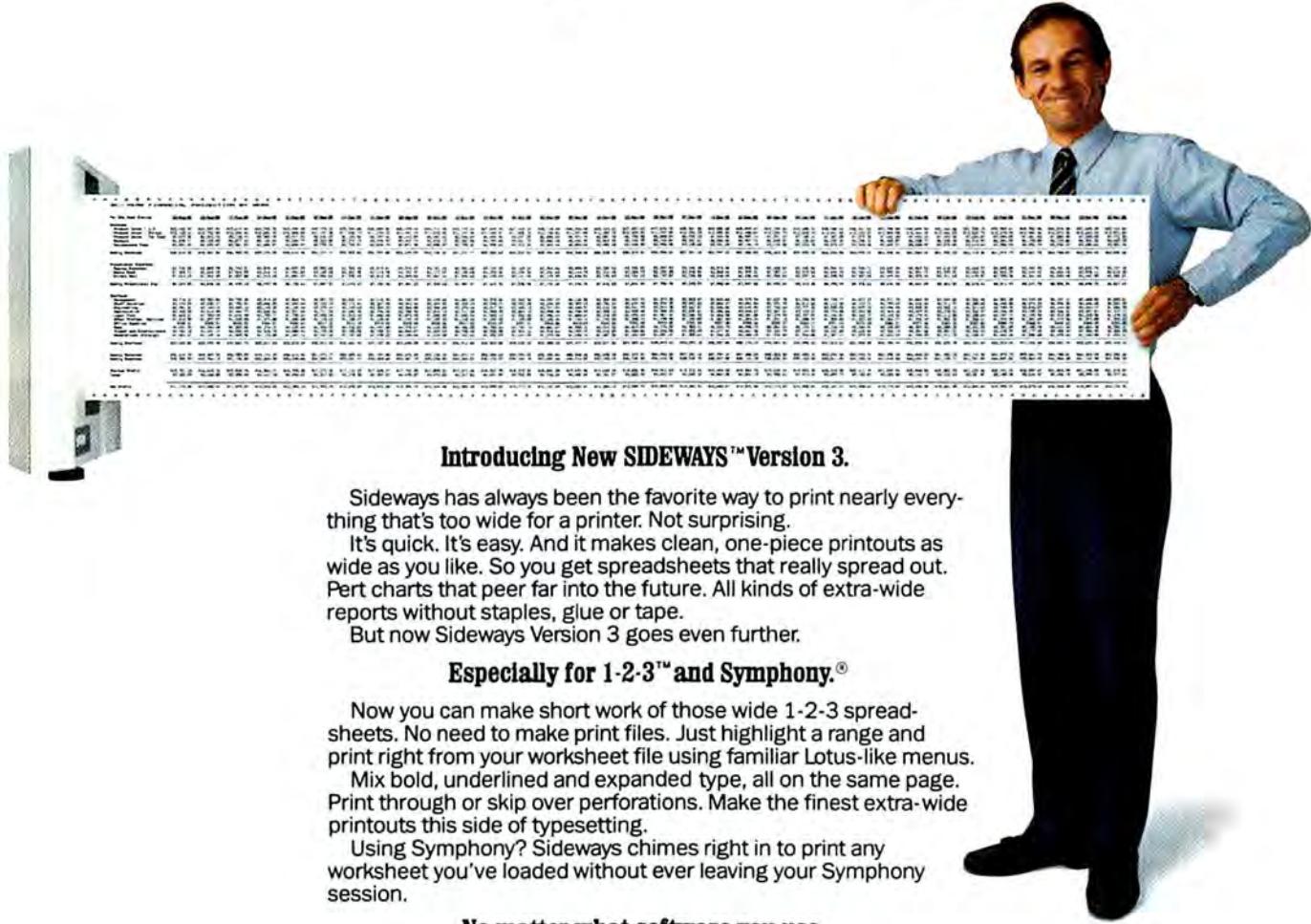
In the view of ITG's Brian Jeffery, that time may not be too distant. He suggests that AT compatibles “go fast and early” to the 80386. “In getting the AT out late, IBM handed them a market,” he says. “If they're not careful, IBM will take it back. I expect IBM to make the transition to the 386 very early.”

Whether next month or next year, a new generation *will* be served. It always is. Speaking at an industry forum last winter, Lotus chairman Mitch Kapor put it this way: “The revolution in semiconductor technology that is fueling all this great hardware shows no sign of letting up. Every time somebody does something better at that level, it creates a series of cascading opportunities to create better systems, better peripherals, better software. The best uses for personal computers haven't been invented yet.” ●

|| Ken Greenberg is the Senior Editor of PC World.



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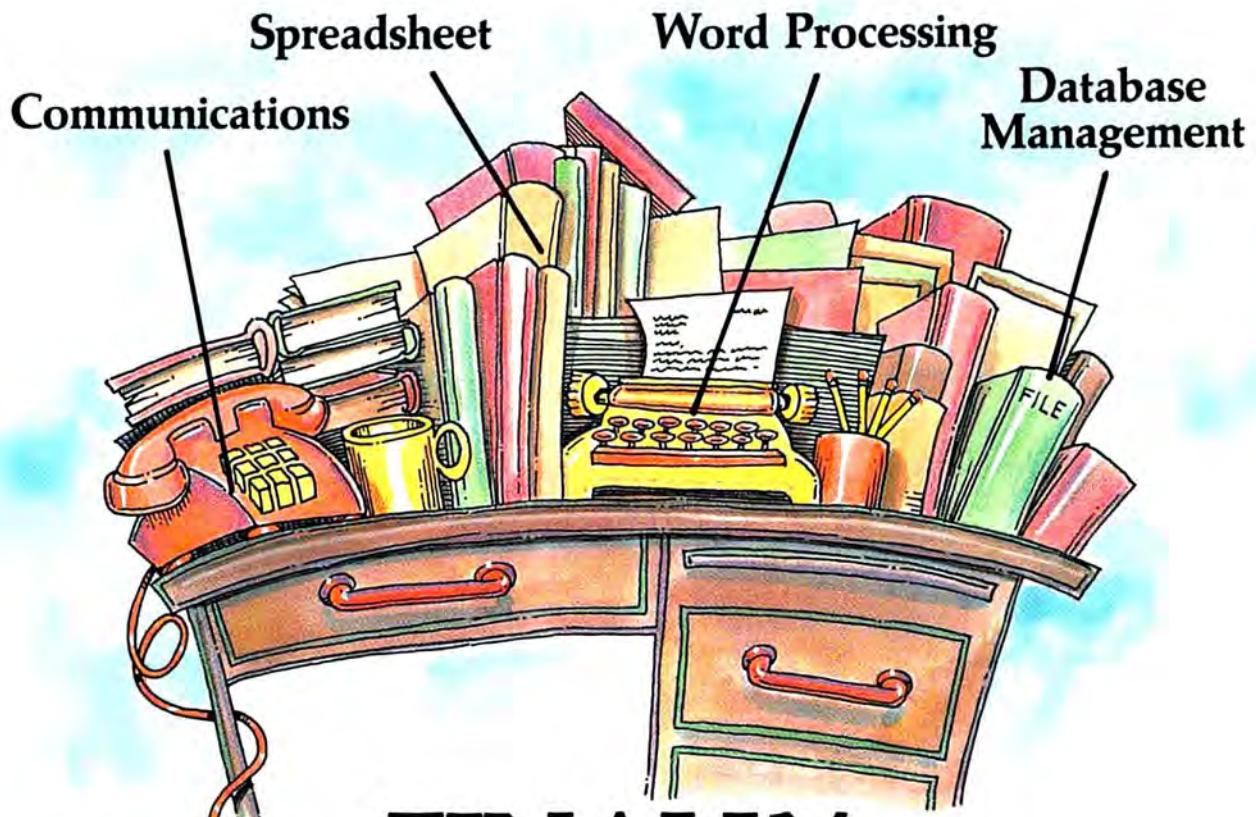
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In summary, they said, "...the hard disk drives supplied as standard in the [IBM] AT are unreliable, destroying data and requiring many trips to service centers for reformatting and exchanges."

AN EDITOR'S ODYSSEY.

"The bottom line is that IBM is not maintaining the reputation for quality products that has made it so successful in the business world.", says John Dickinson, a contributing editor to PC Magazine, a leading periodical for IBM personal computer users.

Consider his AT hard disk ordeal: His original AT Enhanced model's hard-disk began failing after six-months of light use.

Two replacements from IBM also failed to perform.

The third IBM drive failed to write most of a word-processing file.

While he goes into much detail in

the story, Mr. Dickinson concludes that, "There have been plenty of 'authoritarian' reasons given in the press about the cause of the AT's disk problems — none of course, come from IBM. Wherever they come from, my experiences support all the popular theories..."

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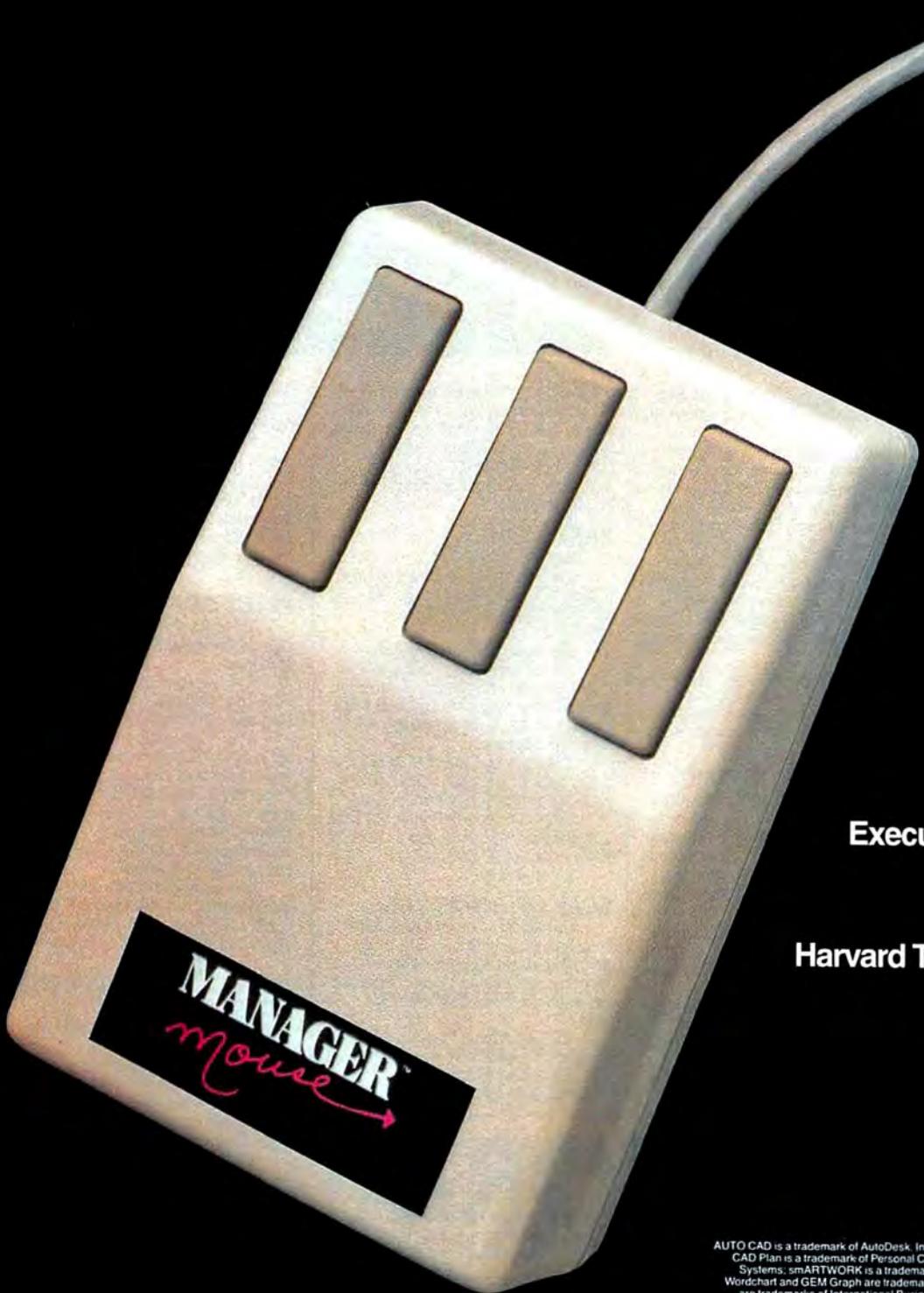


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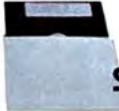
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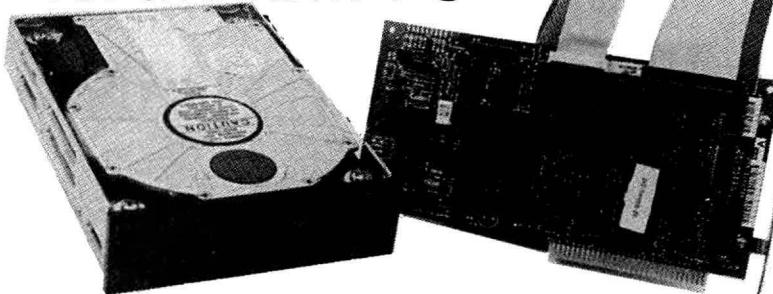
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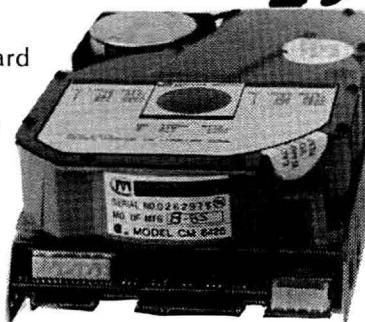
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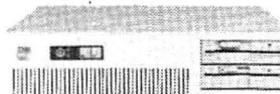
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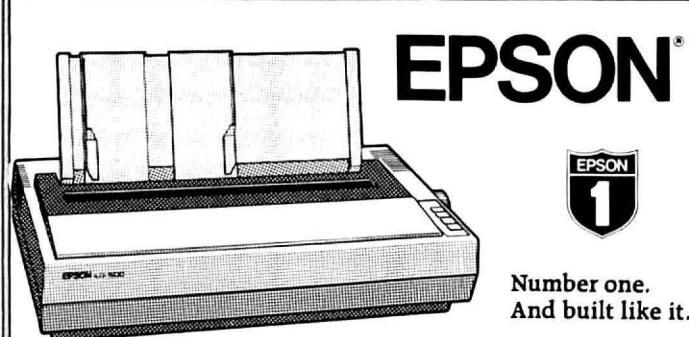
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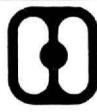
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Fast Is Not Enough

High-speed modems, concurrent-session software, and an avalanche of micro-mainframe links highlighted the communications story of 1985, but advanced technology didn't make communications much easier for users.

Jeremy Joan Hewes and Eric Brown

||||| How do you keep a product exciting after people have begun to take it for granted? For the PC industry that excitement is spelled c-o-m-m-u-n-i-c-a-t-i-o-n-s.

The new hope is to sell the PC not only as a stand-alone computer but as a communications link to all computers worldwide. Yet, so far, potential home-based buyers have been reluctant to purchase PCs until a sizable number of interactive on-line services can easily be accessed without extensive training and cost. Even in business, where the PC has made its greatest inroads, some corporations hesitate to replace dumb terminals with PCs until micro-to-mainframe communications becomes facile and affordable.



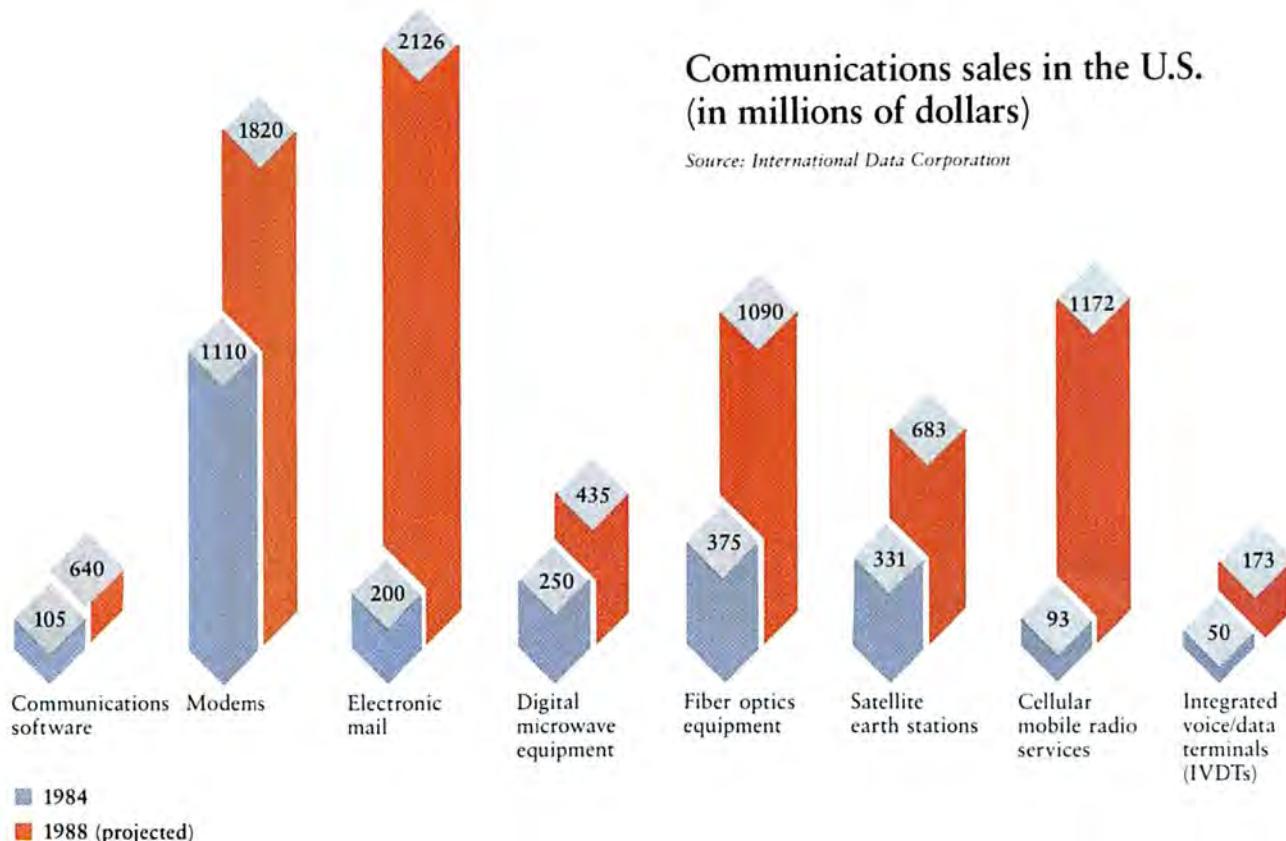
The communications industry has responded to these needs by inundating the marketplace with a bewildering array of new products. Notable introductions this past year included high-speed modems, concurrent-session communications software, on-line "gateway" systems, and micro-to-mainframe emulation products. Although 1985 has seen significant advances in communications technology, one reality remains unchanged: Linking one computer to another and exchanging information is still a complicated and mysterious process.



■ Standards on the Fly

To date, only about one-third of all personal computers are equipped for communications, and few firm software or hardware standards have emerged. Although the Hayes command set is the de facto standard for modem operations in the United States, a number of modems implement only some of the Hayes set, and some bravely head off into the data wilderness with incompatible proprietary commands. In the United States, telecommunications still revolves around the Bell 103 standard for 300 bps and Bell 212A standard for 1200 bps, but the 2400-bps modems that flooded the market this year have turned to variations of the CCITT (Comité Consultatif Télégraphique et Téléphonique) V.22bis standard.

In software, a variety of incompatible error-correction protocols have been battling it out for domination of error-prone 2400-bps communications. As 1985 draws to a close, it appears that Tymnet's public domain X.PC is winning the standards competition, having obtained endorsements from Hayes, Microsoft, MCI, and other companies. Reasons for the X.PC protocol's popularity in the asynchronous world include low cost, compatibility with the synchronous X.25 protocol, and support of concurrent communications. However, X.PC's major competitor, Microcom's MNP, has garnered quite a few followers, including IBM. Meanwhile,



XMODEM remains popular for PC-to-PC communications, and the Kermit and Blast protocols are also gaining ground. The upshot of this protocol confusion is that even if a communications program includes more than one protocol, it's left up to the user to decide which protocol to use when.

None of these communications standards has been universally accepted, primarily because IBM and AT&T, the companies destined to be the major forces in the communications field, have yet to play their trump cards. IBM improved its position by acquiring MCI Communications Corporation, the largest electronic mail vendor and the second-largest long distance telephone service.

Closer to the PC community, IBM recently announced two Hayes-compatible 1200-bps modems for the PC. The IBM 1200 plug-in board and the external 5841 modem are both manufactured by Rockwell International Corporation and sold by IBM on an OEM basis. Although the modems provide no breakthroughs in standards, performance, or pricing, IBM's entry into PC telecommunications indicates that more can be expected from Big Blue in this area.

Communications sales in the U.S. (in millions of dollars)

Source: International Data Corporation

AT&T, while continuing to dominate long distance telephone carriers, has been somewhat hampered in the computer arena by divestiture restrictions imposed by the Federal Communications Commission (FCC). Nevertheless, AT&T made a move in the fledgling telecomputer industry with its UNIX PC and entered into several marketing agreements and joint ventures with teleconferencing and electronic services companies. More important, AT&T is developing an electronic mail service—AT&T-MAIL—that will be peddled to large corporations. Undoubtedly, this is only the beginning for the new AT&T. As the shackles of divestiture are loosened, the corporate giant can be expected to attempt a comeback in telecommunications, especially in the modem marketplace.

■ High-Speed Modems

This year Hayes continued to lead the modem industry, and modems continued to increase in speed and decrease in price. Almost all the major modem manufacturers, including Hayes, came out with 2400-bps modems, most selling for under \$1000.

However, the conversion to 2400 bps has been unhurried, for several reasons. First, the competitive

pricing has impelled the manufacturers to drop prices on their 1200-bps modems, making them attractive bargains. As a result, 300-bps modems seem destined for extinction. Second, conventional telephone lines become increasingly unreliable at high speeds; due to the necessity for complex error-checking schemes at 2400 bps and the profusion of conflicting protocols, there is no assurance of compatibility among different modems. Often, to achieve effective and error-free communications, you need the same type of modem at each end of the connection. Finally, a number of communications services are waiting until market demand increases before they convert to higher speeds.

Several companies, including Gamma Technology and Electronic Vaults, have bypassed 2400 bps to attempt transmitting through aging dial-up phone lines at 9600 bps. The most significant 9600-bps modem introduction was IRMA Fastlink, a modem manufactured by Telebit and marketed by Digital Communications Associates (DCA). DCA claims transmission speeds of up to 10,000 bps with Fastlinks on both sides of the connection. However, the Fastlink costs more than twice as much as most 2400-bps modems.

Another innovation in high-speed modems comes not in the form of a modem but as an expansion board that speeds up communications. The Modem Accelerator from Datran incorporates a ROM-based translation dictionary called a Symbolic Tokenizer that converts each word into a 15-bit binary token. This compression technique allows text to be stored in one-third the space and transmitted in one-third the time.

The 1200 Club

Despite the move toward high-speed modems, 1200 bps continues to be the accepted standard. As Jocelyn Young, a senior researcher at Future Computing, points out: "In terms of our end user survey, 1200 was the most popular baud rate in the office." Young also believes that 2400-bps devices will definitely increase in use but that many businesses will stay with their current 1200-bps modems for now. "I think a lot of people are waiting," she states. "When we asked end users the baud rate of their next modem, a substantial number said they didn't know or

hadn't decided yet. I think that's because the market has been bombarded with all these speeds at once."

Aside from increasing transmission rates, modem manufacturers have attempted to stand out in the crowded marketplace by adding features. In response to the move toward micro-mainframe communications, a few offer both asynchronous and synchronous capabilities, and some have added terminal emulation capabilities. Increasingly, modems are being supplied with some nonvolatile memory, which can store phone numbers and security access codes. Larger memory buffers, designed to hold downloaded files, are also being offered as companion devices to modems.

Too Soon for Telecomputers?

Modems are only one part of the communications hardware story of 1985. A number of companies have tried to come up with the perfect hybrid of the telephone, the modem, and the microcomputer. Why clutter up your desk with these often-incompatible appliances when you can combine them in one integrated voice-data terminal (IVDT)? IVDT products range from modems that synthesize and digitize voice to double as phones (Code-a-Phone's Tel-a-Modem), computerized phones that act as sophisticated answering machines (Cygenet's Co-System), and internal modems that synthesize and digitize voice to double as voice recognition answering machines (Natural MicroSystems' Watson), to completely integrated telecomputers that combine a computer, a modem, and a telephone into one unit (AT&T's UNIX PC).

While many analysts point to telecomputers as the future of microcomputing, several IVDT offerings ran aground in 1985. The "Heaven's Gate" award for this category clearly goes to Zaisan, whose ES.3 telecomputer sold only about 5000 units. The company, which started out with a whopping \$22 million in venture capital, disappeared into Chapter 11 bankruptcy this summer.

Although peripheral IVDT products such as the Watson have met with some success, few computer buyers have been willing to move to a complete telecomputer system. Until market demand increases, only established corporations can afford to compete in this category. This year Compaq, which appears to be on its way to becoming one of the big fish, tested the IVDT waters with its Telecompaq, basically a DeskPro with a modem, a telephone, and a Z80 coprocessor built in to handle phone management.

Communications

In the communications category, the editors of *PC World* have chosen a communications program and a modem as the most influential products of 1985. Both represent sophistication and advanced technology while remaining reasonably easy to use.

■ Communications Software: *Microsoft Access*

As the first product on the market to provide concurrent communications sessions and a built-in script programming language, *Microsoft Access* stands out as this year's most significant communications program. Had Microstuf's *Crosstalk Mark 4* been available for evaluation at the time of this writing, it might have come in a close second. Reportedly it has most of the new features supplied by *Access*.

Access offers all the standard features—and more—with a consistent menu interface. Similar menus are provided for logging on to all the major on-line services. In addition, *Access* takes advantage of the session-level X.PC error-checking protocol to allow up to eight concurrent communications sessions. A windowing feature is built in, so multiple sessions can be viewed simultaneously. You can also use both communications

ports on the PC at once (for example, connecting one to a modem and using the other for terminal emulation) and cut and paste between the two sessions.

Perhaps more significant is *Access'* programming language, MASC, which allows conditional statements for automating batch operations and creating custom applications. Other *Access* features include a built-in editor, export utilities for converting downloaded data to the formats of popular business programs, and mathematical capabilities.

Although *Microsoft Access* isn't a perfect program—the current version suffers from bugs in the programming language, slow program operation, and an inflexible copy-protection scheme—its wealth of features is complemented by a relatively easy interface, and it points to the future of multitasking communications.

■ Communications Hardware: *IRMA Fastlink*

While 1985 was the year of the 2400-bps modem, no one 2400-bps model stands out as particularly superior, more influential, or more innovative than any other. Therefore the prize goes to a modem that has succeeded in establishing reliable communications at 9600 bps. *IRMA Fastlink*, manufactured by Telebit and marketed by Digital Communications Associates (DCA), reportedly achieves

Micro to Mainframe and Then What?

This year signaled a turning point in micro-to-host communications. For the first time PCs achieved corporate respectability and became integral components of the total data processing picture. As worker demand for mainframe access increased, MIS managers finally saw the benefits of using PCs to alleviate some of the mainframe's computational burdens.

A case in point is Nordstrom's, a retail chain based in Seattle, which connects PCs to mainframes with CXI terminal emulation boards. Says Larry Shaw, Nordstrom's PC coordinator, "PC-to-host communications gives us the ability to extend our mainframe network without cluttering desks with expensive terminals."

In response to this new willingness on the part of both the users and the data processing guardians to cross-communicate, a flurry of specialized devices for micro-to-mainframe connections were introduced throughout the year. According to International Data Corporation, 190,000 micro-to-mainframe links were in place by mid-1985, double the amount of the year before.

These link products range from simple dumb terminal emulators, which allow PC users to download mainframe information or act as data input terminals, to hardware/software combinations, which enable users to emulate sophisticated graphics workstation terminals or convert data to and from the many incompatible formats used by personal computers, minicomputers, and mainframes. The majority of micro-to-host products emulate DEC VAX minicomputer terminals (specifically VT 100 and VT 200 emulation), IBM 5250 series terminals (which are attached to IBM System 34/36/38 minicomputers), and IBM 3270 terminals and workstations connected to mainframes.

However, beyond these simple categories, the subdivisions are extensive and confusing. For example, in the 3270 world, products can be further divided into other major categories: terminal emulation

speeds of up to 10,000 bps with Fastlinks on both sides of the connection. In a test by the manufacturer, the new modem allegedly transmitted 360K of data (a full PC floppy disk) in 5.3 minutes. The same transmission took 44 minutes with a 1200-bps modem. Actual speeds will depend on the quality of the telephone lines.

This high-speed miracle, considered impossible only a few short years ago, is accomplished with DAM/QAM, a method that takes advantage of a greater percentage of the bandwidth to pack more data into the phone line. The Fastlink can also drop down and communicate with other modems at lower speeds.

Although the high price and lack of support for 9600 bps among information services will initially limit the Fastlink's impact in the commercial marketplace, the modem will be immediately cost effective for users who regularly need to send large amounts of information over dial-up phone lines. The Fastlink's assault on high-speed communications proves that our aging phone lines can still be counted on to handle the data communications job until digital networks become widely accessible.

boards, data base extraction software, protocol converters, multiplexers, cluster controller emulation boards, and virtual disk products. And that doesn't include the variety of networking-oriented communications products for tying local area networks to host computers (see "Net Results" in this issue).

Linking one computer to another and exchanging information is still a complicated and mysterious process.

Among terminal emulation boards, DCA's line of IRMA boards still leads the pack; other major players include AST, Quadram, CXI, and Forte. The latest IRMA innovation is a windowing feature called *IRMAlink/Windows* that allows an IRMA user to keep track of several local and remote sessions at once.

This year both micro and mainframe software companies (sometimes in joint ventures) have come out with data base extraction programs that convert data formats to allow efficient data transfer between the PC and larger systems. The leader in this field continues to be Informatics' *Answer* series, which is configured for major PC programs such as 1-2-3, *Symphony*, *dBASE III*, and *Framework*. If the corresponding *Answer* software is installed on an IBM mainframe, users can download mainframe data into the formats of major PC programs. Specialized data extraction programs, such as Lotus's *Symphony Link*, that are configured for particular applications are also gaining acceptance.

However, with most data extraction programs, micro-to-mainframe file transfer is still awkward. Says Nordstrom's Shaw, "You have to fiddle with the files so much to make them usable, it's hardly worthwhile. I have not seen a good translation program yet." Shaw also thinks pricing is a problem for mainframe software vendors coming out with software for the PC. "They're still thinking in terms of mainframe prices. But when it involves only a few PCs, is it worth it?"

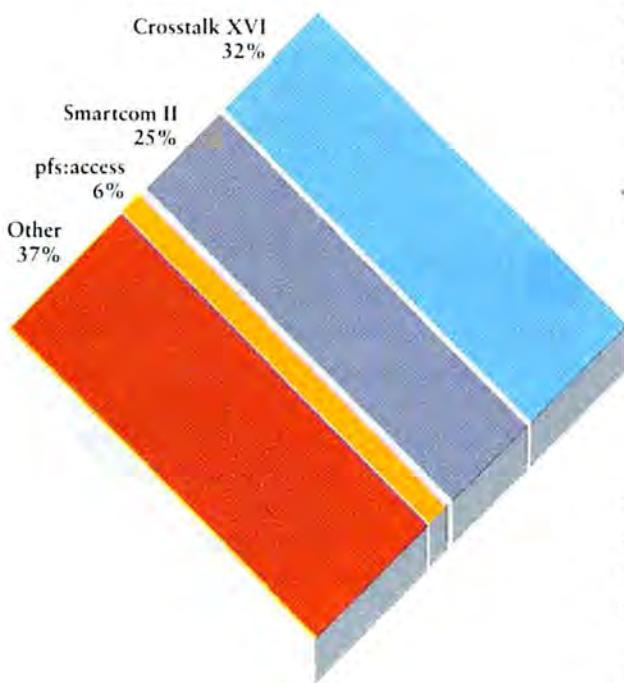
One innovation this year was plug-in boards that emulate IBM's 3274 cluster controller. AST and Emulex/Persyst have both come out with controller products that can provide great cost savings for small mainframe networks. Another breakthrough came with the announcement of *Alpha/Link*, a joint venture between Informatics and Micro Tempus Incorporated. *Alpha/Link* enables PC users to appropriate a portion of the mainframe as a virtual disk, similar to a RAM disk on a PC but more powerful. Once the virtual disk is set up on the mainframe using a separate program, the mainframe appears to the user as a separate disk drive running under PC-DOS.

Despite the recent micro-to-mainframe advances, this section of the computer industry is still in its infancy, and a number of products are flawed and difficult to use. Since no single product can handle all linking needs, compatibility problems ensue even among the best of products. Once again, IBM's tardiness in setting standards for communications between its various computers is creating a fascinating, although chaotic, industry for newcomers. However, this may change. Such rumored IBM introductions as a new cluster controller or a shift to a universal operating system (perhaps the LU 6.2 protocol) could make life easier for corporations and more difficult for the communications companies that have already invested in the micro-to-host field.

■ Software: Concurrent Communications

In 1985 Microstuf's *Crosstalk XVI* and Hayes' *Smartcom II* continued their reign as the best-sellers among communications programs. Despite the stability of the top communications programs, the market was flooded with new communications software this year. Most of the upgrades and new entries in communications software in 1985 have followed the same trends: support for high-speed communications, menu-driven interfaces, unattended and remote communications, password or encryption features, and file conversion utilities.

The most dramatic developments in software came with the introduction of two programs that brought a new level of sophistication to communications: *Access* from Microsoft and *Crosstalk Mark 4* from Microstuf. Although the two programs differ somewhat in features and operation, they both take advantage of the X.PC protocol to allow simultaneous multiple communications sessions. Both



Communications software sales,* 1985 (projected)

Source: Future Computing

*Not including public-domain software, notably PC-Talk, or integrated, multifunction software

programs offer a windowing feature to let you view the concurrent sessions.

Another distinguishing feature of *Access* and *Mark 4* is that both contain a programming language, so that you can create complex command strings to direct a variety of batch operations on line. Because both programs allow the use of conditional statements in their command sequences, you can establish conditions under which the computer and modem perform a specific function if the condition is met and refrain from doing so if it isn't.

Relay Gold, a significant upgrade of the popular *Relay* program from VM Personal Computing, also comes with a powerful script language. Although *Relay* doesn't support concurrent communications, multitasking with other applications programs is allowed, and users can simultaneously send, receive, and chat over a single phone line.

Undeniably, concurrent communications software represents a major technological breakthrough, yet some competitors question its usefulness. "The fact that you can have more than one session simultaneously doesn't give you any more utility," says Richard de Mornay, vice president of marketing at

Norton Lambert Corporation, manufacturer of *Lync* communications software. "Most people don't want to hook up to Tymnet and talk to 15 systems simultaneously."

De Mornay says his company looked into adding concurrency to its new version—*Lync 5.0*—but decided instead to concentrate on what he feels is a much more important feature—data encryption. "A lot of people say they're really scared to use electronic mail systems due to the lack of data security," says de Mornay. *Lync 5.0* provides a modified version of DES encryption that can report back to the user if any errors occurred and indicate where the errors occurred in the text. The program also provides a conversion utility that allows you to convert an 8-bit binary file into a 7-bit ASCII file so spreadsheets can be transmitted via electronic mail services with all formulas intact.

Another trend in communications is the attempt to meet the needs of businesspeople who want to simultaneously review and edit spreadsheets and other files on both ends of the communications link. PCC/Systems claims its new program, *cc:Share*, can run all PC application programs simultaneously on two connected PCs.

■ On-Line Gateways

The increasing popularity of on-line searching has spawned products designed to assist in the connection and operation of various commercial data base services. The most impressive of this group is *Pro-Search* from Menlo Corporation, which replaces an earlier Menlo product, *In-Search*. *Pro-Search* is designed for information professionals who do extensive

on-line data base searching; it provides easy logon to 15 commercial services, detailed background information about the individual data bases offered by the two major services, a menu-driven user interface, and a "native" mode that bypasses the interface.

Several other programs are intended primarily for people who have little or no experience using commercial data base services. These programs include *PC/Net-Link* from Informatics General, *Sci-Mate Universal On-line Searcher* from the Institute of Scientific Information, *SearchHelper* from Information Access, and *Searchmaster* from SDC Information

A number of alternative digital networking methods are competing to link up those companies that can afford them.

Services. Each program provides a guided tour through the search process as well as automated logon and translation of search requests into the appropriate form. While their purpose is specialized, these programs are good examples of how communications can be simplified for users.

An alternative to on-line search products is gateway services such as Business Computer Network and EasyNet. These gateways act as user-friendly mediators between the user and a wide variety of on-line services. Some handle subscriptions and logon procedures, and others go as far as providing menu-assisted searching to protect the user from the often-arcane search languages used by the various services.

Some of the most popular programs aimed at particular on-line services combine communications with the ability to download and analyze stock

quotations. Financial investment programs such as Dow Jones' *Spreadsheet Link* and Teleware's *The Equalizer* give investors the power and risk of acting as their own brokers (see "Business Software: Cut to Fit" in this issue).

■ On-Line Fever

On-line services multiplied in 1985, and existing services added enough new data bases to provide an overwhelming supermarket of data for financial investors, researchers, and other information professionals. Meanwhile, the two major consumer services, CompuServe and The Source, continued to attract new subscribers, and bulletin board systems prospered and multiplied despite harassment from both law enforcement agencies and juvenile crackers and crashers.

Yet the greatest gains in the on-line world were in the growth of bibliographic and full-text electronic libraries. The two principal search services—Lockheed's Dialog and Bibliographic Retrieval Service's BRS—have undergone important changes during 1985. BRS has instituted two simplified versions of its service: Brkthru, a menu-driven, easy-search-oriented component, and Colleague/Medical, an easy-to-use service tailored to the medical community.

Rather than dividing its offerings into separate components, Dialog has concentrated on adding data bases to its service. The clear emphasis in 1985 has been on business. Dialog marketing director Barbara Gersh says, "We've seen a great increase in the use of business data bases on Dialog."

In addition, Dialog has added features to its searching software, including a report generator that lets a business searcher retrieve information from a data base and format it to individual preference. "You can use that feature on line and actually produce a report that you could hand to somebody without having to do anything further to it," Gersh points out.

The introduction of compact optical disks may have a major impact on the on-line industry and its customers in the years to come. These mass storage devices are penetrating the ranks of personal computing, and they are especially promising as substitutes for some on-line data bases (see "Critical Mass" in this issue). By purchasing a data base in disk form,

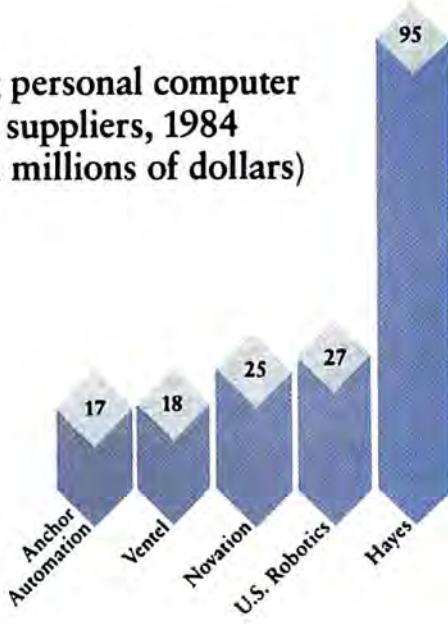
you avoid on-line connect costs and have more time to browse and experiment with search methods. Currently, the prevailing type of compact disk is the read-only variety, commonly called CD ROM, so its use would be limited to data bases that do not need frequent updates.

"CD ROMs are a factor, but nobody is really using them yet," says data base expert Barbara Newlin, author of *Answers Online* (Osborne/McGraw-Hill, Berkeley, 1985). "It seems as if everyone is waiting to see what others do with them. But I think by sometime next year they will be common." Grolier already offers its *Academic American Encyclopedia* in CD ROM form for \$199.

■ Electronic Mail: A Slow Start

Another type of communications service, electronic mail, has not lived up to its promise this year. Although subscribers to the principal commercial services—MCI Mail and Western Union's EasyLink—number about 400,000, such services still represent a limited ingredient of business computing. A survey conducted by Future Computing reports that only 23 percent of corporate buyers of computer equipment use some form of electronic mail, including in-house systems.

Leading personal computer modem suppliers, 1984 (sales in millions of dollars)



Nonetheless, many analysts, such as consultant David Ferris, chairman of Ferrin Corporation, believe that electronic mail will eventually prosper. "I think there is a strong future for the commercial services because they are public networks, and they're developing a larger and larger geographical sphere," notes Ferris. "But there's also a major market for in-house electronic mail networks."

However, moving beyond the computer-literate Fortune 500 companies is proving troublesome for electronic mail companies. "The part of the marketplace that's frustrating to me is the general communications market, contrasted to an applications market where a company has a clear purpose for using electronic mail," says J. Robert Hartcharik, president of MCI. "It's not easy to talk a guy who doesn't use a computer into using one for communications."

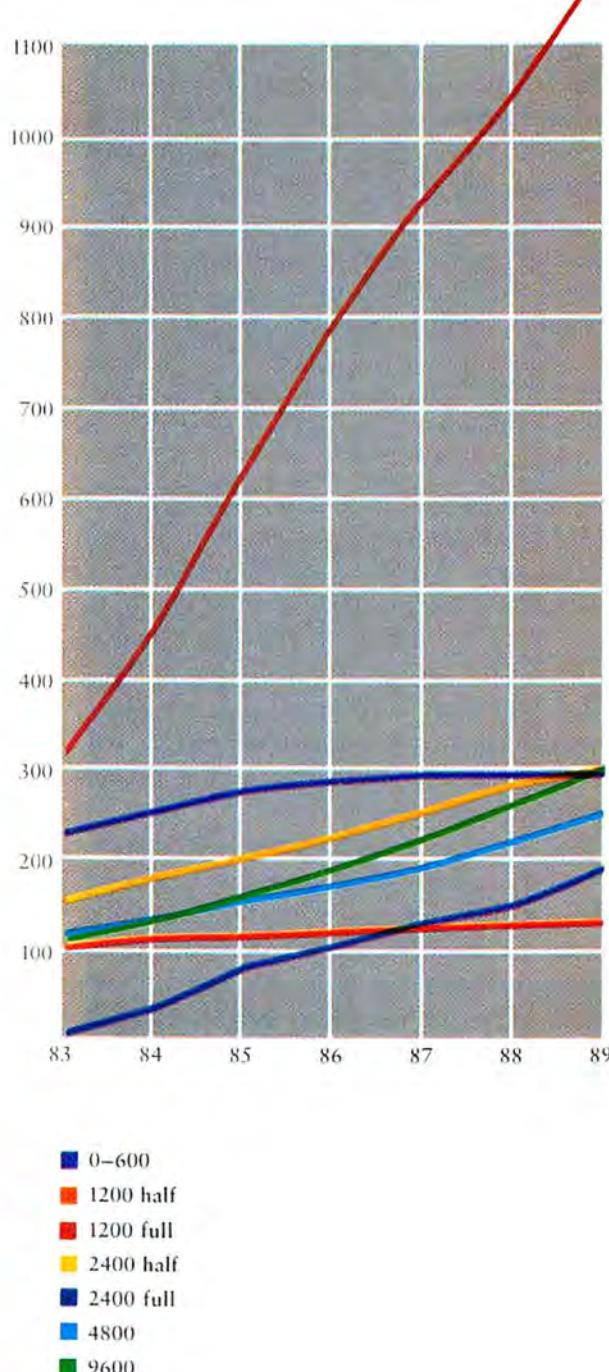
Hartcharik remains euphoric about AT&T's entry into the electronic mail business. "Actually, we're flattered," he says. "AT&T substantially copied MCI Mail. They copied certain parts of our system word for word." The main difference between the two services is that AT&T has concentrated solely on big businesses. "The Fortune 500 companies are where the gravy is in any form of information service, but we also keep various programs in place that keep us in touch with the general populace."

Meanwhile, the use of telecommunications for interactive home banking and home shopping remains limited. Although major data communications companies, including IBM and AT&T, continue to show interest in interactive videotex projects, it's clear that consumers are not yet willing to bank by modem or pay for monthly subscriptions to catalogs, directories, and entertainment information.

However, next year home banking may expand its scope; this year AT&T formed a joint venture with Time Incorporated and the two banks that currently provide home banking services: Chemical Bank in New York and Bank of America in California. The joint venture plans to offer interactive banking and financial services through a network of banks and brokerage firms.

Modem market (in thousands of units shipped)

Source: International Data Corporation



Meanwhile, graphics NAPLPS videotex is moving slowly in the United States. Although a number of companies are marketing NAPLPS decoders and frame-creation software for the PC, sales have been sluggish. The main obstacle to videotex is the lack of available NAPLPS services, but the PC's relatively poor graphics resolution is also an impediment.

■ Digital Networks

The rise of computer communications has been one long struggle with our country's aging analog phone lines. A number of alternative digital networking methods are competing to link up those companies that can afford them. Once free of the analog voice phone lines, transmission speed can increase without being unduly hampered by line noise; as a side effect, modems cease to be a necessity.

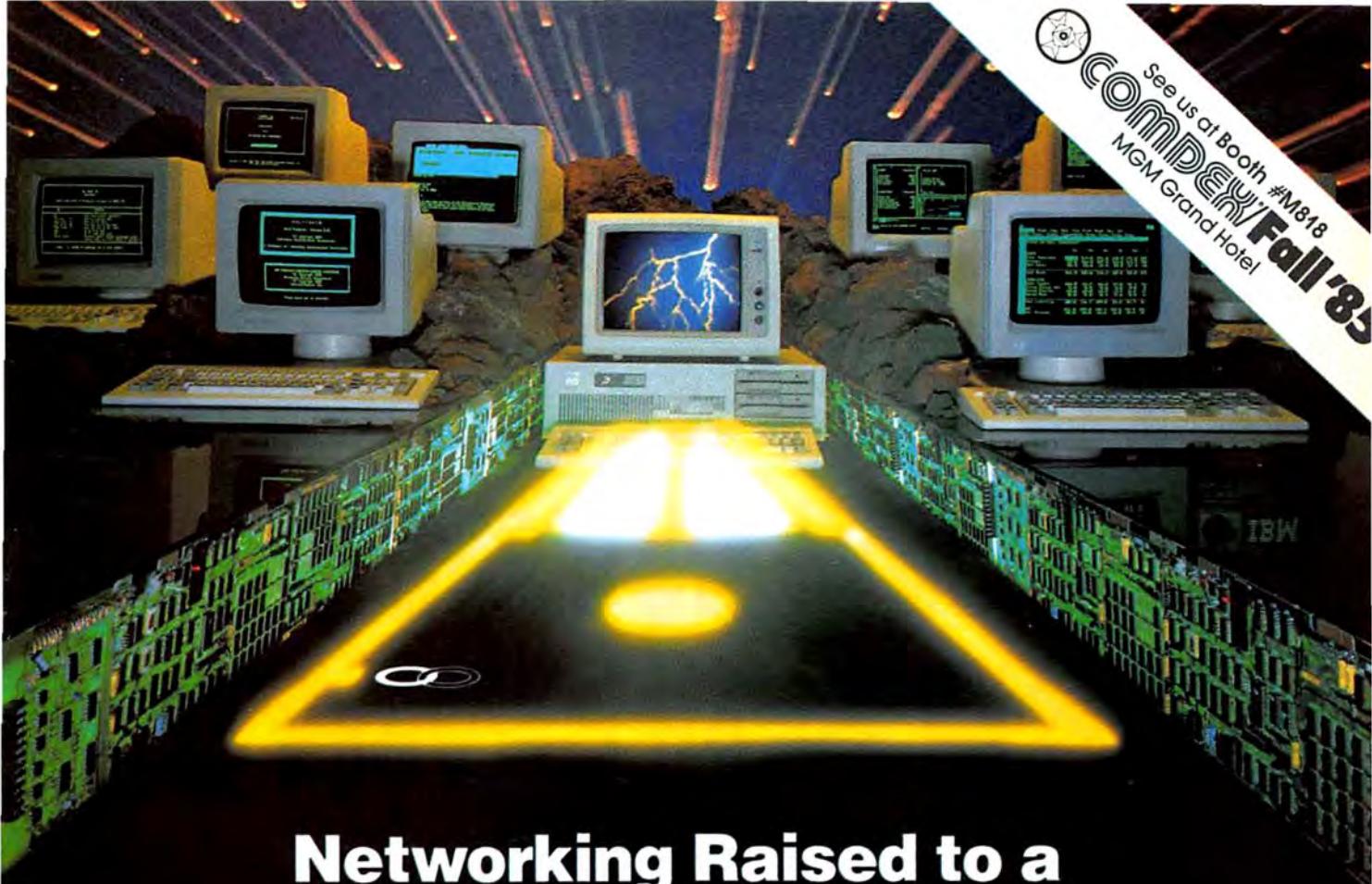
In all likelihood no single digital technology will predominate in the near future; rather, various methods will be linked to work together. Already digital networks comprising fiber optic leased lines, digital microwave transmissions, and satellite communications are serving the communications needs of major corporations.

Another promising digital network technology, called Project Victoria, will be tested by Pacific Bell next year in 200 homes in Danville, California. The experimental integrated services digital network (ISDN) will transmit two voice and five data lines simultaneously using a standard telephone cable. Each house will be equipped with a computer that can communicate at 9600 bps over the network without a modem.

Cellular and FM radio data communication is another promising technological area that has only begun to take off. In a cellular radio network, a metropolitan area is split into geographical "cells." In each cell, a transmitter/receiver acts as a switching station between mobile, cellular phones in the area and the centrally located call-switching system. Over 90 cities have installed cellular networks offered by GTE Mobilnet, Cellular One, and NYNEX Mobile Communications.

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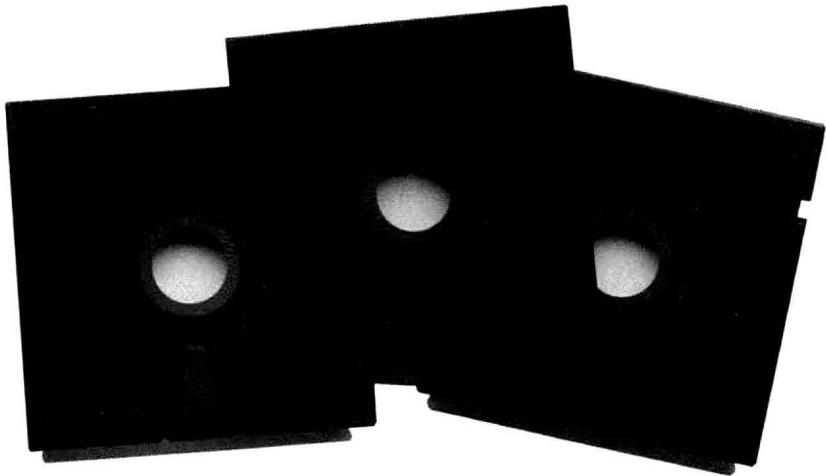
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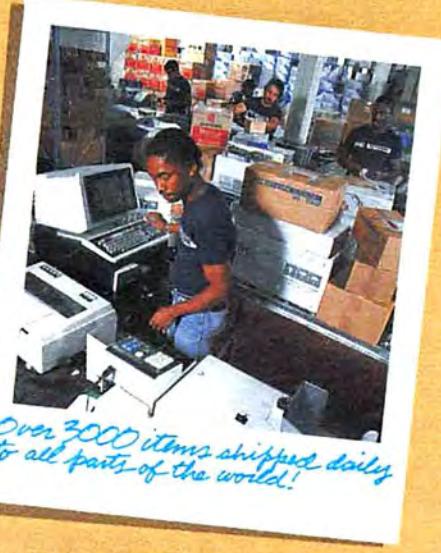
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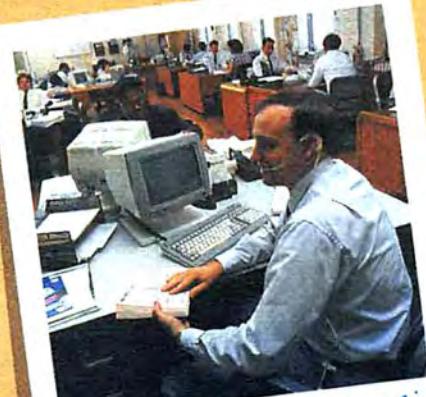
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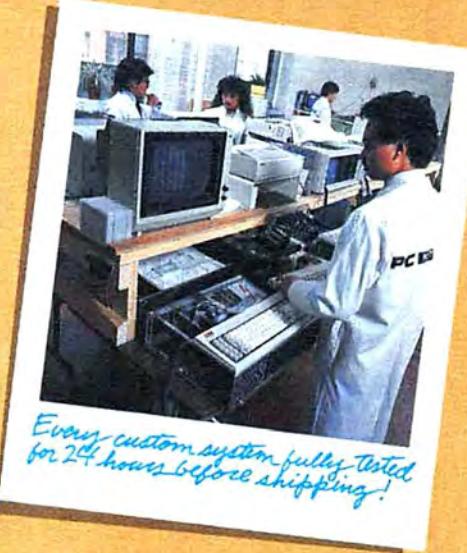
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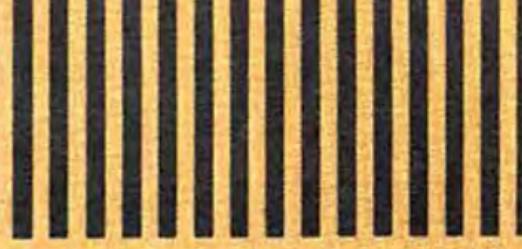
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PC NETWORK GOES TO THE

ORIENT DIRECT

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They go to the Orient... taking either their designs or simply their ideas to one or more of the major electronics manufacturing concerns, getting bids for making these devices under contract to the creators. Multifunction Cards, Video Cards, Disk Controllers, Modems and I/O Boards all begin their life in this way.

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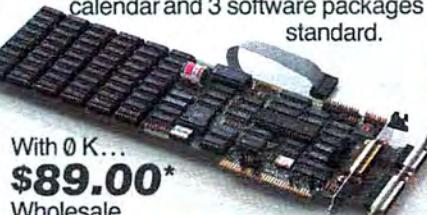
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ATARI™ 520ST	IBM™ PCAT™	APPLE™ Macintosh™	COMMODORE™ AMIGA™
Price	\$799	\$4675	\$2795
CPU	68000	80286	68000
Speed MHz	8.0	6.0	7.16
Standard RAM	512K	256K	512K
Number of Keys	95	95	59
Mouse	Yes	No	Yes
Screen Resolution (Non-Interlaced Mode)			
Color	640 x 200	640 x 200	640 x 200***
Monochrome	640 x 400	720 x 350**	512 x 342
Color Output	Yes	Optional	None
Number of Colors	512	16	None
Disk Drive	3.5"	5.25"	3.5"
Built-in Hard Disk (DMA) Port	Yes	Yes	No
MIDI Interface	Yes	No	No
No. of Sound Voices	3	1	4

**With optional monochrome board (non bit-mapped)

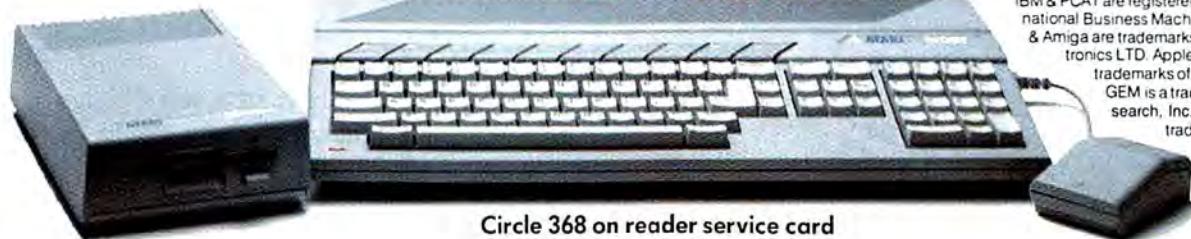
***Interlace Mode - 640 x 400



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A Sense of Balance

The powers of full-scale data management continue to move from the preserve of the programmer into the hands of the daily user. Easing the transition are 1-2-3-like interfaces and structures, graphics, and query techniques that take the guesswork and frustration out of making data dance to your tune.

Christine Whyte

||||| Almost without exception, data management systems, whether new or updated versions, strove toward a single goal in 1985: to strike an optimal balance in the trade-off between powerful features and ease of use. Until this year data management programs huddled at either end of the scale—as evidenced by the popularity of both *pfs:file* and *dBASE II*. Aimed at first-time and casual users, *pfs:file* provides only simple file management functions; the command-driven *dBASE II* pleased programmers with its muscle and flexibility, but its complexity prevented the majority of PC users from mastering more than a few arcane commands. At both ends of the spectrum, the situation was the

same—most users were able to tap just a fraction of the data management power the PC has to offer.

In 1985 this trend was in full retreat. In response to the demands of the PC's growing business audience, manufacturers had to attempt the seemingly impossible: to create a product that embraced users at all levels of expertise. This incentive produced a new crop of middleweight programs that provide more breadth than *pfs:file*, considerably more friendliness than *dBASE II*, and a creative emphasis on analyzing data in a variety of ways. At the same time, manufacturers of so-called low-end file management programs scrambled to make their products more flexible. Fred Gibbons, president of Software Publishing, asserts that *pfs:file* will "grow with its users" by adopting the analytical features of mid-dleweight programs such as *Reflex*.

The squeeze is on as new low-end competitors practice one-upmanship and more comprehensive programs bridge the gap between power and simplicity. *Q&A* from Symantec Corporation is a strong challenger to the popular hero among file managers, *pfs:file*. *Q&A* borrows its menu structure from *pfs:file* but adds advanced data-manipulation features—such as sorting simultaneously on as many fields as you like—and offers an English query language. It even includes a report writer and a word processor—all for only \$159 more than *pfs:file*. At the high end, programs such as *dBASE III*, *R:base 5000*, and newcomer *Paradox* from Ansa Software provide not only high-level command languages, code generators, and report writers but also user interfaces even a novice can love.



■ Can I Borrow a Cup of 1-2-3?

In the rush toward easier, more flexible data manipulation and analysis, new data management programs have taken their inspiration from varied sources. Foremost is the tabular spreadsheet metaphor, which lets users visualize data interrelationships in a row-and-column format. 1-2-3's command line has motivated developers to discard their clumsy menus and DOS-like user interfaces.

The interactive, instantly gratifying nature of spreadsheets has been incorporated into 1985's data management stars. The increase of RAM-based and virtual-memory techniques gives new packages a spreadsheet feel, encouraging "what-if" speculations. More intuitive data-retrieval methods—*Paradox's*

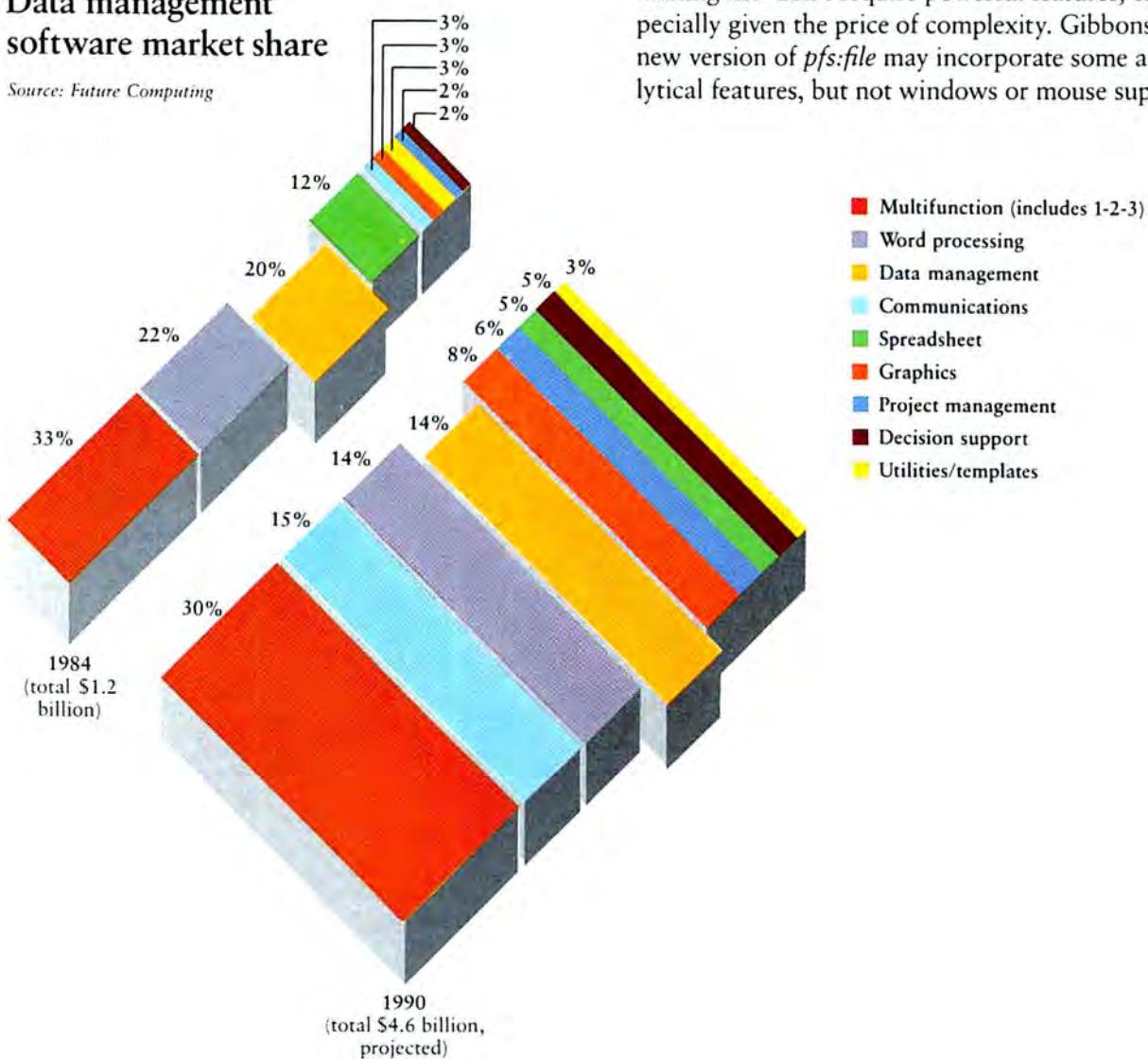
query-by-example and *Q&A's* English language queries—also make life easier for analysts, whether amateur or professional. Clearly, the business user has gained the most from the drive toward simplicity. But as we shall see, the application developer has not been left out in the cold.

■ File Managers: All You Need?

Until *Q&A* hit the market in fall 1985, *pfs:file* lacked serious competition. According to Software Publishing's Gibbons, as of September the installed base for *pfs:file* and *IBM Filing Assistant* (simply *pfs:file* by another name) totaled an astounding 610,000 copies. No other products have so successfully demonstrated that many common data management applications—such as maintaining a business mailing list—don't require powerful features, especially given the price of complexity. Gibbons says a new version of *pfs:file* may incorporate some analytical features, but not windows or mouse support,

Data management software market share

Source: Future Computing



much less an AI-inspired query language. These functions, says Gibbons, "don't add value or ease of use in a productivity tool."

The advantages of a file management program such as *pfs:file* are quick start-up time and compatibility with word processing mail merge functions. On the downside, you are restricted to using one file at a time and are saddled with slow and limited sorting; further, the program performs no data analysis.

■ *Reflex points up the emerging importance of graphics in data analysis.*

If you only need to maintain a mailing list and generate form letters, a file manager is sufficient. But if simplicity puts your data in a straitjacket, think again.

Q&A takes a step away from the file management world while emulating *pfs:*'s familiar interface. Although *Q&A* can't operate on multiple files, company founder Gary Hendrix hopes the product's flexibility will appeal to *dBASE* users who typically work on only one file at a time.

In keeping with the market's new emphasis, *Q&A*'s special data-manipulation functions can be ignored until the application demands more. One such function lets you create a custom data entry form or help screen; another instructs the program to automatically fill in addresses for all customer names entered. The program also uses macros to automate repetitive keystrokes—headers and footers, return addresses in form letters, and even information recurring in a data entry form. Unlike *pfs:file*, *Q&A* lets you designate formats for certain fields, such as dollar values or dates, and request both detailed and summary reports.

Particularly noteworthy is *Q&A*'s ability to use your English phrases as instructions to alter data and extract it for analysis. The only PC product that compares is Microrim's *Clout*, a gofer that fetches data from *R:base 5000*, *dBASE*, *1-2-3*, and other programs. But setting up *Clout* requires skillful programming, and the program cannot alter the data it works on. *Q&A*, on the other hand, prompts you as you teach it new vocabulary (limited solely by disk space). Also important: Changes to data are automatically reflected in the data base. The program is

quick-witted enough to handle some variations in phrasing such as, "What are the salaries of administrators in the personnel department?" versus, "Tell me how much Personnel Department supervisors are paid."

■ Middle Managers: A Compromise

The data management software buyer looking for a happy medium between scope and friendliness has a choice of programs such as *Reflex* from Analytica Corporation, *Cornerstone* from Infocom, *Power-base* from PowerBase Systems, *Six* from ASAP Systems, and an updated *Goldatabase* from Goldata Computer Services. Designed with the PC neophyte in mind and packed with menus and prompts, these programs are faster and more versatile than simple file managers. Most of the middleweights aren't adept at handling very large or complex data base applications, but they may be ideal for middle managers who analyze sales reports or for small businesses that track customer invoices.

Unfortunately, ease of use imposes limits. These programs can link multiple files but lack programming languages, which allow you to establish complex relationships among multiple files or generate customized applications. Report generation usually tilts toward the novice's needs. Thus the reign of these fancy file managers may be brief, as high-end data management programs reach out to less experienced users.

Nonetheless, there are programs to reckon with. The *Reflex* interface takes its cues from the right places: It borrows *1-2-3*'s command line and extensive use of PC function keys and filches famous Macintosh traits such as pull-down menus, windowing, and mouse support.

Reflex can present the same data in five views or formats. Its Graph View points up the emerging importance of graphics in data analysis. The program cleverly integrates graphics throughout all views; changes made to data in the Form or List View, for example, are immediately reflected in the graph sharing the same screen. Conversely, you can select an item on a bar graph or a point on a line graph and see the Form or List View of the data that item represents. Being able to play with data freely is what interactive analysis is all about.

Reflex is but one example of the trend toward spreadsheet/data base mergers. *VP-Planner* from Paperback Software is another "spreadbase" hybrid for 1985. But unlike *Reflex*, *VP-Planner* is built around a 1-2-3-compatible spreadsheet that attempts to combine the best qualities of Lotus's brainchild with *dBASE II* and *III* (see "Ledger Domain" in this issue).

Aside from this trend toward crossbreeding and parallel developments in text data management (see "Word Processing and the Three Bears" in this issue), it's not clear whether middle-of-the-road programs will gain a sufficient following. Their time has surely come, but it may pass quickly. If nothing else, their moment of glory proves that innovation can prosper—at least until someone else with an established market share follows suit and does it better.

■ Float Like a Butterfly, Sting Like a Bee

The major data management programs weighing in this year were mostly polished versions of established programs—the number-one-selling *dBASE III* and its tough competitor, *R:base 5000*. The new kid, *Paradox*, may be the strongest contender yet to challenge these established heavyweights. The manufacturers of all three programs are conscientiously wooing the neophyte while addressing application developers and power users.

In a similar crowd-pleasing attempt, version 2.5 of *Dataease* from Software Solutions strikes a balanced pose with its menu-driven interface and flexible command language. Outside the ring, but with loyal fans nonetheless (mostly application developers), are three veterans deserving of mention: *Revelation* from Cosmos, *Knowledge Man*, from Micro Data Base Systems, and *Zim* from Zanthe Information in Ottawa, Ontario.

A consultant and writer with experience in six data base languages for both micros and mainframes, Warren Sirota offers a perspective on the current state of the art: "Until artificial intelligence really works—to the point that a program will decipher your needs by doing your thinking for you—we won't see

any truly significant developments in PC data management. Instead of major breakthroughs, we can only hope to see improved ease of use. The most important trend in 1985 has been the dropping prices of 10MB hard disks, making data management accessible to more people."

But storing data cheaply doesn't simplify the process of getting to it. Luckily, the rise of intuitive user interfaces has made data retrieval easier and more rewarding. *R:base 5000* includes a query language, but new users can bypass it entirely by invoking a Prompt mode that builds commands for them. They can further simplify the task—or, as some contend, complicate it—with *Clout's* English-language approach.

Paradox not only is fast and powerful but employs a combination of interface techniques that exemplify ease of use. These include a familiar 1-2-3-style command line, table and form formats, and a visually oriented data retrieval and updating method called query-by-example. This query method allows a user to pose questions by placing a check mark in a table (which represents a file of data) to indicate which data should be displayed (see the sidebar "PC World Pacesetters—Data Management").

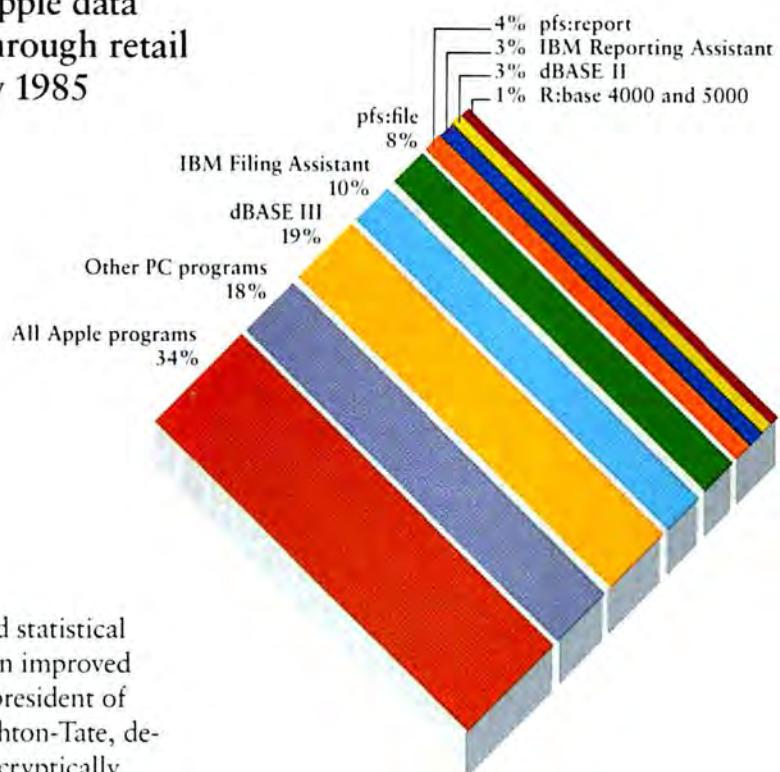
The flip side of the input coin is output, and flexible, easy report generation is a winning move on the part of these heavy hitters.

With all this high-powered competition, the pressure is on Ashton-Tate. *dBASE III* made a reasonable attempt to expand *dBASE II* capabilities while eliminating some notable flaws. But time waits for no developer, and industry rumors indicate that the program is undergoing a significant overhaul. The new *dBASE* will purportedly supply pull-down menus, windows, and alternative views of data—including business graphs and a tabular format for "what-if" analysis.

Breakdown of total PC and Apple data management program sales through retail outlets,* January through July 1985

Source: IMS America

*Retail sales constitute 40% of U.S. software market according to Software Access.



Other rumored changes would add statistical functions such as cross-tabulation and an improved report writer. Roy Folk, executive vice president of marketing and strategic planning for Ashton-Tate, declined to give details beyond remarking cryptically that "graphics interfaces are a key issue, and we think they will be very important in future products. They may be Mac-like, or they may take other forms."

Where do command languages fit into the new scheme of things? The presence of a command language in *dBASE III* was one reason for the program's wild success; the lack of such a language in *R:base 4000* dampened sales. As most developers freely admit, command languages not only expand the power of a data manager but in many instances compensate for its failings. When a data management program lacks a clean interface or a report generator or even a data entry screen that verifies input, a consultant can sculpt a solution with a command language.

Many of these "oversights" in data management programs have been eliminated, but command languages live on. *dBASE III*'s command language has new programming structures that let you, for example, combine several procedures in one file, a writing shortcut that also produces faster programs. Microrim has finally seen fit to add a command lan-

guage to *R:base 5000*; *Paradox* has a full-function programming language called *Paradox Application Language* (PAL); even flashy integrated programs like *Framework* have taken to the concept.

Nonetheless, hiding complexity from the user is the rage, and crafty developers have taken a lesson from the mainframe world, specifically from COBOL. For example, *R:base 5000* features the exceptional Application Express, a menu-driven code generator that allows even neophytes (after several hours of study) to build data bases, create data entry screens, and set up interrelated menu systems. Based on your responses to the Application Express, the appropriate command language code is automatically generated.

The flip side of the input coin is output, and flexible, easy report generation is a winning move on the part of these heavy hitters. *R:base 5000*'s menu-driven report abilities surpass those of *dBASE III*, allowing the user to include data from multiple files in the same report. In a substantial improvement over its predecessor, *dBASE III* provides a simple way to

Data Management

When Ben Rosen speaks, people listen. As a lead investor in both Lotus Development Corporation and Compaq Computer Corporation, his dignified manner is appropriate to his eminent position in the PC community. Rosen is chairman of Ansa Software, a new company founded to introduce *Paradox* and, eventually, a family of products. He comments, "Although data management has been the number one application in the mainframe world, it rates third in the PC realm. *Paradox* will change that." Steve Dow, Ansa president, elaborates: "We're trying to move data management away from the black box concept—where data is entered and then disappears from view—and toward the interactivity of spreadsheets, where you can see the data."

■ Data Management: Paradox

Paradox's first major innovation in easier data manipulation is displaying a data file in table format as a spreadsheet would and showing individual

records in standard or customized forms. The second advance: a query-by-example method for retrieving, updating, linking, and performing calculations on data in tables.

To design a query form, you first decide which tables (up to 24) to display simultaneously on the screen. Unlike the vast majority of data management programs, which subscribe to the black box approach, *Paradox* links multiple tables before your eyes. As an example, to obtain a description of the items bought by each customer, you would display the *Products* table, which provides a description of each item by stock number, and the *Orders* table, which contains a list of customers and the stock numbers of items they purchased. To retrieve the desired output in the query-by-example style, you place a check mark under the appropriate field names listed in the two tables. To link the tables, you enter the same text string (such as "xyz") in the Stock Number fields shared by both tables. Issuing the Do It command joins the tables and displays the results—customer, stock number, and item description—in an Answer table on the same screen.

Paradox uses a virtual memory scheme and is bound by disk capacity rather than available RAM, so you can pose queries on large amounts of data. Under the virtual memory system, *Paradox* swaps current and recently used data between disk and RAM, appearing to work as fast as a RAM-based spreadsheet. Also responsible for *Paradox*'s speed are its machine-reasoning techniques, similar to those used by chess programs, which determine the most efficient way to solve a given query.

An essential data management trait these days is the ability to exchange data between two data base programs and import files in ASCII format. In just a few keystrokes, *Paradox* exchanges files with 1-2-3, *Symphony*, *dBASE II/III*, *pfs:file*, and any program that uses ASCII or DIF files.

With its visually intuitive interface, fully relational functions, and programming language, *Paradox* may have struck an ideal balance. In fact, it may be the data management program we've all been waiting for.

churn out mailing labels, along with considerable on-line assistance in creating and printing reports. *Paradox*'s report generator lets programming-shy users produce both standard and customized reports, plus mailing labels.

The three major high-end players made considerable progress in 1985 toward negotiating a détente between power and accessibility. Although this advance hardly spells doom for the best file management programs, the three powerhouses may prove irresistible to users at all skill levels who have an appetite for adventure above and beyond a mailing list.

■ Multiuser Data Management: Same Time Next Year

Contrary to the claims of numerous network vendors, 1985 was not the year of the LAN. With sluggish LAN sales and a clearly established operating system standard only now emerging, most data management software companies saw little reason to rush multiuser versions of their popular products to market—or develop new ones from scratch (see "Net Results" in this issue).

The introduction of the PC Network has raised some sights: New multiuser data managers have appeared, including *Team-Up* and *Informa* from Unlimited Processing, *Network Revelation* from Cosmos, *Knowledge Man* and *MDBS III* from Micro Data Base Systems, *Datastore:lan* from Software Connections, *reQuest* from System Automation, *dBMan* from Versasoft Corporation, and *Goldatabase 6.0*. At press time, multiuser versions of *R:base 5000*, *dBASE III*, *pfs:file*, *Dataease*, *Power-base*, and *Zim* reportedly were on the way. Ansa was mum on plans for a multiuser version of *Paradox*.

David Ferris, chairman of San Francisco's Ferrin Corporation, a PC services and training firm, sums up the current scene: "Multiuser data management programs on the PC are in an unsatisfactory state—they often don't work as advertised, and at this stage, I'm very skeptical about a product being truly multiuser until I see it working."

George Treiber, president of Unlimited Processing of Jacksonville, Florida, which manufactures single- and multiuser versions of *Team-Up*, shares Ferris's wariness and notes that LAN hardware

LAN hardware manufacturers must cooperate with software developers in educating the public.

manufacturers must cooperate with software developers in educating the public: "They should recommend true multiuser programs rather than selling single-user versions to unsuspecting customers, who may find out too late that they can't share data, or worse, may lose or destroy data."

For multiuser data management software to gain widespread public support, manufacturers must overcome the commonly perceived credibility gap be-

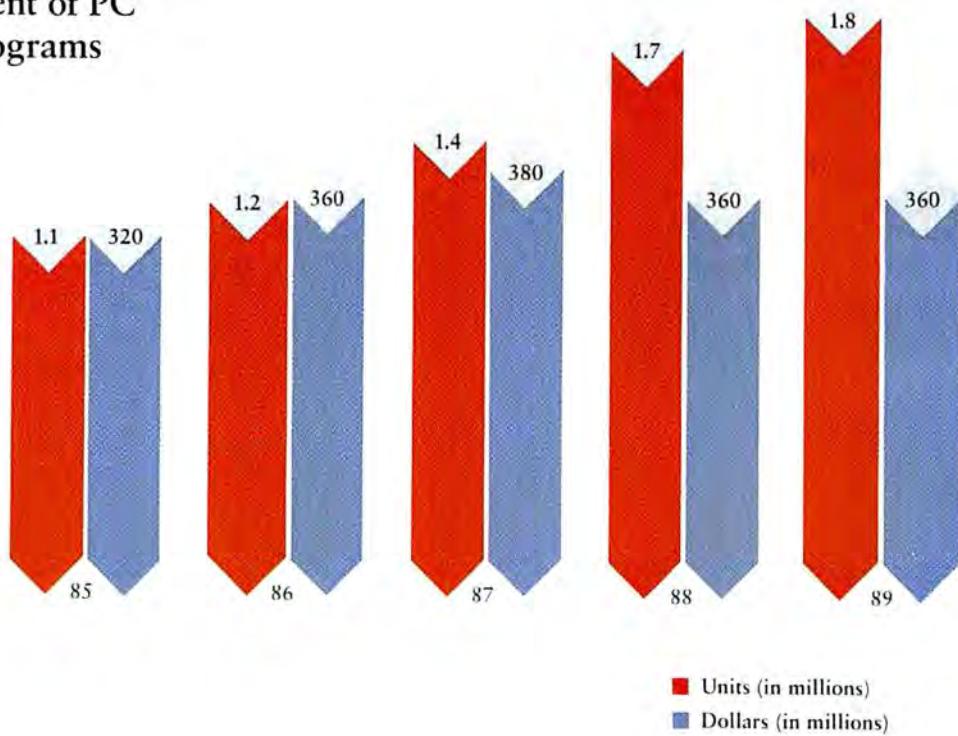
tween promised and actual performance. Ashton-Tate's Folk considers the introduction and subsequent withdrawal of *dBASE II Multiuser* to have been "in the nature of a product experiment. We learned some lessons from our mistakes and will incorporate [what we learned] in the multiuser version of *dBASE III*."

Aside from the central issue of a network operating system standard, Folk cites the technical difficulties of developing a multiuser data management program that can effectively grapple with the "deadly embrace"—two or more users trying to update the same record simultaneously, which causes the system to crash. Security on all levels—field, record, and file—is important to guarantee the confidentiality of data. To be practical and saleable, a multiuser program must also be fast; people want to retrieve records within seconds.

Although multiuser data base managers haven't garnered much popular support, the potential market is huge given the large number of corporate PCs and the prevalent desire to network these machines to one

Projected U.S. shipment of PC data management programs

Source: Software Access



another and to mainframes. Perhaps 1986 will be the year when full acceptance of a network standard signals the arrival of multiuser data management programs.

■ You Say ASCII, I Say EBCDIC

Analysts expect contact between PCs and mainframes to occur in 1986. To what extent they'll communicate is an open question, but tapping into mainframe data bases is a top priority for business users. David Ferris notes one obstacle: "Getting all the systems software and hardware to work together is not easily accomplished." Ashton-Tate's Folk adds, "A technical solution isn't the only answer; there are marketing problems as well, such as providing special sales support. Although this is an important area for future development, other types of products have taken priority."

One PC-to-mainframe connection already available is easy data transfer between Focus, the mainframe data manager in use at more than 1000 organizations, and its counterpart, *PC/Focus*, the first PC data management program to incorporate a fourth-generation mainframe programming language. To avoid costly mainframe time-sharing fees, corporate users may employ a PC or an XT for entering data before updating the mainframe data base or for developing Focus applications. Applications requiring large-volume data processing can then be run on the mainframe. But data base linguist Sirota emphasizes that the advantages of *PC/Focus* don't extend beyond the corporate Focus environment, adding, "The interface of *PC/Focus* is too similar to a mainframe's. *R:base 5000* incorporates much of the power of *PC/Focus* but has an interface that's much easier to use."

With the lack of standardized PC-to-mainframe data exchange software and the high cost of its development, PC users may not see substantial action on this corporate battleground until 1987.

■ The Ultimate Data Manager

General consensus proclaims that a precise, reliable natural language query system has yet to be successfully implemented on the PC. Among those who say it might work someday if combined with a "browsing function" is Peter Gabel, former 1-2-3 development manager and president of Arity Corporation. Gabel, whose firm markets its own version of Prolog—an AI development language—notes, "People are better at selecting queries than formulating them; they want to be constrained a bit. Query-by-example is a good way to provide visual clues to the user."

George Treiber of Unlimited Processing believes that "natural language won't succeed without a voice-driven system, because it increases the number of required keystrokes—and most managers are two-finger typists. Query-by-example is being embraced by managers because it's easy to use."

Gabel foresees information management products that combine standard relational data management functions with AI. Such programs will use "knowledge representation" techniques so they can accept data that doesn't fit neatly into a record format; automatically pigeonhole items according to context, whether historical or functional; and possibly incorporate graphics. Thus, an accounting system could learn the nuances of your bookkeeping style. Once molded to your requirements, it would serve as an expert system.

■ Balancing Act

The heyday of the inscrutable yet successful *dBASE II*, master of the 8-bit data management world, is mercifully behind us. In 1985 developers were forced to heed the anguished cries of the corporate masses for ease of use. Though this catch phrase is bandied about *ad nauseam*, data democracy is a real need. Your level of PC literacy should not be a stumbling block to mastering a data manager. Toward that end, 1985 was a year of progress, because now more than ever, the scales have tipped decidedly in favor of the user. ●

Christine Whyte is Product Review Editor for PC World.



Critical Mass

The tumult and shouting have subsided, but the changes wrought in the storage industry during 1985 will likely reverberate for years to come. A legion of start-ups followed the path of least resistance to bankruptcy, and old-timers learned some new tricks. Innovation may have suffered, but in the end, it persevered.

Robert Luhn

|||| It's a maxim for modern times: Everyone who wanted a hard disk drive in 1984 bought one in 1985—and will need tape backup by 1986. The storage story largely revolves around how this maxim has been played out.

The laws of supply and demand, particularly in the hard disk arena, have been tested and found all too unforgiving. The combination of events makes for classic economics. IBM slashed the price tag on the PC XT in late 1984, spurring demand for the machine (and its clones) and, naturally, introducing the





masses to the joys of mass storage. Hard disk manufacturers discovered that 10MB drives could be produced as cheaply as 5MB drives; then IBM released the XT without its hard disk. Overnight, start-up hard disk companies hoping to fill that slot rushed to market. At the same time, the PC AT made 20MB de rigueur and 10MB passé. Ponderous programs from *Framework* to *BMS* fueled the fire by making fast mass storage a necessity.

The result? One of the biggest booms and busts since the Great Compatibles Shakeout of 1984. Low-end internal and external hard disk drives from an estimated 40 vendors glutted the market, slapping prices down. Vendors with visions of green suddenly saw red. For PC users, the hard disk price plummet was a bonus; for hard disk companies that ignored the laws of supply and demand, it was too much of the same thing for too small a market. Opined one industry analyst: "Too many companies put the same product in different colored boxes."

■ Hard Times

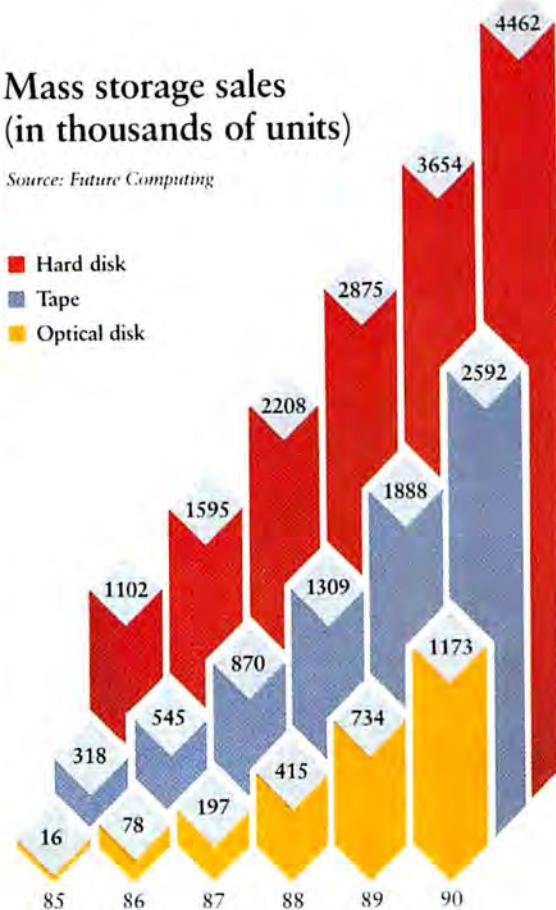
The book on the storage industry has opened increasingly at Chapter 11 this year. The list of casualties reads like a *Who's Who* in storage. Companies that folded up their tents include Davong Systems (subsystems), Shugart Associates and Atasi Corporation (hard disk drives), and DMA Systems (removable hard disks). Those that survived—or even prospered—did so by scaling back production or moving it overseas, merging with competitors, and issuing pink slips by the bushel. Tandon Corporation combined its floppy and hard disk operations and dropped 12 percent of its work force. Xebec "consolidated" its various subsidiaries—ostensibly under the guise of automation—and gave two vice presidents their walking papers. Reference Technology slimmed down by 11 percent, Priam cut 5.5 percent, and Cipher Data Products, 5 percent. By some accounts, the hard disk industry has been instrumental in its own decline.

"There's been an absurd oversupply of vendors," says Gabe Fusco, president of Iomega Corporation. "A lot of companies have been picking fruit off the same tree, and now it's bare." David Allen, president of Tallgrass Technologies, concurs: "The

Mass storage sales (in thousands of units)

Source: Future Computing

■ Hard disk
■ Tape
■ Optical disk



market can realistically support only ten hard disk companies—if that." Add to the industry's self-inflicted wounds the IBM Factor, and you have a formula for a free-market fracas.

■ Hard Lessons

For many storage companies, success or failure depends on direct sales to IBM—or indirect sales to those riding on Big Blue's coattails. For example, when IBM backed a 40-millisecond (ms), 20MB hard disk drive for the AT, 10MB drive manufacturers found themselves holding fire sales. When the combination of IBM's lawyers and market realities abruptly narrowed the PC-compatibles market in 1984, OEM hard disk orders dried up. Worse, when sales of the XT and AT stalled this year, IBM called its suppliers and coolly gave them notice.

To James Porter, editor of *Disk/Trend Report*, IBM's irresponsibility and incompetence have put able companies on the skids. "IBM has created havoc in the PC hard disk industry with its erratic buying

patterns. They'll lock up 90 percent of a small company's production and then pull the plug. They've done it to MiniScribe, IMI, Tandon, Atlas, and of course, CMI."

"I don't think it's intentional on IBM's part—they just don't give a damn," says Porter. "They haven't managed their inventories well. They fill their warehouses, then sales drop, and somebody finally panics and cuts off the suppliers. At least they were polite to CMI and gave them four months' notice—instead of four days."

CMI is perhaps the classic example of how not to get involved with IBM. Courted and convinced to be sole supplier of the AT's 20MB hard disk drive, the Chatsworth, California, company suddenly found itself devoting 80 percent of its production to the drive. Though it tried to quickly "ramp up" production by adding workers, expanding domestic plants, and building new facilities in Singapore, CMI couldn't match the market demand for the AT. Then in early 1985, rumors about problems with the 20MB drive began to surface. "Cash flow" problems followed, and in an uncharacteristic move, IBM bailed out CMI with a \$6 million loan. Though IBM later ordered another 240,000 drives from the company, it decided not to renew its contract. CMI had lost nearly 70 percent of its business.

Tough Guys Finish First

Of course not every hard disk manufacturer has been caught with its ramps up because of a fickle PC market or a whimsical IBM. A case in point is king-of-the-hill Seagate Technologies. Founded by Al Shugart, the man who introduced the 5½-inch hard disk to the world, Seagate has supplied drives for IBM (for the XT, and now, the AT) and a number of compatibles and subsystem vendors. In the first quarter of 1984, the company reported sales of \$100 million; by the first quarter of 1985, sales had sunk to \$40 million. But the company remained barely profitable and, better still, didn't report huge losses. How did Seagate shrink more than 50 percent and remain solvent?

"It was a delicate balancing act that required very tough, decisive management," says Porter. "Seagate laid off people, moved most of its production to

Singapore, and cut suppliers off at the pockets. They managed the situation so they wouldn't lose their tail."

Cruel, you say? Consider the fate of MiniScribe, an IBM supplier and Seagate's closest competitor. Says Porter: "They reported \$24 million in sales and over \$30 million in cost of goods sold! MiniScribe's management is excellent: They beat Seagate to market with the product, and they had tremendous rapport with their employees. When IBM pulled its business, MiniScribe didn't fire any employees, hoping somehow to replace the lost income. They were nicer than Seagate, and now they're paying for it." MiniScribe posted a first-quarter 1985 loss of \$12.5 million.

Mass Storage en Masse

In spite of vendor woes, shakeouts, and shake-downs, mass storage is still big business. An estimated 3.5 million hard disks will be sold in 1985; 1986 sales are expected to top 6 million. Flip through any computer magazine and you'll see why. A Compaq Deskpro with a speedy 8086 microprocessor, 640K RAM, a 360K floppy disk drive, a 10MB hard disk, and a 10MB tape backup system is advertised at \$3000. On another page, an internal 20MB hard disk drive that outperforms anything IBM offers can be had for only \$600. Or for an extra \$400, the Hardcard provides 10MB on an expansion board—the ultimate in transportable mass storage.

But the storage story of 1985 isn't confined to hard disks—though this sector of the industry largely drives the rest of the market. Consider these plot twists:

As hard disk manufacturers lick their wounds and regroup, tape drive makers are expecting to profit from the flood of hard disks. But if recent history repeats itself—and this seems likely—the tape industry may end up on a similarly ruinous path. Only the lack of standards may delay the hammer blow.

"The tape market is still insulated," says David Allen of Tallgrass. "Vendors aren't exposed to the same level of competition because their products aren't that popular. There are different technologies, different mechanical approaches, formats, cartridge sizes, start/stop versus streaming, and so on."

What this boils down to is data incompatibility—a tape recorded on one manufacturer's drive can seldom be read on another's. Not surprisingly, the people who make personal computers (with

Storage

For the most noteworthy storage products of the year, *PC World*'s editorial board leaned toward those products that exemplify innovation, affordability, reliability, and portability. The products that made their mark in 1985 solved old and new problems with interesting approaches—and did it first.

■ Hard Disk Storage: The Hardcard

The Hardcard from Plus Development affirms the adage that less is more. Packing 10MB into a single-slot expansion board, the Hardcard delivers simple-to-use, portable, and affordable mass storage. You don't have to remove your PC's floppy disk drive, buy an extra power supply, fiddle with DIP switches, or get tangled up in cables. The Hardcard sips power—11 watts—and reportedly outperforms the Compaq Deskpro's hard disk drive. In keeping with its non-technical bent, the Hardcard is low-level formatted at the factory; running a short batch file completes the process. The Hardcard is the only product of its kind—for now. Expect 10MB and 20MB clones to appear next year.

■ Tape Backup: OneReel Tape

Another company with a better, smaller idea is Sigma Designs. Billed as part of a "new generation of tape drives," Sigma's OneReel Tape drive can not only back up a hard disk but in a pinch, replace it. The core of the drive is Sigma's removable, self-threading reel of 1/4-inch tape. A reel stores 10MB of data; OneReel software allows you to back up larger hard disks on multiple tapes.

Unlike a number of more expensive systems, OneReel can save a working copy of your hard disk. So if your hard disk has a nervous breakdown, your sanity is preserved and your data is accessible. The OneReel Tape isn't the fastest mass storage device around, but it's small, controlled by a floppy disk controller, and leaves some change in your pocket.

■ Alternative Storage: The Bernoulli Box

The Bernoulli Box is 1985's rags-to-riches success story. Based on aerodynamic principles first discerned by mathematician Daniel Bernoulli in the 18th century, the technology has since paid its dues. Initially embraced by IBM and then spurned, the Bernoulli Box—which essentially wrests hard disk storage and speed from a floppy

disk encased in a plastic cartridge—was turned down by some of the major players in the storage business. Iomega took to the idea and with some fine tuning, turned the Bernoulli technology into a winner.

Though the Bernoulli Box in its current incarnation is limited to 10MB of on-line storage per drive, it offers swift, reliable, and rugged mass storage. This isn't the cheapest hard disk alternative, but price, Iomega president Gabe Fusco points out, is relative. "Try adding another 10MB to your hard disk. You'd have to buy another system. With the Bernoulli Box, you just get another \$79 10MB cartridge."

Iomega expects to release a 20MB cartridge sometime in 1986; a 50MB version is also in the works. In the meantime, Fusco expects the Bernoulli Box to carry the ball for Iomega. What's Iomega's secret for success? "The end user is the smartest guy. On our products, the end user has voted."

the notable exception of Compaq) have shied away from including tape backup in their machines. But the need for backup is more urgent than ever, given the introduction of the AT and the subsequent appearance of nearly a dozen clones sporting 20MB hard disks—and standards be damned when your disk crashes.

Thus, analysts from InfoCorp to IDC predict that the tape drive market will expand quickly over the next few years. To date, there are over 50 stand-alone tape backup systems and a similar number of hard disk/tape backup units. Prices are sliding, capacities and speeds rising, and the accent is on unobtrusiveness. For example, Genoa Systems' 60MB Model 3160 tape drive is aimed at AT users who want more than image backup and restoration. The \$1645 unit offers file-by-file backup and restoration by directory, subdirectory, time, or date and by files last modified, appended, or excluded. Sysgen's 45MB Smart QIC-File works like a VCR and can be programmed to back up data automatically at set times. The PC Megastore from Ampex boasts not only a 20MB hard disk but a 25MB backup tape you can use to start up your system if the hard disk fails. The list goes on—you can have backup your way, sometimes for under \$1000.

But though tape drives continue to match hard disk capacities, they haven't always kept up technologically. In the days before personal computers and hard disk drives, sophisticated tape systems ruled the storage roost. Today, tape systems, at least for the PC, are relegated to backup.

"Tape—as primary storage—is a perfect fit for the PC market," says Allen. "Tape systems can be cheap, reliable, and fast. But you have to remember that users don't want to think. A product has to look and act like a disk."

"Unfortunately, most tape vendors have offered streaming tape—a distasteful approach that turns a serial medium into the equivalent of a write-once medium! It's annoying and technologically unnecessary."

A few companies—Tallgrass included—have heeded Allen's call and provide tape systems that not only back up data but function as primary storage when your hard disk is in traction. These drives use DOS commands, directories, and paths and provide

Hard disk sales (in thousands of units)

Source: Future Computing



random access to data—essentially working like any hard disk. But streaming tape is still the norm. Allen notes caustically that “optical disk drives will eat tape’s lunch.”

Edward Rothchild, publisher of *Optical Memory News*, agrees. “The write-once optical disk is a natural backup device. Even at this early stage, the cost per byte stored is almost the same as with tape, it offers 200 to 400MB of backup (instead of 40 to 60MB), and the medium is far more durable.”

The end may be in sight: Write-once optical disk drives in the \$5000 price range from Information Storage Incorporated (ISI) and Optotech are already out of the laboratory and on the production line. These first two drives for the PC—which use 100MB and 200MB 5 1/4-inch removable disks, respectively—are expected to appear under subsystem labels by year’s end. Hard disk backup is by no means the only application developers have in mind for these optical drives. Both drives write unalterable (but updatable) data—ideal for banks, hospitals, publishers, and government agencies that need securely archived data and permanent audit trails.

Skipping hand in hand to market with the write-once optical disk is the CD-ROM, a less expensive device that may have the greatest impact on our information age since television. Based on the same audio compact disk technology developed by Sony, the CD-ROM offers PC users access to as much as 600MB of prerecorded information on a single silver disk. CD-ROMs from Sony, Philips Peripherals, Hitachi, and Toshiba already debuted this year at industry hoedowns. But don’t expect to find CD-ROMs on the shelves at Businessland this Christmas. “The mass market CD-ROM for the rest of us won’t arrive until 1987,” says Rothchild. CD-ROMs are first going

to Fortune 100 corporations, government agencies, and other well-heeled institutions eager to store their mountains of data in a few filing cabinets instead of acres of warehouses.

“CD-ROMs today are an odd mix for most PC users,” continues Rothchild. “They offer too much storage for most people and access times approaching 1 second.” Rothchild contends the dam will burst sometime in late 1987 or early 1988 when Sony releases the DataROM. The drive will purportedly use 300MB disks, match hard disk access rates, and most important, be able to read write-once and erasable optical disks—all for a paltry \$1500. Not surprisingly, Sony expects 50 percent of its revenue by 1990 to come from DataROM and disk sales.

In the meantime, some of the commercial CD-ROM disks slated to appear by the time you read this are tantalizing: Publisher Grolier plans to issue its 21-volume *Academic American Encyclopedia* on a single 110MB platter; Library Corporation of Washington, D.C., will likewise market a single disk containing the entire Library of Congress catalog. Both private and public data bases such as Micromedex (poison control) and ERIC (education and social sciences) should be available by year’s end.

■ The Innovators

In spite of current market pressure to focus only on the bottom line, some storage companies are looking up from their ledger books and betting on innovation. In a year when survival seemed enough, companies that took advantage of new technologies or squeezed every drop out of existing ones harvested the financial rewards (see the sidebar “PC World Pacesetters—Storage”).

One of these innovations—the Bernoulli Box from Iomega—combines the speed and mass storage of a hard disk with a durable, removable cartridge built around a 10MB floppy disk. The Bernoulli Box is positively phlegmatic about rough handling—a head crash is nearly impossible. At \$2695 for a 10MB system, the Bernoulli Box is no steal—but Iomega has sold over 60,000 units through retail channels since 1984.

"Everybody buys salami, bologna, and provolone cheese, and they all make a hero sandwich which tastes the same," says Iomega president Gabe Fusco. "We bring differentiation to the marketplace." Iomega has reason to crow about its success: Both IBM and Tallgrass Technologies gave the Bernoulli technology a thumbs-down and have been kicking themselves ever since. The company is also canny enough to work the laws of supply and demand to its advantage: Since the Bernoulli Box uses removable cartridges (a large part of its charm), Iomega is assured of steady income from storage-hungry users. Cartridges, in fact, are the most profitable product in Iomega's line.

Though Iomega has felt the current hard disk slump, the future looks bright. Retail sales are brisk, and the company recently agreed to supply the system to Tandy for the Model 1000 and 1200 PC compatibles and the Model 1600 multiuser system. The deal is said to be worth \$114 million. That buys a lot of salami.

Like Osborne and Software Arts before it, Plus Development Corporation had a prescient idea: Put a 10MB hard disk on an expansion board and call it the Hardcard. The company relied on custom-designed mechanics and CMOS circuitry to reduce the power consumption, size, and weight of a 10MB hard disk drive by 75 percent while maintaining its speed and matching its cost. The Hardcard boasts a 65ms access time and a \$1095 price tag.

The Hardcard is perfect for both shelf-conscious retailers and space-conscious PC users who want XT power without losing a floppy disk drive or gaining an expensive, larger power supply. You install the Hardcard like any other expansion board—no cables or switches are required. Of course, selling a 10MB drive of any sort in an industry racked by 20MB fever may seem foolish. Market analysts have tsk-tsked Plus Development's gaucherie for ignoring such a trend, but the buying public doesn't seem to care. Several large corporations are reportedly purchasing the Hardcard in case lots. Six national retail outlets, including Entré, CompuShop, and CompuMark, are carrying the product. The 20MB "standard" won't be kept at bay for long—Western Digital plans to release a 20MB hard-disk-on-a-board in early 1986.

Another system that defies the storage pigeonhole is the OneReel Tape drive from Sigma Designs. Controlled by a standard floppy disk adapter,

the portable 10MB drive uses removable self-threading reels and can act as a tape backup or portable mass storage system. In the former mode, the system can back up almost any hard disk and restore it to a different drive. The OneReel supports the appropriate DOS commands, verifies data, and performs file-by-file restoration. As a mass storage system, the OneReel Tape acts like a typical—albeit slower—hard disk drive. The drive supports random access and recognizes DOS subdirectories, so locating a file usually takes 20 seconds instead of several minutes. At \$945, the OneReel Tape is a compact deal.

■ Drives, He Said

Whatever the medium and its message, the storage industry will continue to focus on speed, size, and capacity. The Amazing Shrinking Hard Disk will likely utilize 3½-inch media more and more, speed past the 40ms barrier, and jump from 20MB to 40MB. The optical disk market will expand into three tiers and then collapse into two. CD-ROMs will likely occupy the bargain basement, while write-once drives will take the middle ground for several years as pricey erasable drives ease into the market. When erasable optical drives enter mainstream computing, the write-once drive is expected to exit stage right.

And what of tape? The short-term market promises big profits; the long-term looks decidedly grim. In the meantime, vendors must struggle with standards, IBM, and marketing an unglamorous product to users still grappling with the concepts of mass storage.

Next year's scenario is still up for grabs. The plot may thicken as optical technologies mature ahead of schedule or an 80386 PC makes an entrance. Whatever the outcome, it's probably safe to assume the storage story is being ghost-written by Big Blue. ●

|| Robert Luhn is an Associate Editor at PC World.

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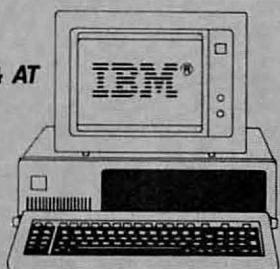


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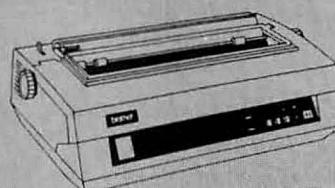
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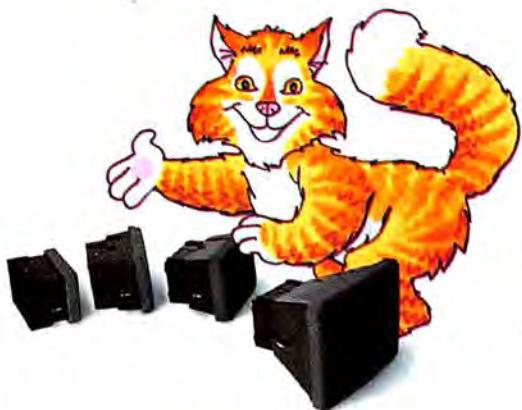
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Business Software: Cut to Fit

In the world of accounting, investment, project management, and decision support/financial modeling, software tailored to vertical markets was the preferred stock of 1985.

Reed McManus

||||| The business user is tough to impress. After all the hype and circumstance, any software package without a proven track record gets a jaundiced eye. The business applications genre, which encompasses accounting, project management, decision support/financial modeling, and investment software, tags along behind hot-selling spreadsheet, word processing, and data management products. As a result of this humble status—plus the industry's general belt-tightening—these products must work double-time to survive.

The most successful business application programs of 1985 zeroed in on specific vertical markets. While hardly glamorous, applications tailored to particular business tasks can make life at the PC much easier. The less time a manager or an employee spends bending a general business program to his or her needs, the more time free for the job at hand.





According to Infocorp, a Cupertino, California, market research firm, these benefits will net vertical market software 41 percent of 1990's software market, compared to its current 26 percent share.

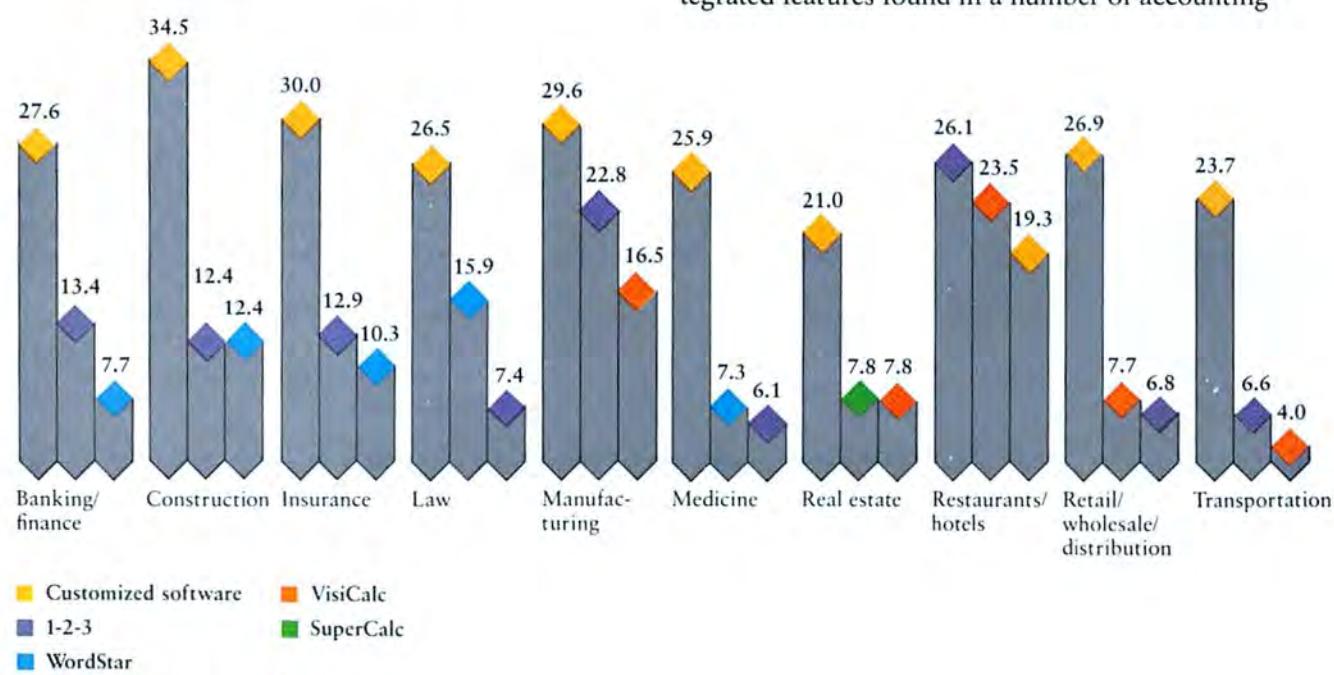
■ Template Transformation

The cleverest vertical application idea of 1985 has been to ride the coattails of the program that won't go away, 1-2-3. For example, software clearinghouse 4-5-6 World offers over 400 templates and add-on utilities that tailor 1-2-3 to specific jobs from tax analysis and accounting to aviation flight planning. This makes good business sense: With over 850,000 copies of 1-2-3 out there, the PC and 1-2-3 seem nothing less than inseparable.

In fact, it's hard for software writers to resist the enticements of lucrative 1-2-3 markets. Besides providing a direct line to the established customer base, producing a 1-2-3 template is both faster and cheaper than developing a stand-alone program. "The people who might have been found building computers in their garages a few years ago are now working on 1-2-3 and *Symphony* templates," according to one developer of 1-2-3 add-ons.

Leading PC software used in selected industries (by percentage of users)

Source: Future Computing



Traditionally, the narrow appeal of vertical market software has stymied retail sales. To sidestep this obstacle, some vendors of specialized applications have joined IBM's Value-Added Dealer (VAD) network. Bundling their programs with IBM hardware allows vertical market VADs to sell their software as part of an industry-specific configuration. For example, Technical Marketing Systems, IBM's largest VAD and a leading supplier of vertical application software, has successfully penetrated medical, real estate, accounting, and legal markets with this "turnkey" approach.

Everyone wins in the VAD market. The customer gets a tailored IBM system, training, and technical support, while the dealer gains the prestige of IBM approval and a more or less guaranteed supply of machines. Finally, comprehensive sales support gives IBM an edge in specialized markets that are difficult for smaller vendors to crack.

■ Accounting for Cost

Despite its success in VAD marketing, IBM has had trouble selling some of its own software. Its thorough (and thoroughly cumbersome) *Business Management Series* (BMS) accounting software is a case in point. This downsized minicomputer package is a product of IBM Information Services, an umbrella division formed in late 1983 that gathers IBM's consulting, networking, and application software activities under one roof. Although it's slow and lacks some integrated features found in a number of accounting

packages designed specifically for the PC, BMS represents IBM's push to dominate the market with programs equally at home in micro, mini, and mainframe environments.

A big ticket is one reason behind the failure of the BMS venture. While industry wisdom has always

The cleverest vertical application idea of 1985 has been to ride the coattails of the program that won't go away, 1-2-3.

held that accounting software is less price-sensitive than other applications, this axiom breaks down in the small and medium-size business market. Generally, high-priced items like IBM's \$695-per-module BMS have done best with larger companies.

Enter the low-cost accounting package, this year's most significant innovation in accounting software. Most of these programs can handle small-business accounting tasks without a high-end system's often Byzantine procedures, and at far less cost. They're also generally easier to learn, allowing businesses to convert to computerized accounting without a huge investment of time and money.

Taking the lead in this market is *Dac-Easy* from Dac Software, whose \$69.95, seven-module program incorporates the kind of close integration found on high-end systems. Since its release in March, *Dac-Easy* has sold over 15,000 copies, mainly to small businesses. The program handles general ledger, accounts receivable, accounts payable, inventory, purchase order, billing, and forecasting, and the number of accounts and customers it manages is restricted only by disk space.

Although these programs have their limitations (*Dac-Easy*, for example, doesn't support departmental accounting), many small businesses find them

more than adequate. Other popular low-end accounting packages include Peachtree's \$295 *Back-to-Basics Accounting* and Evergreen Software's \$295 *One-Write Plus*. Two additional low-cost programs, Alfred Publishing's \$50-per-module *Ready to Run Accounting* and GNP Development's \$695 *CPA Plus*, are templates that convert 1-2-3 into an effective accounting application.

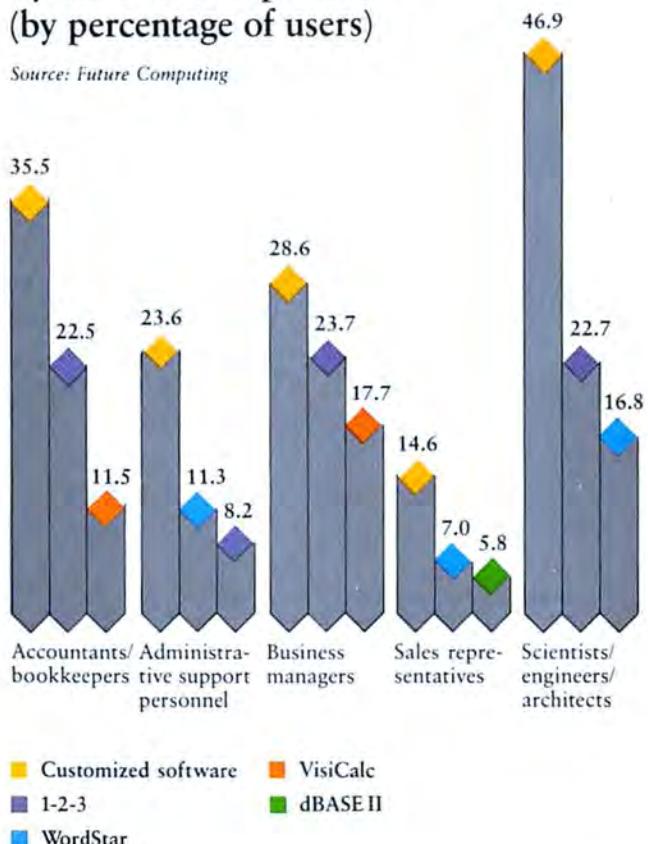
The Electronic Broker

Investment software's big push in 1985 was toward on-line investing. The impetus for this trend came from a new breed of entrepreneur, the discount broker. Because discount brokers don't normally give advice to their clients, offering software that helps independent investors analyze market activity provides a way to lure business from full-service brokerage houses.

Charles Schwab & Company, one of the most successful discount brokers, offers an on-line order-entry/portfolio-management program that includes a

Leading PC software used by selected occupations (by percentage of users)

Source: Future Computing



Business

Business applications is a broad field embracing many types of software. For clarity's sake, we've divided this territory into four areas and selected a trend-setting product of the year for each category.

■ Accounting: *Dac-Easy*

An accounting program for \$69.95? This proposition usually elicits a laugh from accounting professionals, who've seen single accounting modules go for as much as \$695 apiece. Incredibly, *Dac-Easy* from Dac Software, a seven-module accounting package, actually retails for this remarkably low price.

However, Dac Software's competitors are not amused, because *Dac-Easy* boasts many features found in high-end systems. The program offers general ledger, accounts receivable, accounts payable, inventory, purchase order, and billing, all fully integrated. As a bonus, the program includes a forecasting module—an application missing from most accounting packages. While *Dac-Easy* does lack some common features, notably balance forward and departmental accounting, its price has made it a winner in the small-business market.

■ Investment: *The Equalizer*

Charles Schwab & Company, maker of *The Equalizer*, calls this investment package a "complete electronic broker." Both an on-line trading package and a portfolio management tool, *The*

Equalizer is part of discount broker Charles Schwab's effort to offer the next best thing to full service to his clients.

The Equalizer consists of two packages, the Electronic Broker and the Portfolio Accountant. To trade on line with the Electronic Broker, you must have a Schwab brokerage account. But even without an account, you still have access to the program's wealth of stock analysis and portfolio management features.

For \$199, you get both *The Equalizer* and \$168 worth of services, including one hour's use of Dow Jones News/Retrieval and one month's subscription to Standard & Poor's MarketScope. If you're a Schwab client, you can use the Electronic Broker to enter or cancel orders, view open orders or account information, and garner real-time quotes for each security traded.

■ Project Management: *Qwiknet*

PSDI's *Qwiknet* offers both a wide array of project management functions and an easy user interface. Designed for use with a mouse, the program relies heavily on flexible windowing and an assortment of pull-down menus.

number of tantalizing perks. Called *The Equalizer*, this package comes part and parcel with a free subscription to Dow Jones News/Retrieval (the number one financial data base service), plus access to MarketScope, Standard & Poor's data delivery system that supplies information on more than 4600 corporations.

Although the first electronic brokerage, San Francisco's C.D. Anderson & Co., went on line in 1983, the entry this year of discount giants like Schwab and Quick & Reilly signifies that on-line trading is here to stay. Some ten electronic brokerages now offer on-line traders the chance to buy stock, cancel orders, and check the status of their investments at any time. Orders entered during stock market hours are executed immediately, while those entered during off-hours take effect the next business day.

Stand-alone portfolio management programs, such as Hale Systems' *Pear Portfolio Management* and Dow Jones' *Market Manager Plus*, have already established themselves as valuable tools. Of uncertain value for most investors, however, are the programs that claim to perform technical analysis. In the right hands, software like Savant Corporation's *Technical Investor* can provide the tools for sophisticated technical evaluation. If an investor is new to playing the market, however, such programs may be more dangerous than helpful.

■ On a Critical Path

Since its rise to prominence in 1984, project management software has become a fundamental business tool for managers of complex projects. Recently released programs bridge the gulf between two opposing camps. The first tier is derived from well-established minicomputer and mainframe programs, which tend to be elaborate and difficult to use. The second set of programs was designed specifically for the desktop environment, offering ease of use but lacking critical features. "We were left with a tremendous gap between those that were nice to use but didn't do much and those that did everything you wanted but were dogs to operate," says Harvey Levine of the Project Management Institute.

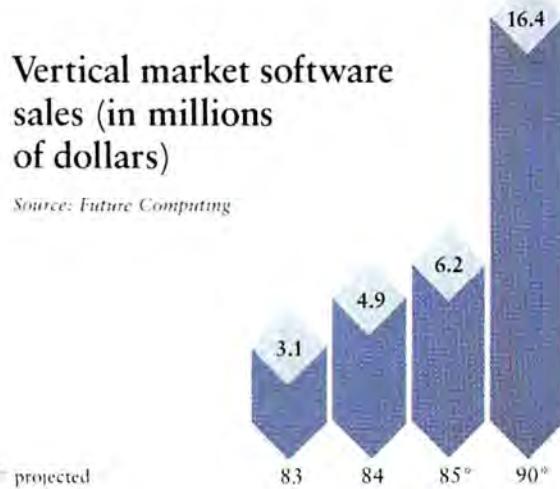
Culling the best from both worlds are such programs as PSDI's *Qwiknet*, Scitor's *Project Scheduler Network*, and Breakthrough Software's *Time Line*.

Qwiknet goes well beyond scheduling to allow planning, monitoring, and control of resources. Built around the critical path method of project management, the program tracks up to 500 individual tasks and lets you quickly assess how these tasks interrelate. *Qwiknet's* output includes Gantt charts, PERT (program evaluation and review technique) charts, and reports that compare a project's status with targeted goals.

■ Decision Support: Javelin

Using elements from both spreadsheets and data bases, *Javelin* from Javelin Software frees financial modeling from the grid-bound spreadsheet format. The program uses data base techniques for storage and cross-referencing, allowing financial planners to manipulate data according to user-defined categories.

The program has the ability to link the numbers in a formula with words that describe them. For example, entering the words *interest payments* would call up the appropriate entries on screen. In addition, you can display in flowchart form all the keywords that make up a *Javelin* information base. By offering unique ways of exploring the logic behind interdependent data, Javelin Software hopes to set a new standard for PC financial analysis.



Above and beyond their traditional schedule-building skills, these PC incarnations are now adept at tracking, budgeting, cost control, expense reporting, and polished graphics output.

Because added features increase program complexity, which is compounded by a lack of standardization between programs, some businesspeople still find project managers more trouble to learn than they're worth. As a result, software publishers have gone out of their way to make the start-up process as painless as possible. Computer Associates' *Super-Project*, for example, includes an elaborate and well-designed set of manuals to initiate both first-time and experienced users, and *Qwiknet* now comes with a mouse to simplify screen input.

The trend toward elaborate simplicity should continue into 1986. Levine has a wish list of features he wants in every serious project management program for the PC: multiple project calendars, considerable previewing functions, extensive resource definitions, and the ability to define activity relationships that accommodate lag time.

■ "What If" Plus

Financial modeling systems, also known as decision support systems (DSSs), have found their way from mainframes and minis to the PC. These applications take the modeling power of spreadsheets a step further, providing input screens, menus, and prompts to help you manage both a model's data and its particular logic structure.

Once the sole domain of financial analysts, financial modeling programs appeal to those dissatisfied with a spreadsheet's financial planning and forecasting capabilities. Packages such as Alloy Computer

Products' *Formula/One*, Ferox Microsystems' *Encore*, and Via Computer's *MicroProphet* are designed to ease the model building and verification process.

"Think of them as programmable spreadsheets that are especially good at self-documentation," says Rusty Luhring of Ferox. The idea is that a model's logic structures are easier to understand and maintain when they're not embedded in a spreadsheet—especially if more than one person uses a single model.

Applications that involve too many variables, too much data, or formulas too complex for a spreadsheet are prime candidates for a financial modeling program. Spreadsheets are limited by the amount of memory available, whereas modeling languages, which store formulas separately from data, can handle far more extensive models. Many financial modeling systems now include goal seeking, which works like a spreadsheet's "what if" analysis in reverse: First you set the goal, then you modify the contributing variables to meet it. A feature now emerging in PC modeling languages is risk analysis, which allows you to run simulations assessing varying degrees of uncertainty.

The most innovative financial modeling program of 1985 was *Javelin* from Javelin Software. Billed as a challenger to 1-2-3, *Javelin* enables users to perform complex forecasting and time-series analysis outside of the standard worksheet grid. Variables and relationships can be viewed in a number of different formats, including flowcharts, diagrams, graphs, and formulas, as well as the traditional spreadsheet.

Although the financial modeling market is growing, it's likely to remain dwarfed by spreadsheets. There's no threat that modeling languages will ever beat a spreadsheet's ability to solve "the quick and dirty problems," as Luhring puts it. But for the spreadsheet's power users, modeling languages are the next step up.

■ Making Up Your Mind

DSSs are also entering the nonfinancial world, notably in sales and management. Two leading sales support entries are Experience in Software's *The Art of Negotiating* and Thoughtware's sales training program, *Sell! Sell! Sell!*. Although these two programs have enjoyed mild success, a DSS has yet to make the PC best-seller lists.

The innovative but poor-selling *Lightyear* is a good example of a DSS that missed the mark. Intended as a "thought spreadsheet" to help users weigh complex alternatives, *Lightyear* was designed with ease of use in mind: Over 70 percent of the program's code is devoted to its "human interface." Unfortunately, *Lightyear* was received as an "ought to" product—one that everyone ought to use but, unlike a spreadsheet or data manager, hardly necessary. *Lightyear's* high price and long learning curve led to a tepid reception, which in turn spawned some alternative strategies.

■ Looking the Future in the AI

If the key to successful business software is ease of use, the future is golden for software capitalizing on AI research. Although truly intelligent "fifth generation" computers are a long way off, AI techniques have already begun to establish themselves in PC software.

AI remains something of a darling in the eyes of Wall Street. When AI moves out of its safe, small market niches into the riskier mainstream business computing world, however, Wall Street's sanguine attitude may change. According to Harvey Newquist, editor of the AI industry newsletter *AI Trends*, "AI vendors must look at the carnage going on in mainstream computing and watch how the victors emerge from the wreckage. It will not be a pretty sight," he warns.

Currently, the most practical and successful AI applications for PC business users are expert, or knowledge-based, systems. In 1985 expert system development programs found their way onto the corporate PC for the first time. Expert systems work by confining themselves to a body of specialized, generally agreed-upon information. Using rules of judgment that characterize reasoning within a given field, these canned experts perform decision-making tasks formerly the domain of their human counterparts.

Currently available for the PC are a dozen or so expert system "shells" ranging in price from \$50 to \$15,000. They allow sophisticated PC users to build their own expert systems without having to learn LISP, the most common AI language. Among these programs are Decision Support Software's *Expert Choice*, Expert Software's *Expert Ease*, and Radian's *RuleMaster*.

Currently, the PC's modest speed and memory limit it to simple expert systems; the average expert

system shell for the PC supports only a few hundred rules. Regardless of this restriction, many useful applications are already up and running. These include expert systems that provide customers with purchase recommendations, aid clerks in making decisions formerly deferred to managers, and help engineers choose appropriate building materials.

With the appearance of the powerful 286-based AT and its compatibles, off-the-shelf expert systems are on the horizon. Already, Lotus-backed Arity Corporation of Concord, Massachusetts, is said to be developing a spreadsheet/data base program whose expert system features will turn a record-oriented data base into a souped-up knowledge base that will "know" how to help the user customize the program.

■ The Real and the Ideal

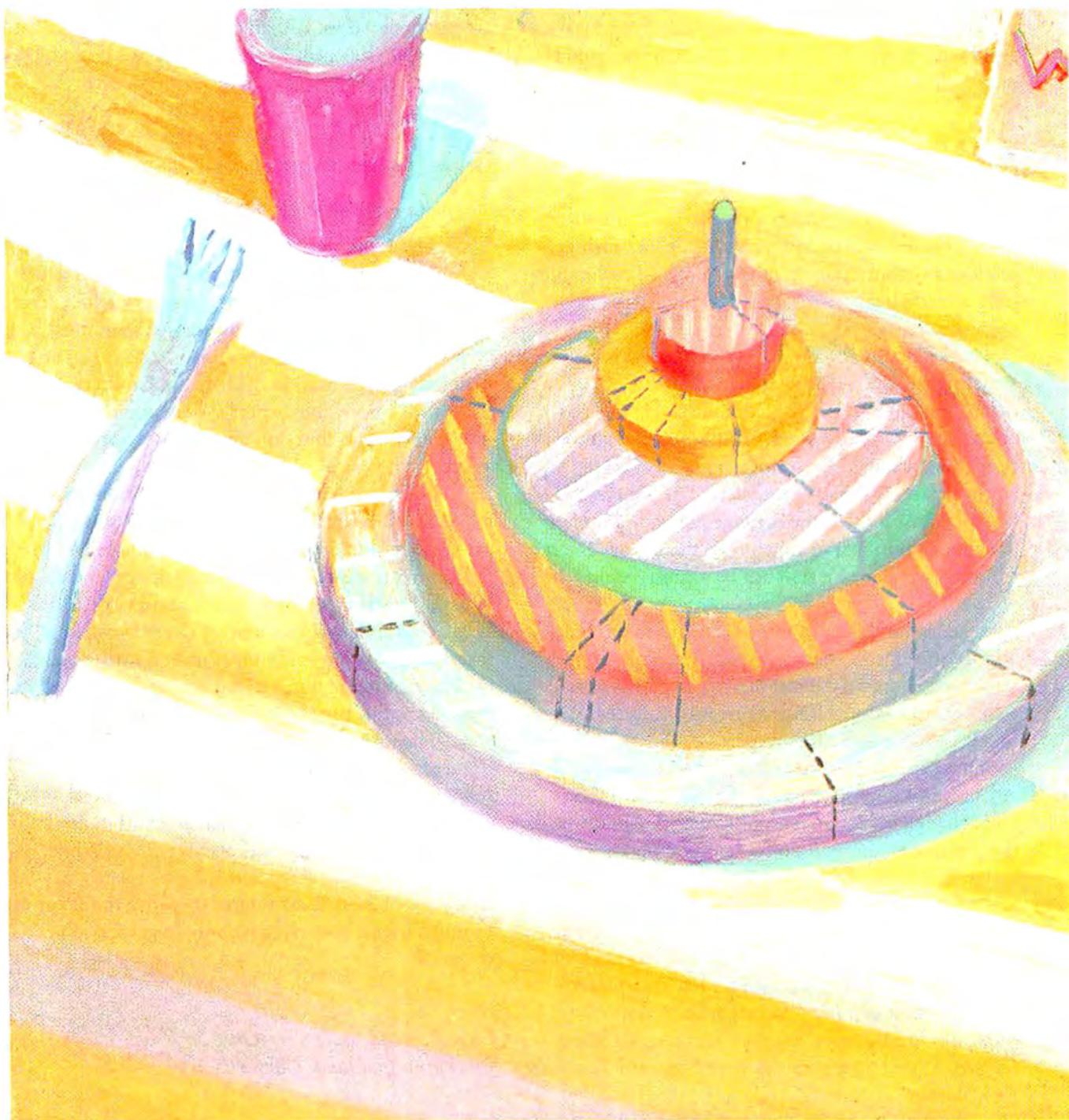
The heady potential of artificial intelligence is tempered by the harsh reality of the business market. To perform well, a PC-based expert system must have a very narrow focus. Commercial success, however, demands a large market. "There are hundreds of thousands of possible expert system applications," notes Newquist, "but don't expect widespread use for another ten years."

Businesses embrace a software product when it makes good business sense to do so, not simply because it's at the forefront of a new technology. From project management and decision support to accounting and investment software, the conservative marketplace is sobering to software developers. To attract buyers, software vendors must put themselves in the place of the pragmatic end user and cater to those business applications that afford immediate utility.

The most practical response to this demand is to target specialized markets. A program like *Dac-Easy*, which homes in on small business needs, is easier to move off the shelf than an exorbitantly priced, one-size-fits-all package like *BMS*. While applications like *Dac-Easy* and *1-2-3* templates may lack the allure of AI-based systems, they give the skeptical business user a cost-effective way to get the job done. ●

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Presentation Fever





This year in graphics, businesses converted to PC slide shows, software aped the Macintosh, the PC took a bite out of the CAD market, and the EGA and VDI struggled to establish themselves as standards.

Abigail Christopher

||||| Carefully constructed charts and graphs aren't just the icing on the cake, they're the most digestible way of absorbing information. In fact, many in the business audience now expect graphics as a main course in any analysis or presentation. The result is more effective data comparison at the desk top and speedier communication between businesspeople.

As graphics literacy grows, the hunger for more sophisticated graphics capabilities increases. In 1985 software publishers whetted this appetite by offering over 200 different presentation graphics packages. Output from the best of these products is adding impact to countless board meetings, annual reports, and corporate slide shows.

This year the Macintosh approach to graphics had a strong effect on PC software. A flood of mouse-driven programs imitating the Mac's *MacPaint* drawing package helped introduce PC users to the icon style of selecting menu options. Some of this software penetrated the business environment by means of its ability to enliven moribund 1-2-3 graphs. PC-based computer-aided design (CAD) software also enjoyed an expanding role, boosted in part by a wealth of enhanced graphics hardware.

Despite a fast-growing market, compatibility among all varieties of graphics applications remains a stumbling block. IBM took a stab at standardization

by endorsing *GSS-Drivers*, a set of device drivers produced by Graphic Software Systems. Designed around the Virtual Device Interface (VDI), a proposed graphics standard, *GSS-Drivers* is intended to engender software compatibility with a broader range of printers, plotters, and graphics boards.

The EGA Question

IBM made another attempt to set an industry standard by releasing its Enhanced Graphics Adapter (EGA). When used with IBM's Enhanced Color Display, a new high-resolution monitor, this color/monochrome board features multiple text and graphics modes, 640-by-350 resolution, and simultaneous display of up to 16 colors.

Although by no means the most advanced graphics board on the market, the EGA reflects some clever strategy. While consumers clamored for faster, higher-resolution boards, IBM watched its competitors and then incorporated the most successful features into its new board. By offering a low-resolution mode matching that of IBM's old workhorse, the Color/Graphics Adapter, the EGA was immediately compatible with many existing graphics software packages. Finally, the IBM label alone makes the EGA "a major event in the graphics industry," as Pete Higgins of Microsoft puts it.

Kevin Jenkins, president of Hercules Computer Technology, which enjoys 45 percent of the graphics board market compared to IBM's 42 percent, admits that IBM has set a new standard. However, Jenkins is critical of the EGA's technology, observing, "There's been no deluge of software for it. The board is very cumbersome and slow. And with 15 text and graphics modes, it's not easy to write drivers for."

In fact, programmers don't seem to be champing at the bit to support the EGA. But in the long run the magnetism of IBM's name should attract the majority of software developers to the EGA standard. Version 2 of *Microsoft Chart* and *Media Cybernetics' Dr. Halo II* were among the first packages to support the EGA. *1-2-3* and *Symphony* followed suit, as did *Microsoft Word*, *Framework*, and *Digital Research's GEM* family of software. After all, says Will Frentz of Number Nine Computer Corporation, "We saw a similar delay when IBM introduced its PC Color/ Graphics Adapter."

Number Nine is one of several competitors developing boards that equal or surpass the EGA's capabilities while simultaneously supporting IBM's Enhanced Color Display. With typical temerity,

IBM's endorsement of GSS-Drivers, a software implementation of the VDI standard, helped stir up renewed controversy over the interface question.

Hercules Computer Technology also proposes to eschew cloning the new board and plans to release a higher-resolution color graphics board at half the price. Adopting a safer approach, Video 7, AST Research, and Emulex plan to take advantage of software written for the EGA by offering clone boards at lower prices.

Jenkins feels that trying to clone the board is a mistake, in part because the EGA's complexity is exacerbated by poor technical documentation. "There will be all sorts of problems with the software [supporting clone boards]," he asserts. For its part, IBM tried to ease the task of supporting its product by incorporating a version of GSS's VDI into the EGA's firmware. However, this IBM-sanctioned interface has its problems, and a number of companies developing EGA-compatible software have chosen to bypass the VDI and write directly to the screen.

The Virtual Device Dilemma

The VDI is an attempt to impose some order on the often chaotic world of computer graphics. A subset of the Graphical Kernel System (GKS), the most widely accepted software/hardware interface standard, the VDI enables programmers to write graphics software without worrying about compatibility with specific output devices. IBM's endorsement of *GSS-Drivers*, a software implementation of the VDI standard, helped stir up renewed controversy over the interface question.

No one disagrees that the objective of the VDI is laudable. A standard way for graphics programs to send commands to output devices would benefit

everyone—programmers, hardware vendors, and end users alike. In reality, however, there's no way for the VDI to both support a broad range of devices and take full advantage of their capabilities. Although it's faster than GKS, the VDI still performs slowly compared with drivers written for specific hardware, and it also lacks some of GKS's display features.

These drawbacks make software and hardware vendors reluctant to support the VDI. For example, EGA-compatible versions of 1-2-3, *Symphony*, and *Framework* all bypass the VDI drivers built into the board. Other proposed standards, such as the North American Presentation Level Protocol Syntax (NAPLPS), a standard used by videotex systems, and *Halo*, a software library developed by Media Cybernetics, have also failed to gain wide acceptance. Apparently, the graphics software industry still awaits a one-size-fits-all interface that can handle high-end potential.

The Slide-Show Revolution

Despite compatibility problems, the wide range of PC graphics packages now available is supported by an increasing variety of printers, plotters, and slide cameras. According to John Meyer, director of marketing at Digital Research, "There's something almost McLuhanish about computer graphics now—'The medium is the message.' Today, graphics have a totally different impact on business presentations. Companies like the impact they make, and they want to improve what they have."

This momentum toward higher-quality visuals has inspired some fancy new hardware. Hewlett-Packard, for example, introduced the HP 7510 film recorder, which offers a vector-based output of 16,000 points per frame with infinite resolution between points. In addition, Matrix's PCR and Calcomp's Samurai slide cameras were upgraded to provide approximately 4000 lines of resolution on a full-color slide. Most popular graphics packages now support these top-notch peripherals, but innovations in hardware technology continue to drive the software.

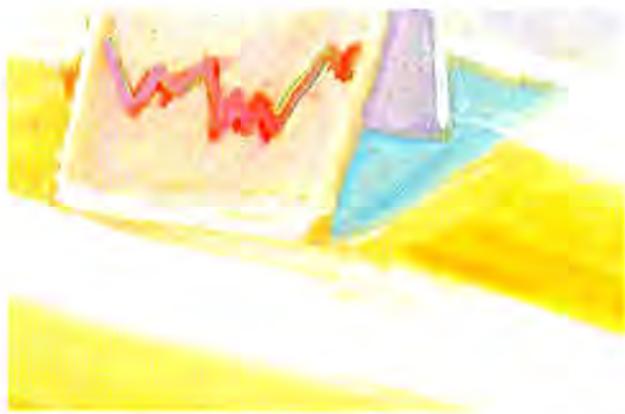
In a class by itself, General Parametrics' VideoShow 150 has generated a great deal of interest among corporate users. This PC-like dedicated graphics machine is easy to use and portable; combined

with a high-resolution monitor and General Parametrics' own *PictureIt* program, it provides presentations that give slide shows a run for their money.

Competing with *PictureIt*, several companies have already developed software to support the VideoShow. Among the first of these was Electronic Cottage, with the *Image Management System*. This program provides a bit-map mode, making it useful for CAD applications. You can also use the *Image Management System* for film and video applications, as well as for traditional charts and graphs. In addition, it supports the Polaroid Palette, Matrix PCR and QCR, the HP 7475 plotter, and the Diablo C150 color ink jet printer, among others.

According to Robert Corr, director of office automation for Electronic Data Systems (EDS), the VideoShow 150 and the *Image Management System* together provide the speed and high quality necessary in a corporate environment. "I sat down one night with 26 charts that were in five different worksheets. Forty minutes later, I had 26 charts in VideoShow format. Twenty-three minutes later, I had an exposed roll of 35mm film."

Meanwhile, software companies are trying to compete with the VideoShow's slide-show success using existing hardware. Two presentation software



packages released this year for the PC, IBM's *PC Storyboard* and Communication Dynamics' *Sound Presentations*, promise to ease the lot of graphic artists. With *PC Storyboard* you can create standard charts and graphs, generate free-form images from the keyboard, or put together composite displays using the program's library of symbols. You can also capture and modify "snapshots" from most PC-compatible programs' on-screen output.

Graphics

The graphics technology explosion continues to expand the PC's potential, generating a plethora of inspired software and hardware innovations. The following picks represent the most influential entries of 1985.

Graphics Software: *Freelance*

Even the best graphics packages lack simple amenities, particularly when it comes to moving text or symbols in a chart. Designed to release you from rigid output formats, *Freelance* from Graphic Communications permits a new level of control over the appearance of charts and graphs.

Freelance makes it easy to place labels, colors, and other enhancements anywhere on a chart. For additional impact, you can change a graph's overall layout with a few simple commands, or take advantage of the program's library of over 200 symbols. *Freelance* also offers grid-based drawing functions and a full set of graphics primitives, allowing you to create logos or other images with little effort.

Although *Freelance* is a powerful stand-alone product, many users will find its ready ability to import 1-2-3 and *Symphony* files particularly attractive. Featuring outstanding flexibility and a straightforward user

interface, *Freelance* makes the transition from analytical to presentation graphics a painless process.

Graphics Hardware: the VideoShow 150

Tired of setting up the same old slide shows? The VideoShow 150 from General Parametrics offers a shortcut to high-quality presentations without the hassle of slides or transparencies. A dedicated graphics computer that connects to the PC, the VideoShow 150 creates arresting visuals on virtually any color video monitor.

Because the VideoShow's screen output is not pixel-based, it can triple a color graphics monitor's resolution, resulting in output that boasts clean lines and exceptionally vibrant colors. Used with General Parametrics' *PictureIt* software, the machine offers a selection of 1000 hues and a library of 24 graph types. General Parametrics' *PhotoMaker* 150, a slide output device available at an additional cost, lets you commit those elegant images to celluloid.

The VideoShow's \$3499 price tag limits its market to companies that need high-quality graphics on a regular basis. Considering the speed and simplicity with which you can create a superior presentation, however, you'd be hard-pressed to find a more cost-effective alternative.

Once you've created a set of images, *PC Storyboard* lets you display them in sequence on screen, offering a wide range of flashy dissolves between frames. *Sound Presentations* is geared toward slide production and provides a substantial template library to speed creation of professional-looking business presentations.

■ CAD Software: AutoCAD 2

AutoCAD is legendary for its powerful array of CAD drawing and editing features. One of the first CAD packages for the PC, the program continues to outsell its many competitors. The current version includes two drafting modules and an extension that offers limited three-dimensional design capabilities.

Like most CAD software, *AutoCAD* permits designers to move, copy, erase, scale, rotate, or mirror any defined object. The package also supports many features found on mainframe CAD systems, including rubberbanding, zoom magnification, and wireframe modeling. Text attributes can be tied to specific objects and saved in a separate data base, and the program's macro language lets you set up your own drawing and modification routines.

In addition to being easy to use, *AutoCAD* is compatible with a broad range of input and output devices, and it shares files with a number of mainframe CAD packages. When and if the PC AT becomes the CAD workstation of choice, *AutoCAD* should reap a healthy share of the credit.

■ Businesslike Graphics

Compared to the hardware on which they run, many graphics packages for the business market are quite limited. Even the most popular program on the market, Decision Resources' *Chart-Master*, offers little beyond basic bar charts, line charts, and pie charts—in other words, the low end of presentation-quality graphics. *Chart-Master* is easy to use, however, and its capabilities are definitely a big step up from programs like 1-2-3.

Like most PC software, graphics packages offer a trade-off between ease of use and power. Graphic Communications' *Graphwriter*, the number two seller

Compared to the hardware on which they run, many graphics packages for the business market are quite limited.

in the PC graphics marketplace, is a case in point. Although it boasts a much richer array of features than *Chart-Master*, *Graphwriter* is not as friendly to beginners. The flexibility inherent in this program yields a more impressive end product, but even for experienced users, it's easier to make mistakes along the way.

Microsoft Chart, version 2.0, is one program that attempts to smooth user interface without sacrificing sophistication. Its windowing system lets you

combine text and graphs easily, and you can mix elements from among its various chart types. Combining straightforward, menu-driven procedures with a full array of features, *Chart* supports over 80 different output devices and allows you to easily import files from 1-2-3.

This year, a number of other programs such as *Freelance*, heir apparent to *Graphwriter*, emphasized their ability to enhance output from 1-2-3. *Freelance* comes with a library of over 200 symbols and a complete selection of drawing functions to improve the impact of 1-2-3 graphs. *Graphix Partner* from Brightbill-Roberts and Chorus Data Systems' *Imigit* are also positioned as products that improve the appearance of 1-2-3 output.

■ MacPaint Clones

Some graphics programs aren't all business. Inspired by the Macintosh's hyperfriendly *MacPaint* interface, programs like *PC Paint* from Mouse Systems and *PC Paintbrush* from IMSI give you the chance to stretch out and express a little artistry. These graphics packages let you use a mouse to draw freehand as well as to assemble images from stock patterns and shapes. Menu options are depicted as icons—when you want to select from another set of icons, you pull down a new menu from the top of the screen.

Another salient characteristic shared by *PC Paint* and *PC Paintbrush* is a FatBits function identical to *MacPaint*'s. If you need to clean up rough spots, FatBits lets you magnify desired areas and manipulate them pixel by pixel. For business applications, you can import 1-2-3 files into either program.

As part of the *GEM* family of software, Digital Research's *GEM Draw* and *GEM Paint* also offer icon-driven, Macintosh-like graphics. Geared toward business presentation applications, *GEM Draw* features particularly facile cut-and-paste functions, as well as 39 patterns, 16 colors, and 12 line styles.

GEM Paint calls itself a graphic screen editor for artistic creations and features brush, pencil, and spray-paint functions. Other programs in the *GEM* family—including *GEM Write*, a word processor—can incorporate images from these graphics programs into their own files.

This year Micrografx, makers of *PC-Draw*, bridged the gap between drawing and CAD programs with *In-A-Vision*, a graphics program selling

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for under \$500. Aimed at a broad audience ranging from businesspeople to designers and architects, *In-A-Vision* was the first graphics program to support *Microsoft Windows*. Since *In-A-Vision* lacks many features found on more expensive PC-based CAD systems, it remains to be seen whether a market exists for low-cost CAD.

■ Cost-Effective CAD

CAD software for the personal computer really took off in 1985. The reason for this boom is primarily hardware-based. Until recently, most engineers and draftsmen felt PC CAD systems lacked the speed and precision necessary for their applications. Now, the increased processing power offered by the PC AT and an abundance of new, fast, high-resolution graphics boards have suddenly made AT-based CAD a viable alternative to expensive graphics workstations.

Popular CAD programs such as Autodesk's *AutoCAD* or T & W Systems' *VersaCAD* take advantage of the 80287 coprocessor and go to considerable

lengths to support leading-edge graphics boards. T & W Systems, for example, sealed an agreement with Vectrix to be a distributor of that company's Pepe graphics board. Vectrix is one of a number of companies, including Metheus, Ramtek, Matrox, and INI Computer Products, that have released boards featuring 1024- by 1024-pixel resolution.

Among software packages, *AutoCAD* continues to dominate the PC CAD market with a 40 percent share and an installed base of over 30,000. Autodesk claims that this number is increasing at a rate of 1800 to 2000 per month. The principal factor behind this breakneck expansion is cost. An AT, a CAD software package, and a high-resolution color graphics board can offer reasonable quality for approximately \$10,000.

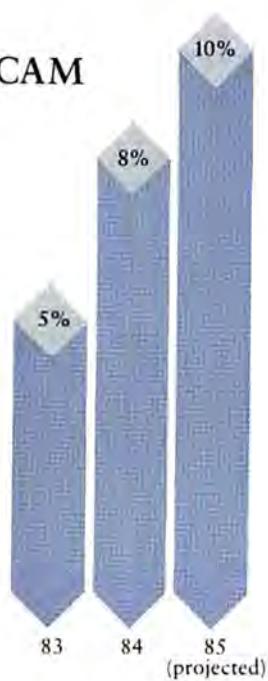
In addition to T & W Systems, several companies are giving Autodesk some healthy competition. Microcomputer Graphics has targeted vertical markets by offering 19 different CAD packages, accommodating everything from digital logic to hydraulic systems design. Other developers are going beyond the two-dimensional capabilities of *AutoCAD* and *VersaCAD*. Mega CADD's *Design Board Professional* and Computervision's *Personal Designer*

let you generate three-dimensional object models from which you can extract many two-dimensional views.

Despite these advancements, PC CAD systems still have a way to go before they can handle most large-scale design applications. Professionals accustomed to larger systems expect large digitizing pads, a joystick for rotating models, fast zooming and windowing, the ability to generate multiple cutaway views from three-dimensional designs, and at least 256 colors, with shading. Taken together, these features may carry too high a price tag for some firms. In 1986, however, this situation may change. According to Mike Ford, marketing manager for Autodesk, "Hardware prices will drop dramatically next year."

Percentage of CAD/CAM done on personal computers

Source: Future Computing

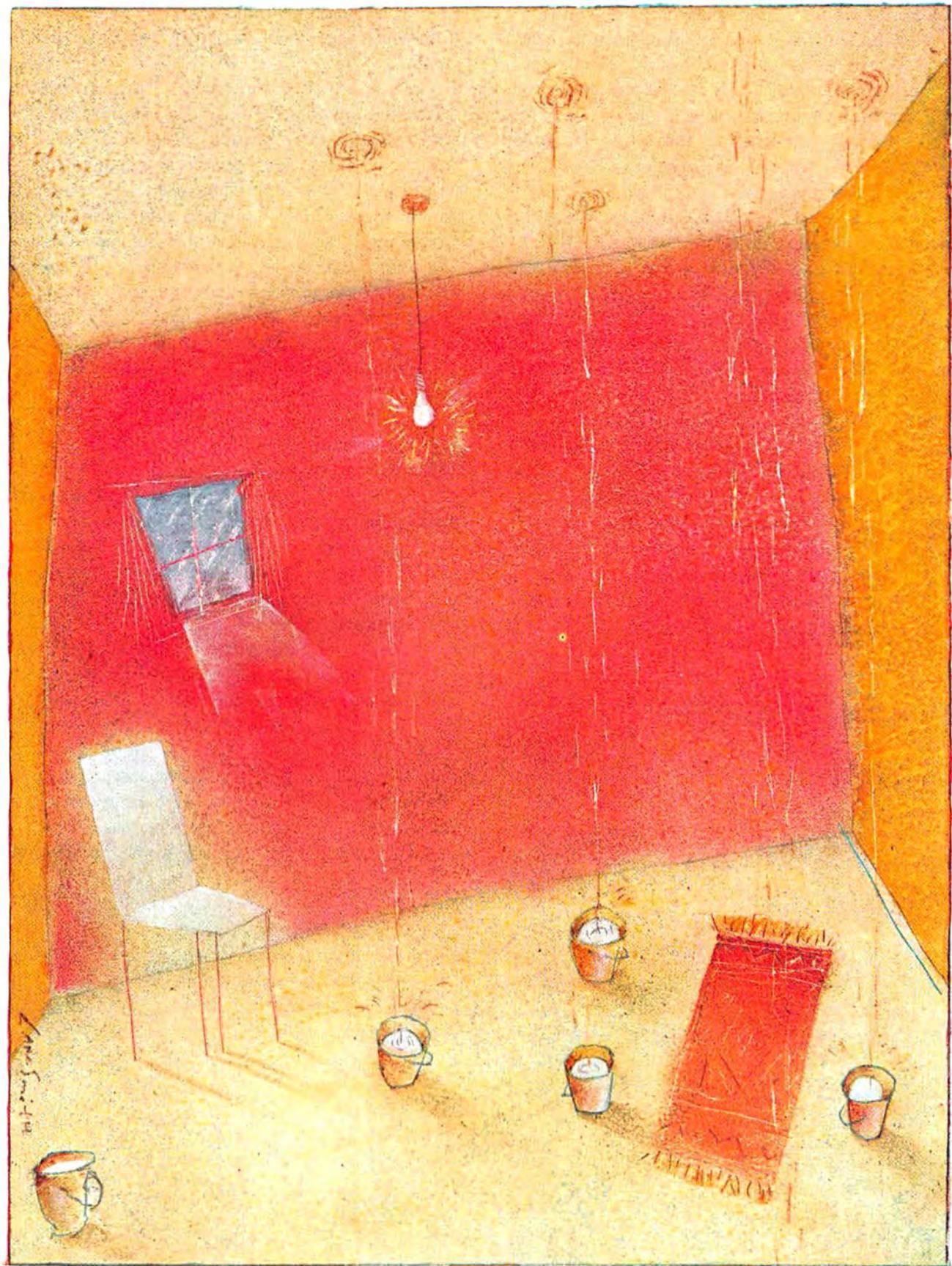


Future Fireworks

Next year should be eventful for the graphics industry as a whole. As more and more users are exposed to high-quality visuals, fewer will settle for a pie chart that looks like a deflated beach ball. Because of the IBM name, the EGA and software that supports it will be major contributors to increasing consumer sophistication.

As a result, most software companies will fall in line and write their own drivers for the EGA. Imitators of the board may rise or fall on their ability to make their clones fully compatible. In the meantime, the search continues for a universal graphics interface that won't slow performance below acceptable limits. As user interfaces continue to improve, graphics artists and designers will have fewer excuses not to make the move from the drawing table to the terminal. ●

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Filling in the Gaps

Catching what escapes the purview of larger applications, today's hard-working desk managers, file managers, and printer utilities exhibit an irrepressible congeniality.

William Urschel

Utilities come after. After *what* isn't particularly important—the point is they're designed to boost some feature, fill a gap, or squash a bug in some piece of hardware or software. Hundreds of little programs exist to correct real or perceived shortcomings in *WordStar* alone. Ashton-Tate's *dBASE II* and *dBASE III* have spawned an entire industry of compilers, debuggers, graphers, report formatters, and indexers. RAM disks take over for slow disk drives, printer utilities tame wild printers, file-conversion programs swap data between applications, and on-screen calculators and notepads replace the real items, which suddenly seem absurdly inconvenient. Other utilities organize your files, back up your hard disk data, reassign the keys on your keyboard, change your screen display, scramble your disks so others can't read them, or unscramble them so you can.

The reactive nature of utilities makes them fascinating. In a sense, they foretell the future. Successful utilities almost always end up incorporated

into later versions of the programs they are designed to fix—or into the competition's. Back in 1976 and 1977, for example, there flourished a brisk market in disk formatting, disk copying, and memory test programs. Companies like Structured System Group were selling sets of these to hardware manufacturers because CP/M didn't yet include them. More recently, *R:base 4000* struggled ineffectively against *dBASE II* and its gang of third-party utilities until Microrim got wise and incorporated the most important of these adjuncts—a code generator, a report formatter, and a compiler—in *R:base 5000*.

In the spring of 1985 the big noise in the utilities market came from the keyboard macro war. The major combatants included *SmartKey* (Software Research Laboratories), *SuperKey* (Borland International), *ProKey* (RoseSoft), and *Keywords* (Alpha Software). As in most street brawls, no clear winner emerged. No one except the participating publishers really seems to care, since all these programs let you quickly and easily assign a long series of keystrokes to a single key.

■ Easy Does It

The overall trend in 1985's utility market was much more interesting than any exchange of marketing verbiage. There's been a definite, fundamental shift away from technical utilities toward what might be called easy utilities: utility programs that do the little jobs that businesspeople, academics, and writers—rather than programmers or systems developers—

need done. Some signs of this shift are the sudden increase in memory-resident utilities (those that pop up with a keystroke when you're in the middle of some other program), fancy graphics (including windows), and an almost complete abandonment of copy protection.

Even Peter Norton, author and publisher of *Norton Utilities*, has adapted his venerable product to the shifting market. "When I changed to version 3 a year ago," he says, "I made the product less technical, with more features that were not primarily of interest to programmers but rather for ordinary people hacking away at computers, trying to get work done."

Two reasons for this shift are obvious. First, the nontechnical computer user now dominates the market. Workaday computer users don't need or want to learn how a computer works; they just want to get the job done. Second, the price of RAM continues to fall, making memory-intensive, memory-resident utility programs a cost-effective option.

■ Desktop Managers: Fat and Sassy

Desktop managers are still dominated by Borland's *SideKick*. Introduced last year, this intrepid program presents its *WordStar*-like text editor, phone directory and dialer, appointment calendar, calculator, and ASCII table with no-nonsense flair.

Like its competitors, *SideKick* is memory resident. You press two keys—in this case <Ctrl> and <Alt>—and the program's main menu instantly appears in a window, overlapping the program you were using. *SideKick*'s dominance was assured this year when Borland announced the program would be bundled with AST's popular SixPakPlus memory expansion board.

PolyWindows Desk, a rather obscure desktop organizer from Polytron, seems to be gaining ground among sophisticated users. It offers the now-standard notepad, calculator, ASCII table, auto-dialer, calendar, and appointment book functions, but it also adds a Rolodex-type data base, DOS functions, an alarm clock, and macro commands—and costs the same as *SideKick*.

Lotus Development's *Spotlight* isn't doing as well. It offers a few more functions than *SideKick* (a card filer, an alarm, and a set of DOS utilities), but no non-copy-protected version is available. *Pop-Up DeskSet Plus* from Popular Programs has also been less than successful. This set of memory-resident util-

Thanks to cheap hard disk drives, normal people are suddenly finding themselves with a monstrous number of files to manage.

ties offers *SideKick*'s features, plus a window for performing DOS operations from within application programs. The *Pop-Up* utilities also include an optional tax log module to track the number of hours your PC is used for business. *DeskSet Plus* sales have been sluggish, in part because it's more expensive than the competition. In addition, the "set" concept appears to confuse some buyers, the complete set takes up considerable RAM, and the alarm function suffers from a few bugs.

Many people feel that utilities are getting out of hand and that they've really become RAM-based integrated application programs. One sign that they may have reached their philosophical limits is the emergence of utility programs for desktop managers. *SKManager*, for example, is a utility that turns *SideKick* into a time management/billing program. When utilities spawn utilities, it's time to stop and think.

■ DOS Shells

Traditionally, file utilities were arcane little programettes that did things only a programmer could appreciate, but these products have also shifted toward the nontechnical user. One reason is that thanks to cheap hard disk drives normal people are suddenly finding themselves with a monstrous number of files to manage. Alan Cooper, author of Computer Associates' *SuperProject*, points out that "it's becoming a trivial exercise to get 10MB or 20MB hung on your computer, but there's nothing trivial about sorting through it."

The first programs to tame the hard disk were the menu-driven front ends for DOS. These include *1dir* (Bourbaki), *DOSshell* (XTC Software), and *Fixed Disk Organizer* (IBM), all of which display in menu format the major DOS functions and every directory listing. A newer type of file manager uses pictures. For example, *Direc-Tree III* from Micro-Z displays directories in a clear, tree-structured diagram. Using the arrow keys, you can move the cursor around the tree, reading, copying, and erasing files, naming and erasing directories, and running programs with the function keys.

Some file managers not only help you find and organize files, they also help you inspect and doctor them. By nature these programs are more technical, but the move toward amicability has affected them too. In this category, one of the first sets of "technical" utilities that nontechies could use was *Norton Utilities*. "In the early days of the PC," says Norton, "utility programs were like traditional mainframe utilities—very much programmers' tools. One of the reasons I had a runaway success with my stuff was that even though I provided a lot of programmer-type functions, the style and ease of use were much more oriented to the ordinary user."

Memory-resident utilities might make life simpler, but they also lay traps. As cheap as memory has become, only about half of us have more than 256K RAM.

Offering an even more engaging facade than *Direc-Tree* or *Norton Utilities* is *WindowDOS* from WindowDOS Associates. This utility takes the best features of the file managers and presents them in the memory-resident, pop-up form of the desk managers.

WindowDOS lies in wait with one window of basic DOS functions and another window for sending printer codes directly to your printer. You can list up to 85 files on screen at a time and sort your files by

nine different criteria. You can even switch files from unhidden to hidden or unprotected to protected and back again. Other features allow you to locate a specified file anywhere on a hard disk, lock up the keyboard until a specified password is entered, and blank the screen after 5 minutes of inactivity. *WindowDOS* also offers a graphic directory tree that stays in memory once it's generated.

Conquering Cantankerous Printers

Programs that control printers' special features have been around for years, but since the laser printer appeared, quick and sometimes dirty printer utilities have been taking over the PC ship like rats. Utilities rush in to fill a need, and the need here is for a way to handle the ridiculously cumbersome control codes of some printers, notably the Hewlett-Packard LaserJet. An ordinary setup string (say, for Times Roman 18.8 pitch in landscape mode) may consist of up to 27 characters. *WordStar*, version 3.3, can store only 8 characters, and *1-2-3*, only 10. Exacerbating the problem is the printer code section of the LaserJet's manual, one of the most obscure pieces of technofog around.

The main problem with most printer utilities is their labyrinthine preliminaries. Before printing a document, you must first "print" it to disk, exit your main application program, and then invoke the printer utility. A more convenient approach—another example of a memory-resident instant interface—is Photon Software's *PrintMate*. Once you've defined your printer string through the pop-up menu, the program sits demurely in RAM, taking up only 9K. As you work, you embed brief printer codes in your document. When you print, *PrintMate* intercepts those codes, sending the actual printer string to the printer. The additional "print-through" step is eliminated altogether.

Competing for Memory

Memory-resident utilities might make life simpler, but they also lay traps. As cheap as memory has become, only about half of us have more than 256K RAM installed in our PCs. With *1-2-3* (192K) and *SideKick* (64K) on a 256K machine, you don't have enough room to build a useful spreadsheet. If you want to use a macro command utility, a mouse, and a

Utilities

The wide range of utilities available for the PC almost defies categorization—utilities abound that enhance almost every system and provide solutions to most software problems (occasionally even problems that don't exist). However, the most popular utilities fall into three main categories: application utilities, keyboard enhancement programs, and desktop managers.

■ Application Utilities: 1-2-3 Report Writer

Among the hundreds of 1-2-3 templates on the market, the most influential comes from—who else—Lotus Development Corporation. Essentially, *1-2-3 Report Writer* turns 1-2-3 into a creditable data base management system by providing the report functions that have become standard with other high-powered data management programs.

Report Writer comes with a variety of reporting functions, including a test pattern feature that helps in lining up forms. The utility allows you to sort on four keys compared to 1-2-3's two and includes a mailing label feature.

Aside from its famous brand name, *1-2-3 Report Writer* stands out from the competition by providing a comprehensive set of features along with a menu structure that closely imitates its successful parent, 1-2-3.

■ Keyboard Enhancers:

Keywords 1.1

Among the many worthy contenders in the keyboard enhancer (or macro processor) market, Alpha Software's *Keywords* is the easiest to use without sacrificing major features. Like its competitors, *Keywords* sits transparently in memory and allows you to record long strings of characters and commands and assign them to single keystrokes. You can also set up interactive menus, design screen displays, and implement lengthy batch applications.

Keywords leads the pack in its sophisticated menu-making features. Among other niceties, you can easily create pop-up menus with moving bars and have macros call other macros. Besides assigning macros to almost any key, you can number up to 245 macros and define them with the <Alt> key and the numeric keypad.

Keywords' on-line editor is clearly the best of the lot. Instead of editing one macro definition at a time, you can edit an entire library of definitions at once. Editing capabilities include displaying every macro in memory and moving, copying, and deleting blocks.

Although *Keywords* doesn't include all the features found in other macro processors, its ease of use and

excellent menu features should expand keyboard enhancement applications beyond the limited realm of power users.

■ Desktop Managers: *SideKick 1.5*

The first of the RAM-based desktop managers, Borland's *SideKick* continues to be the most popular and with its latest release, version 1.5, keeps pace admirably with the competition. In several areas, it remains the best.

Like its competitors, *SideKick 1.5* contains a calculator, notepad, calendar, auto-dialer, and ASCII chart, all available from within any application by pressing a few keys. While Borland has chosen not to include features found in newer desktop organizers, such as a card file and a DOS shell, the applications it provides are logical and well implemented.

The new version excels in its calculator and notepad functions. Unlike its competitors, *SideKick* can calculate in hexadecimal, binary, and decimal math. You can also send a calculated result directly into an application without rekeying. *SideKick's* *WordStar*-like notepad is the most sophisticated text editor of all the desktop managers. You can easily move text to and from an application.

With its low cost, transparent RAM-based operation, and array of helpful features, *SideKick* continues to influence not only the utilities market but the entire software industry.

RAM disk, even 640K might be a tight fit. Fortunately, *SideKick*, *Pop-Up DeskSet Plus*, and others allow you to disassemble their packages and remove certain functions to save memory.

We may be seeing fewer features in memory-resident programs. Doug Caywood, president of Photon Software, says the firm's *TenKey* (a simple pop-up calculator) and *ProType* (a keyboard-to-printer direct printing utility) were both selling wonderfully "until *SideKick* came out, with all those features and massive advertising, and blew us right out of the water. Now sales are coming back," he explains, "because people want just one or two functions, not all the other stuff. *TenKey* takes up only 12K and *ProType* only 35K."

A much more serious problem, which will only worsen as more memory-resident programs reach the market, is that of conflicting memory ranges and interrupts. There are only so many places in RAM to put a program, and only so many desirable keystroke combinations available to call up resident programs.

There are only so many places in RAM to put a program, and only so many desirable keystroke combinations available to call up resident programs.

In other words, you can't use some memory-resident programs in conjunction with others; for example, Photon's utilities won't work with Borland's *Super-Key* or even with some application programs.

General Manager Tom Byers of Turner Hall (publishers of *Note-It*, a memory-resident footnoter for 1-2-3) says staying compatible has been a headache. "When we hear of a compatibility problem, we get in there with *PC Probe*, determine what's going on, and then start working with [other utility] companies one at a time. In the case of GNP with *Recalc Plus*," says Byers, "we negotiated, and we both changed."

Some companies, Borland in particular, are less willing to negotiate. In fact, Philippe Kahn, president of Borland, hardly acknowledges the existence of the competition. "Our programs are the most stable in the business," proclaims Kahn. "They don't crash because they are done right. The others are kind of hack programs. They crash because they haven't solved all the problems." Laments Doug Caywood, "Borland is doing quite well, so it doesn't feel the need to be compatible with anyone else. On the other hand, maybe that's just Borland's marketing strategy." Tom Byers is more sanguine. "You can be damn sure we worked with *SideKick*, because it's such a market-share winner. That's a tough attitude, but that's the way this industry was built."

One prophylactic prescription for memory problems is *RAMWindow*, a forthcoming WindowDOS Associates release. This utility promises to help you keep track of RAM-resident programs. It tells you which programs you have installed, what interrupt vectors they are using, and the approximate proportion of memory they occupy. A utility like *RAMWindow* is more an early-warning system than an antidote, however.

A solution many people suggest is a set of standards. Others think standards are a nice idea that will never happen. "I don't see any real standard evolving," says Peter Norton, "but I do see the people who write [memory-resident utilities] becoming a little more sophisticated in avoiding problems."

■ Temporary Solutions

Utility programs appear quickly when a need arises, but they can dry up and blow away almost as easily. One day in the not-so-distant future, the fancy memory-resident pop-up utility program will become obsolete. As Byers puts it, "The day we get a multitasking operating system, there will be a whole new generation of utilities. We're not going to need memory-resident programs."

Kahn says that it's "conceivable" that memory-resident utilities will fade away, but that some will probably survive the new multitasking environment. "I think you'll see both multitasking and memory-resident utilities," adds Kahn. "Macro products, however, will become even more popular as long as they're multitasking."

Perhaps future versions of DOS will include notepad, calculator, and graphic tree-directory programs, much the way that FORMAT, CHKDSK, and DISKCOPY come with current versions. Alan Cooper thinks operating systems could go still further. "It's not that these programs should be integrated, but that the structure of the operating system should make them unnecessary. That's what Apple did with the Macintosh. People fall all over themselves saying how wonderful the Mac is because it has no such thing as a format program. As far as the user is concerned, there isn't."

Conversely, complete integration may not be the answer either. "You can say an operating system should be so complete that there's no need for things like utility programs," muses Norton. "On the other hand, building a utility into an operating system defines one way of doing it, which might not be the best."

Of course, if that's not the best way to do it—whatever it may be—someone will undoubtedly write a utility program to do it better. ☐

William Urschel is a freelance writer and the author of 1-2-3 application software.

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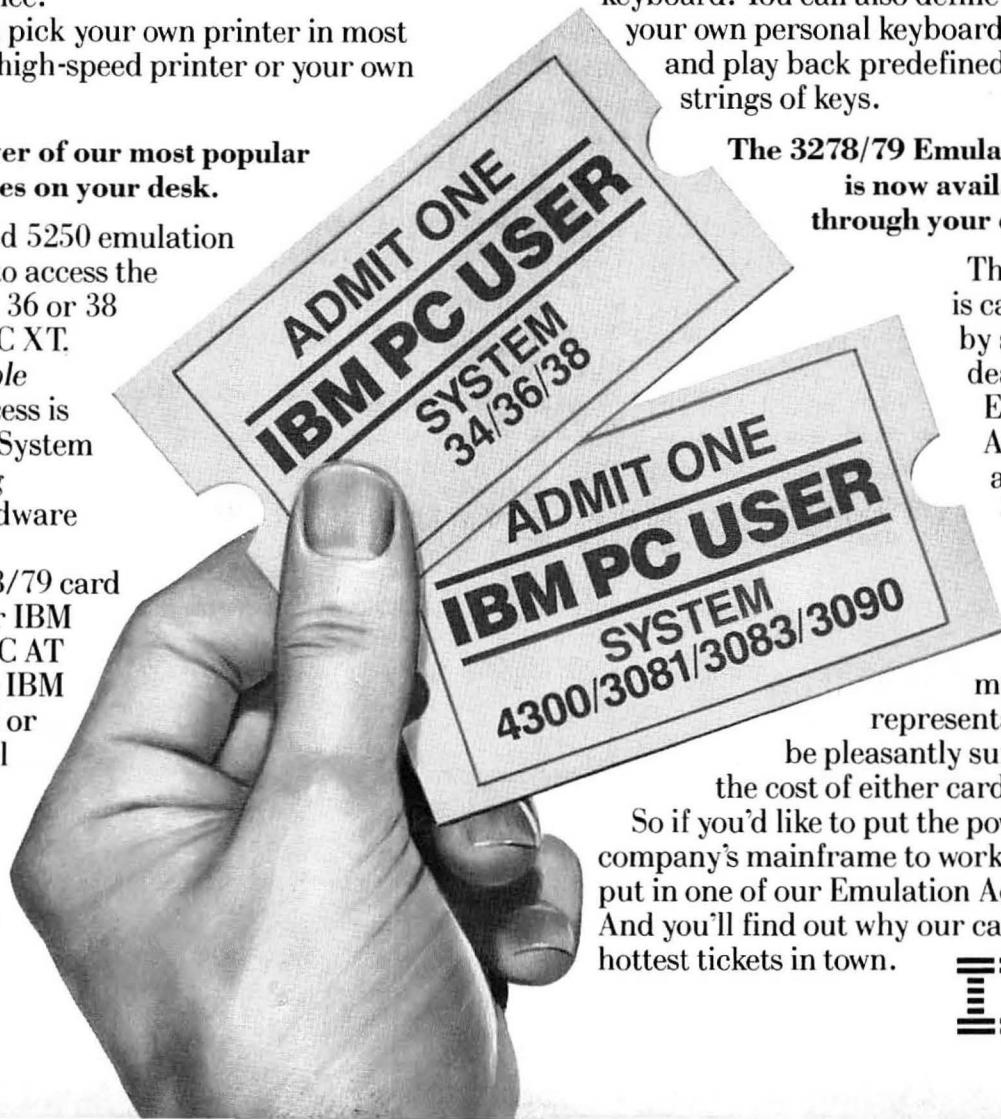
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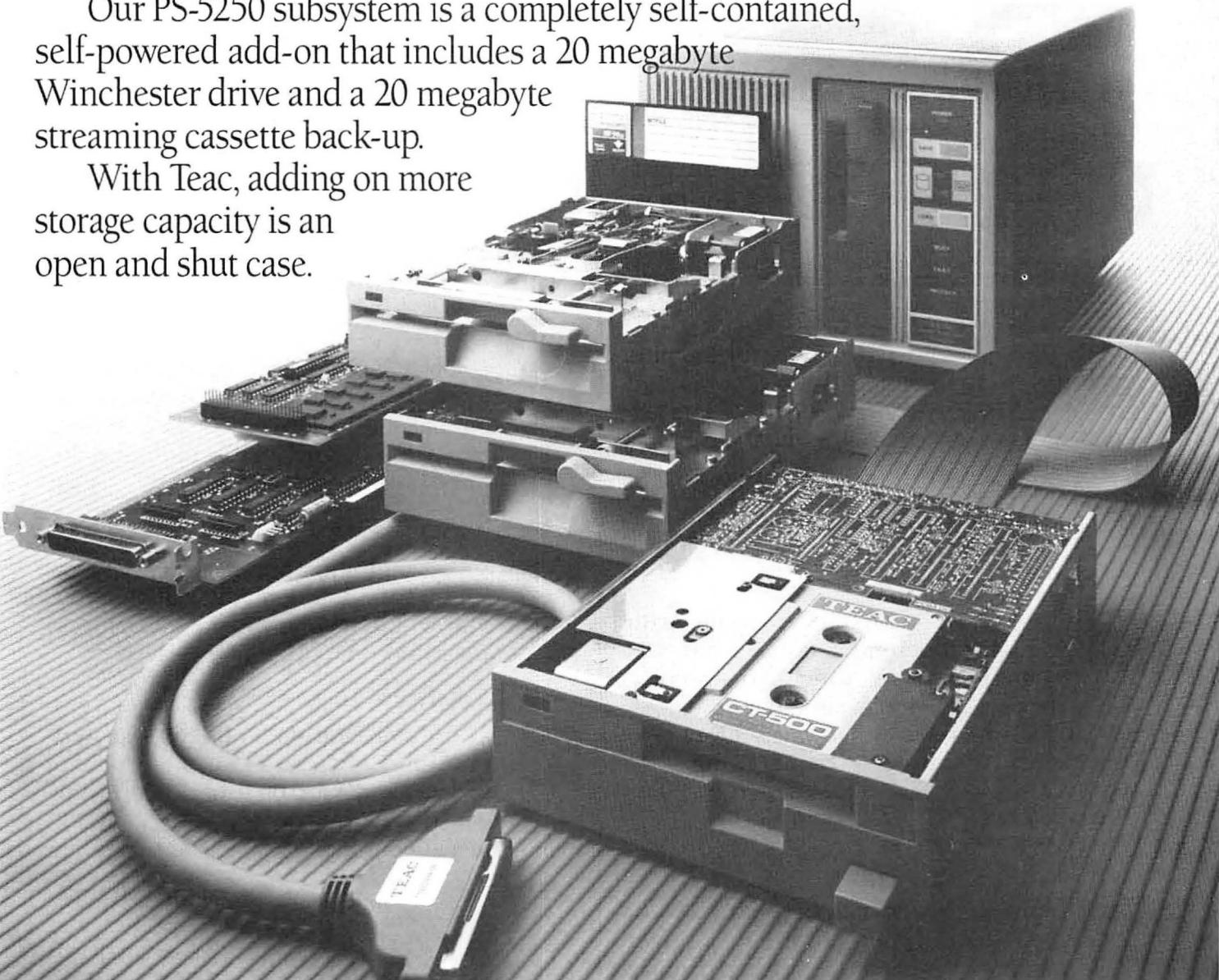
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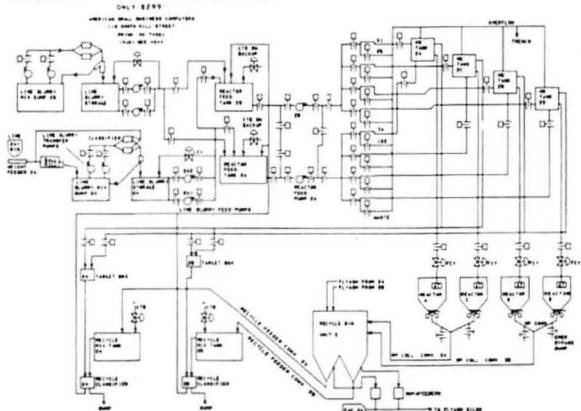
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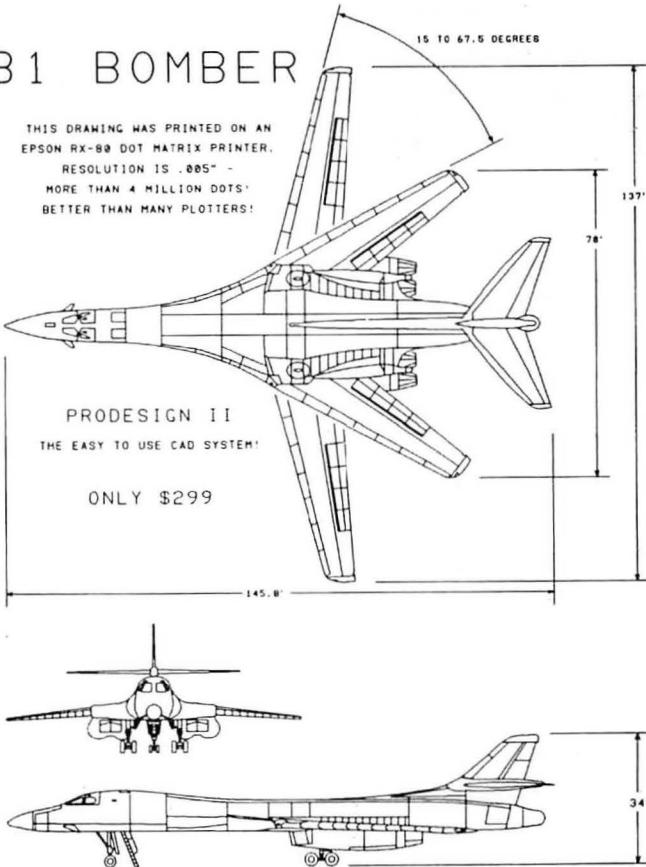
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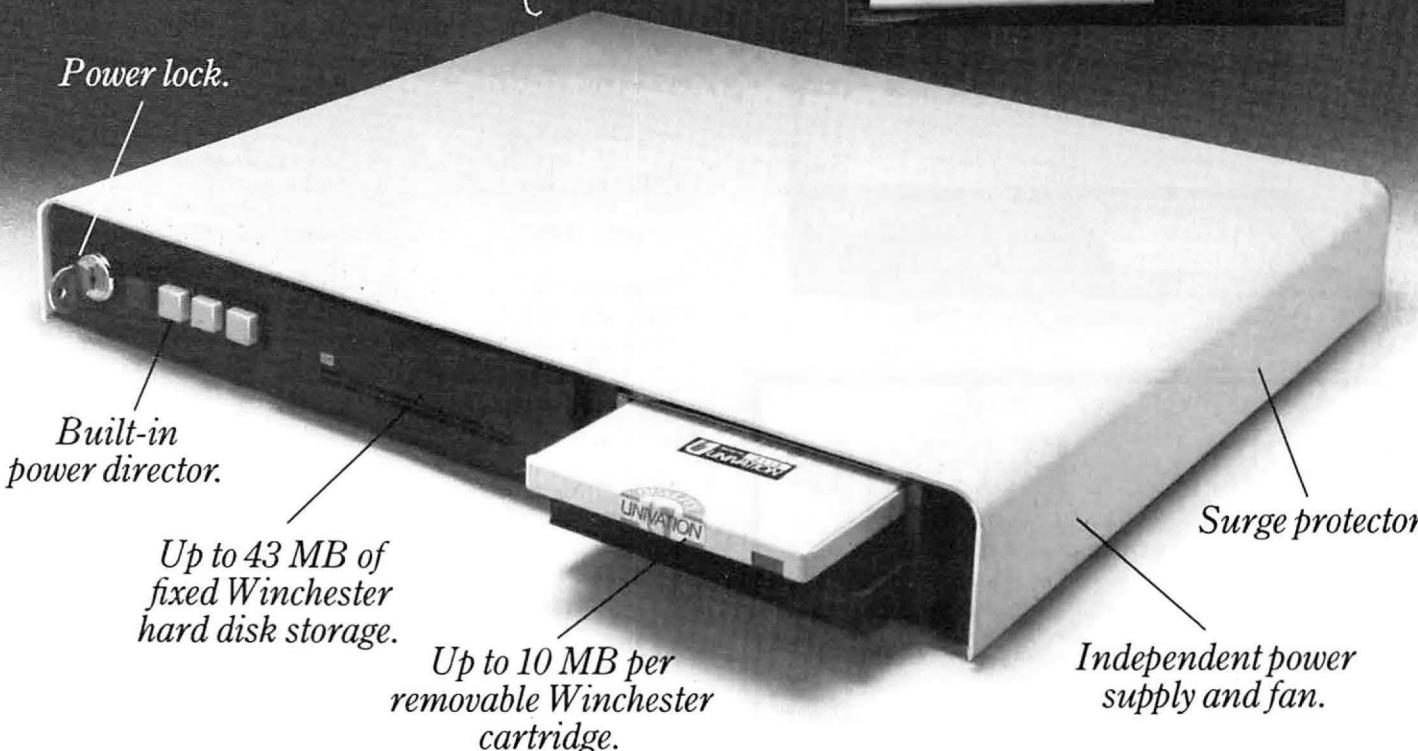
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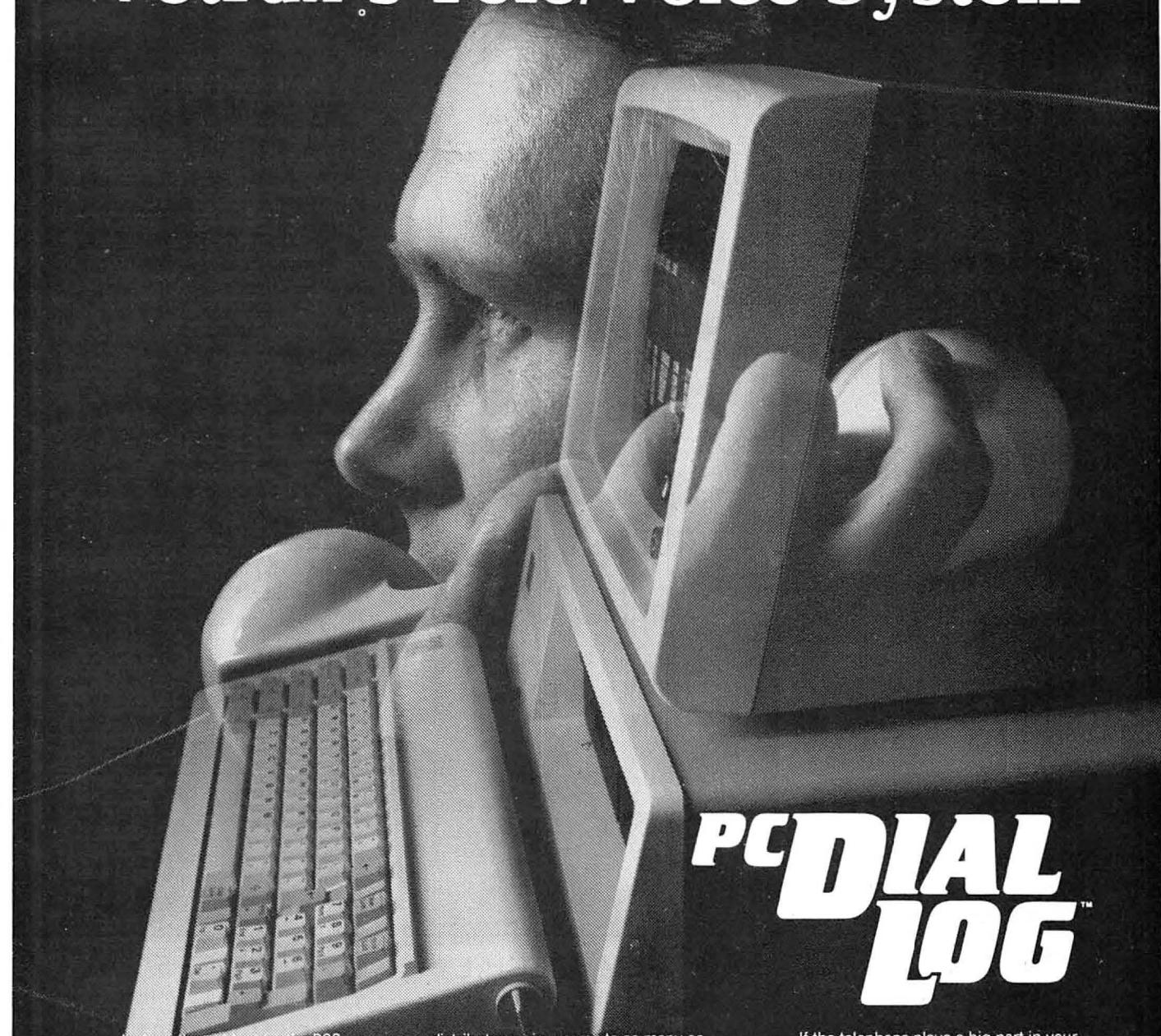
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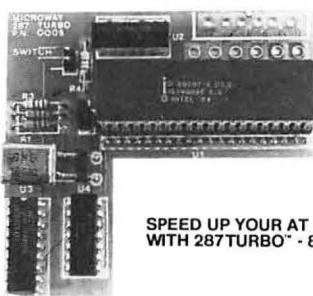
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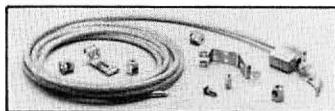
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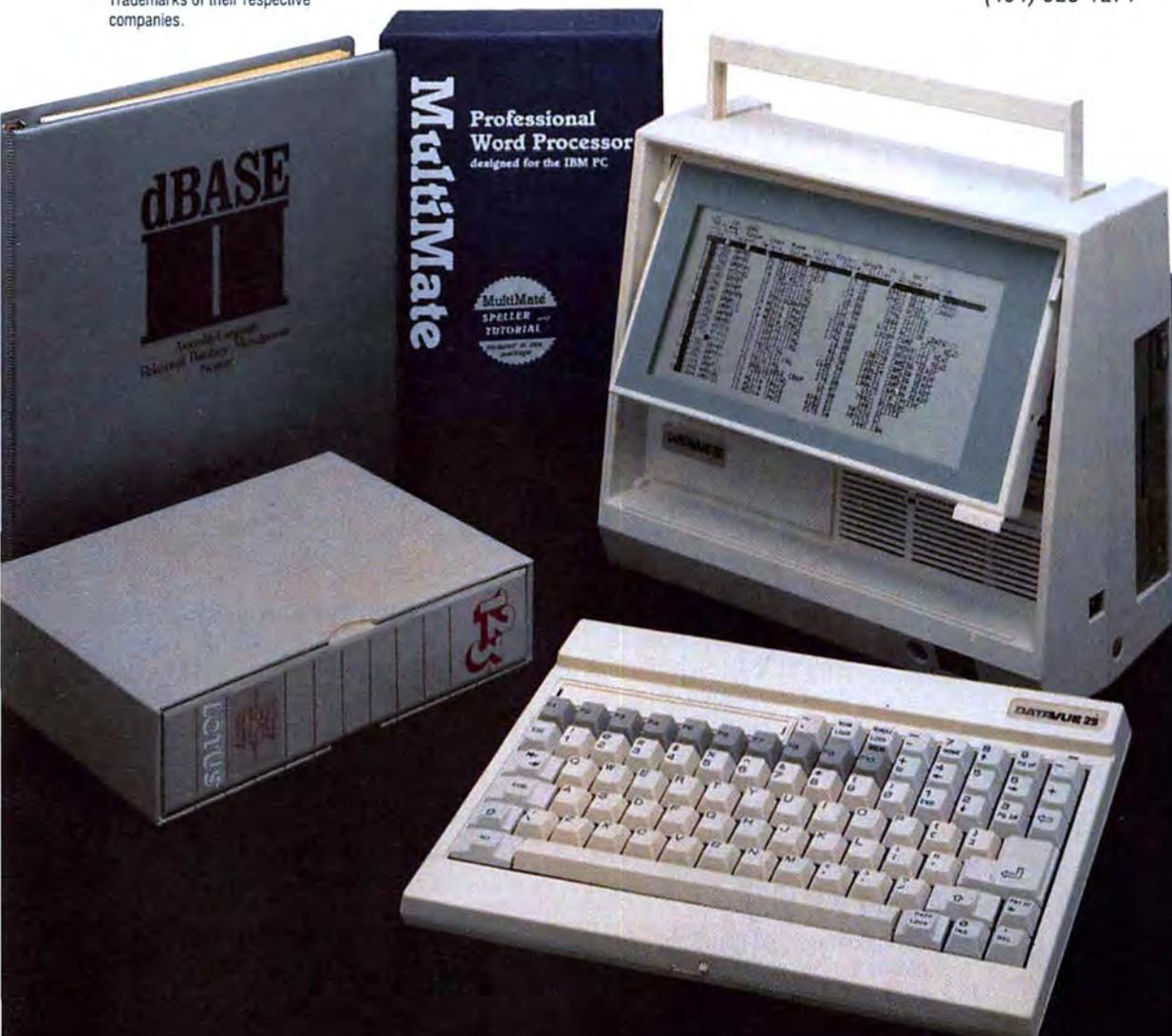
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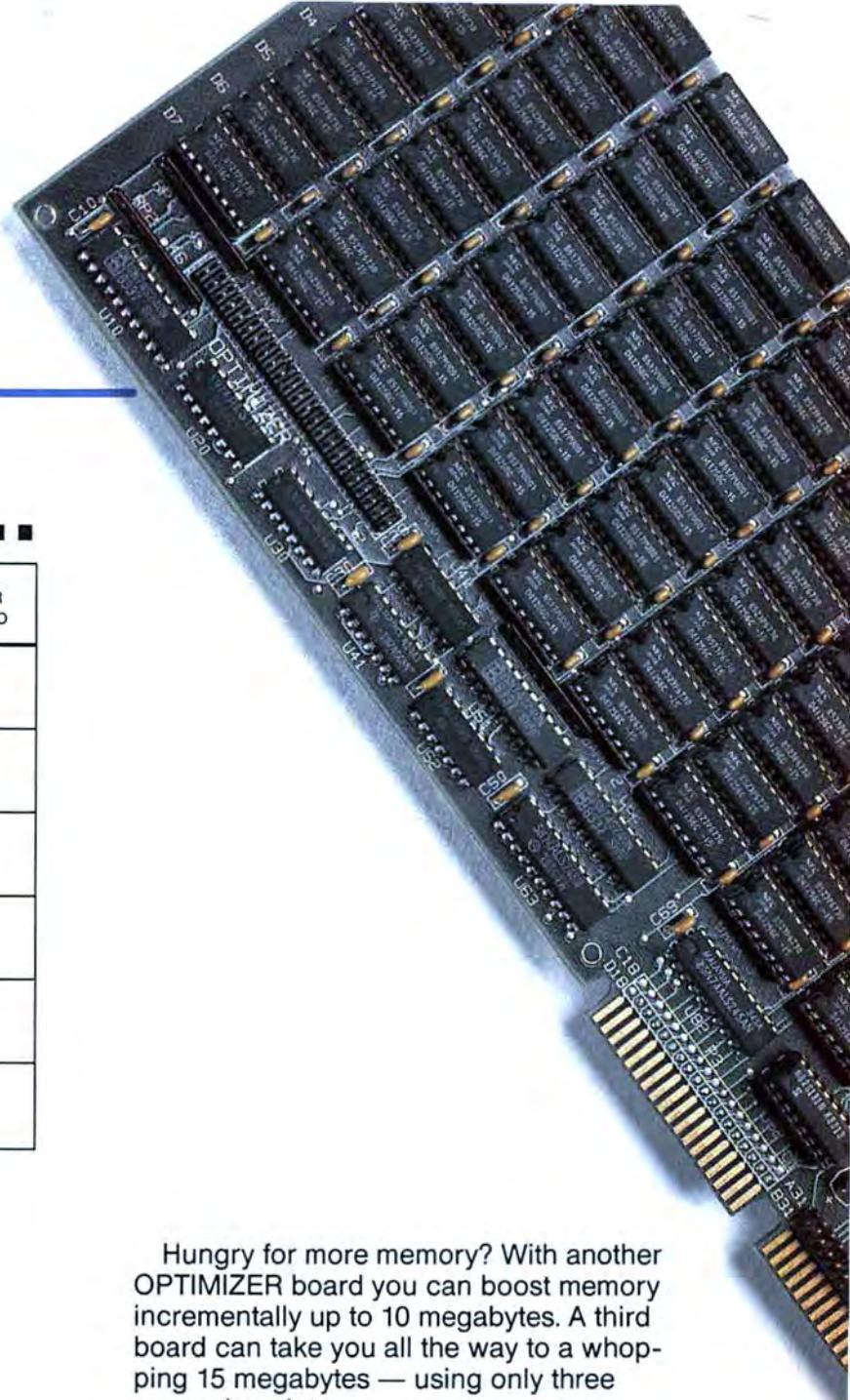
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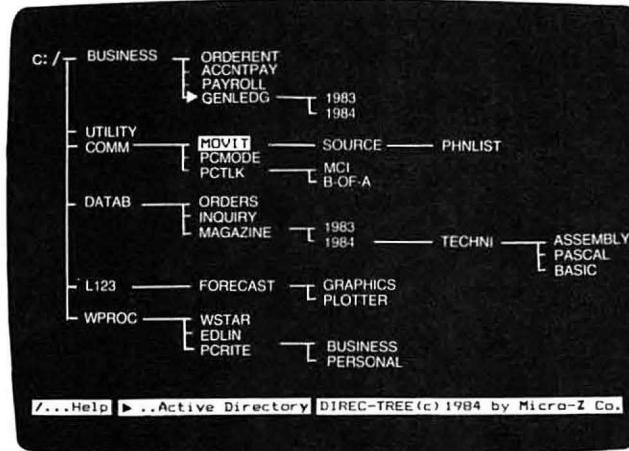
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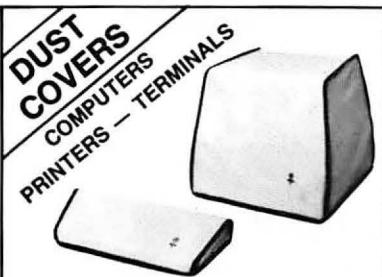
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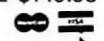
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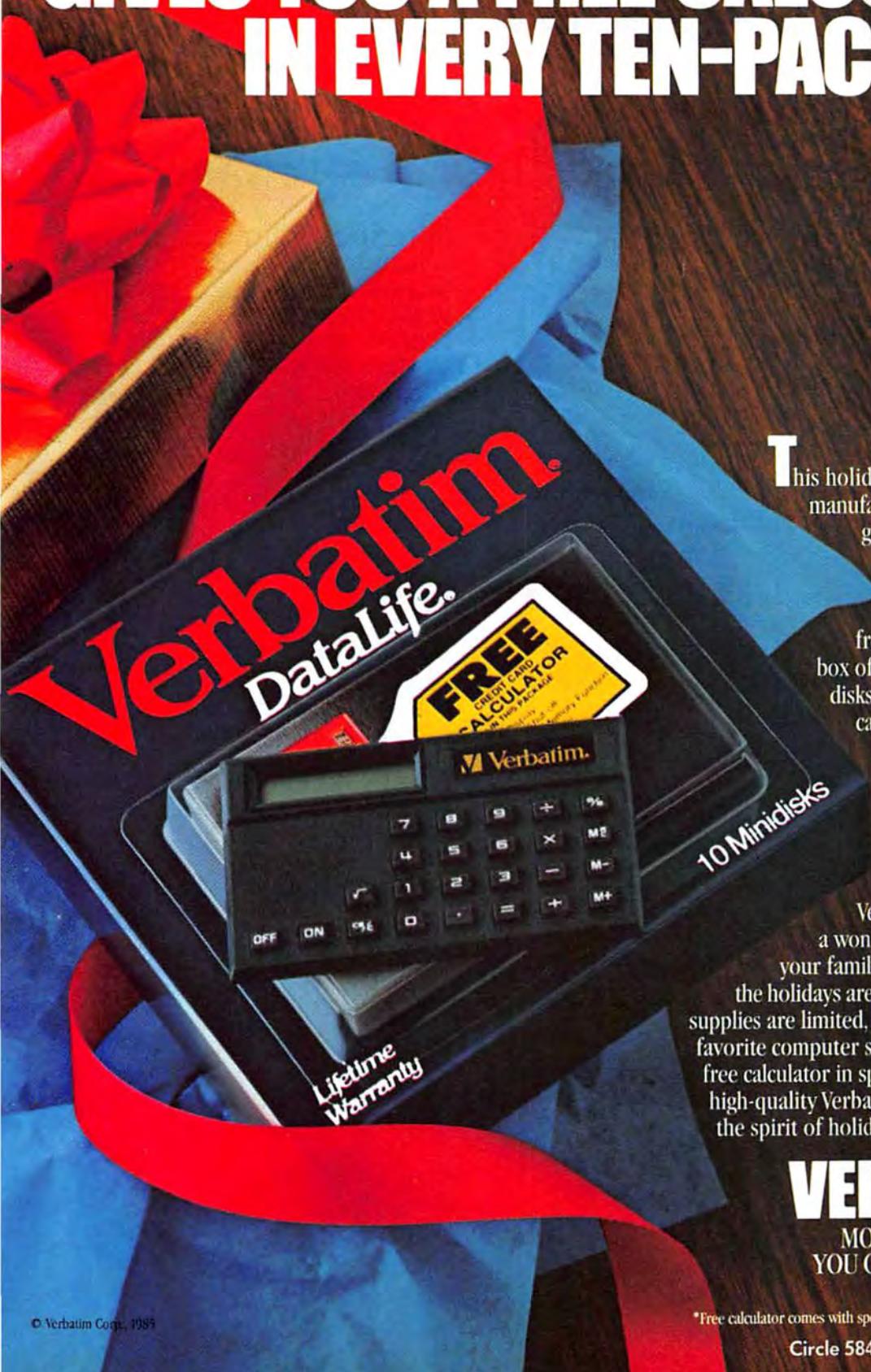
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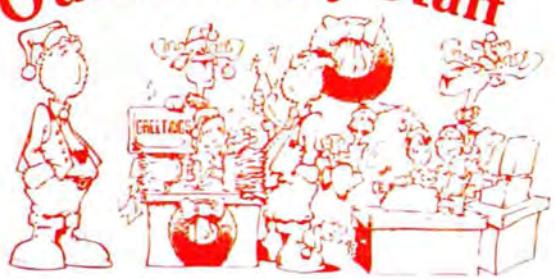
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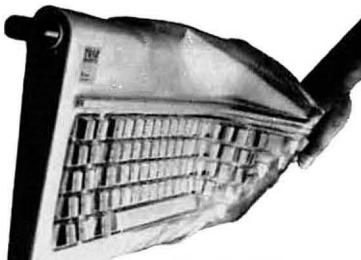
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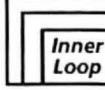
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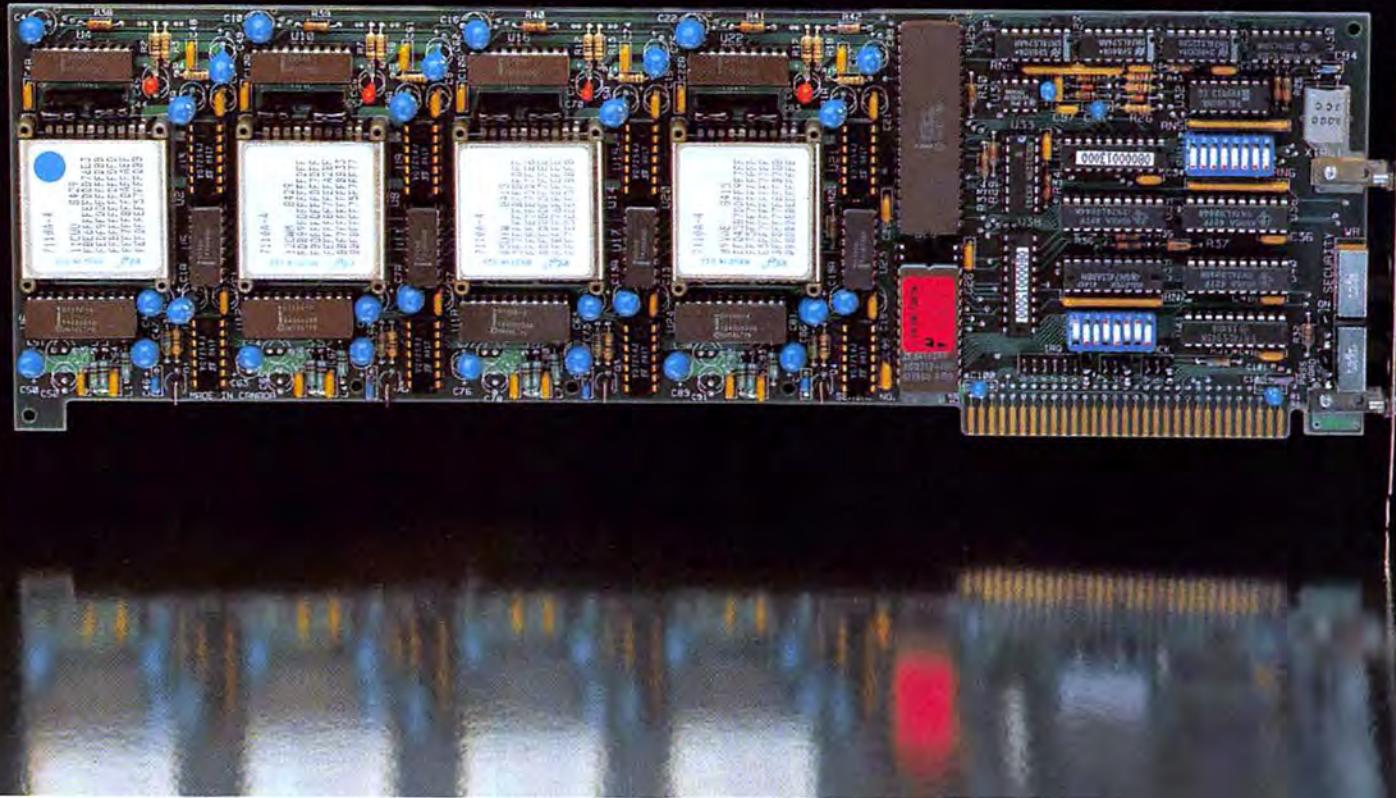
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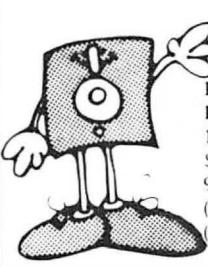
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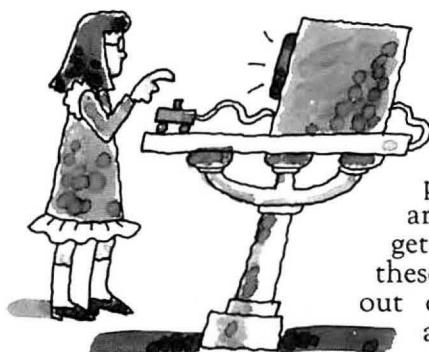
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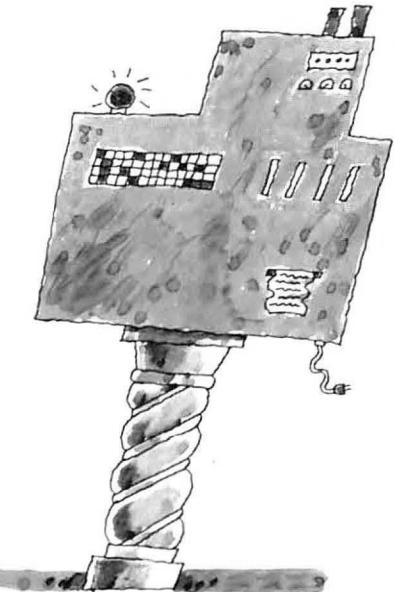
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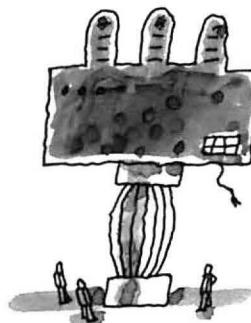
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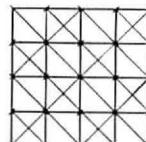
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A COMPARISON OF THE MOST POPULAR PRODUCTS

	PolyWindows DeskPlus	Sidekick	Spotlight
ROLODEX-TYPE FILES			
Variable Card Size	YES	NO Files	NO
Multiple Card Decks	YES (1-10)	NO Files	YES
Number Cards Per Deck	RAM Limit	NO Files	500 Max.
Max. Characters Per Card	969	NO Files	480
Search	YES	NO Files	YES
Auto Alphabetize	YES	NO Files	YES
Print Card or Deck	YES	NO Files	YES
CALENDAR			
Daily Notes	YES	NO	NO
Mark Important Days	YES	NO	NO
APPOINTMENT BOOKS			
Multiple Appt. Books	YES (1-10)	NO	NO
"Things To Do" List	YES	NO	NO
Print Appointment Book	YES	YES	YES
ALARM CLOCK			
Display Time	YES	NO Alarms	YES
Hourly Chimes	YES	NO Alarms	NO
Display Alarm Message	YES	NO Alarms	NO
Number of Alarms	9	NO Alarms	Many
CALCULATOR			
On-Screen Tape	YES	NO	NO
Printing Tape	YES	NO	NO
Percentage Function	YES	NO	YES
Display With Commas	YES	NO	NO
Floating/Fixed Decimals	YES/Both	Fixed	Floating
Memory	YES	YES	YES
Insert Result in Work	YES	YES	YES
Max. Display Digits	15	18	12
Exponential Notation	YES	NO	NO
★ Binary/Hex/Octal	YES	YES	NO
★ ASCII TABLE	YES	YES	NO
NOTEBOOK			
Multiple Documents	YES (1-10)	NO	NO
Word Wrap	YES	YES	YES
Merge Files	YES	NO	NO
Change Margins	YES	YES	NO
Variable File Size	YES	YES	NO
File Size Limit	64K	50K	4.4K
Variable Window Size	YES	YES	NO
★ Search & Replace	YES	YES	NO
★ Block Moves	YES	YES	NO
★ Auto Indenting	YES	YES	NO
★ Page Break Display	YES	NO	YES
★ Insert or Overtype Mode	YES	YES	YES
★ Cut Sheet Printing	YES	NO	YES
Print Document	YES	YES	YES
Print Window Only	YES	YES	YES
Undelete Key(s)	YES	YES	NO
KEYBOARD ENHANCER			
Number Keys Redefined	YES Up to 60	NO Macros	NO Macros
Total Keystrokes	YES 2500	NO Macros	NO Macros
★ GRABBER			
Cut & Paste between applications	YES	Import Only	NO
★ DOS FUNCTIONS			
See copy	YES	NO	NO
★ AUTO DIALER			
GENERAL CHARACTERISTICS	YES	YES	NO
100% Memory Resident	YES	NO	NO
Minimum Memory Used	40,000	61,300	77,200
Typical Memory Used	50,000-75,000	61,300	77,200
On-Line Help	YES	YES	YES
Moveable Windows	YES	YES	NO
Redefine Colors	YES	YES	YES
Expandable/Add Functions	YES	NO	NO
Can Remove Functions	YES	NO	NO
Integrated Interface	Excellent	Good	Good
Visual Appeal	Excellent	Fair	Poor
Speed	Very Fast	Fast	Slow
COST - PROTECTED	\$49.95	\$54.95	\$75.00
COST - UNPROTECTED	\$84.95	\$84.95	NO/Not Avail.

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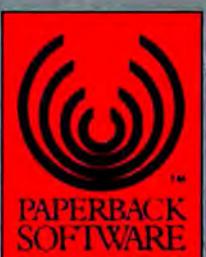
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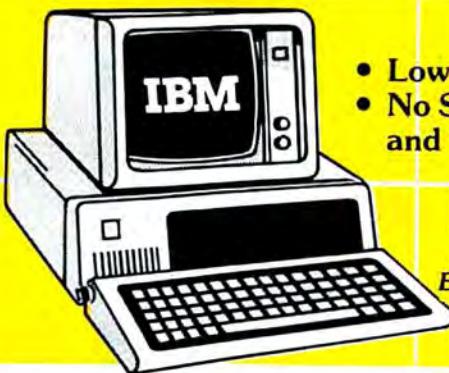
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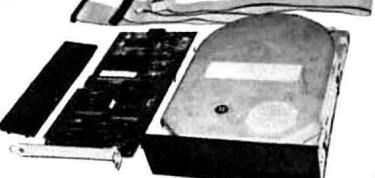
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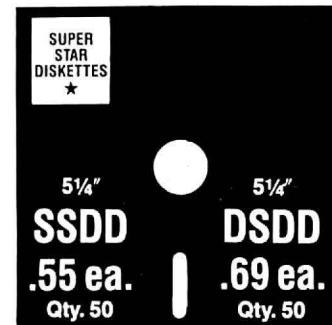
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(In Illinois: 1-312-256-7140)

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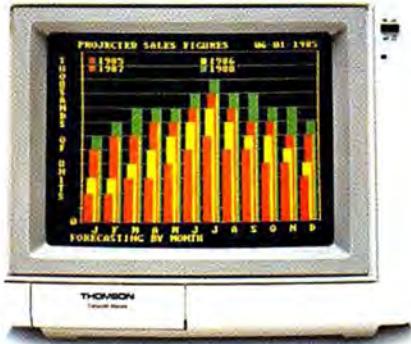
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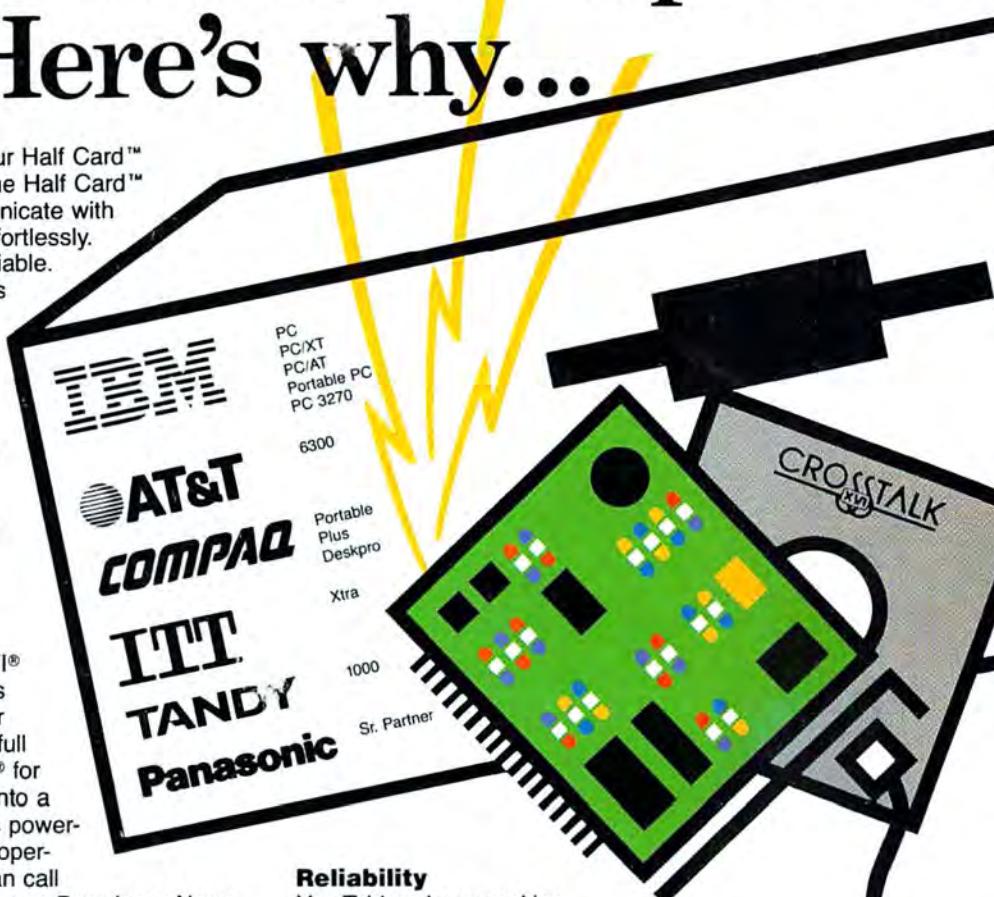
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