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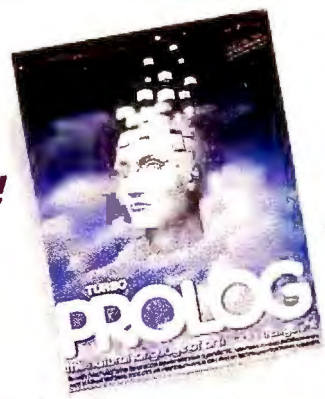

Turbo Prolog, the natural language of Artificial Intelligence, is the most popular AI package in the world with more than 100,000 users. It's the 5th-generation computer programming language that brings supercomputer power to your IBM PC and compatibles. You can join the AI revolution with Turbo Prolog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

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System requirements

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

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Turbo Pascal 3.0

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

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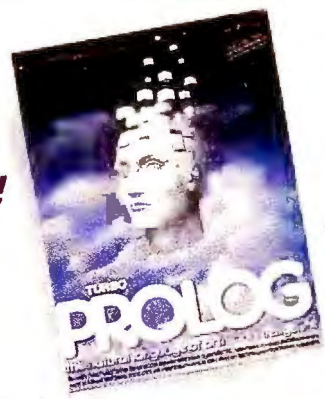

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Includes 8087 & BCD features for 16-bit MS-DOS and CP/M-86 systems. CP/M-80 version minimum memory: 48K; 8087 and BCD features not available. 128K.

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

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

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

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

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

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

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

How to use Eureka: The Solver

It's easy.

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

You can then tell Eureka to

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

Eureka: The Solver includes

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

Some of Eureka's key features

You can key in:

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

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

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

That kind of savings you can calculate with your fingers!

System requirements

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

Because Turbo Basic is compatible with BASICA, chances are that you already know how to use Turbo Basic.

With Turbo Basic your only speed is "Full Speed Ahead"!

You probably already know us for both Turbo Pascal® and Turbo Prolog.™ Well, we've done it again!

We created Turbo Basic, because BASIC doesn't have to be slow.

In fact, building fast compilers is a Borland specialty; both our Turbo Pascal and our Turbo Prolog outperform all their rivals by factors, and with Turbo Basic, we're proud to introduce the first high-speed BASIC compiler for the IBM®PC. If BASIC taught you how to walk, Turbo Basic will teach you how to run!

The Critics' Choice

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

Steve Gibson, InfoWorld

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

John C. Dvorak"

Turbo Basic ends the basic confusion

There's now one standard: Turbo Basic.

It's fast, BASICA-compatible, and because Turbo Basic is a Borland product, the price is right, the quality is there, and the power is at your fingertips. You see, Turbo Basic's part of the fast-growing Borland family of programming languages—we call it the "Turbo Family." Hundreds of thousands of users are already using Borland's languages, so you can't go wrong. So join a whole new generation of smart IBM PC users—get your copy of Turbo Basic today. You get an easy-to-read 300+ page manual, two disks, and a free MicroCalc spreadsheet—and an instant start in the fast new world of Turbo Basic. All of this for only $99.95—Order your copy of Turbo Basic today!

Free spreadsheet included, complete with source code!

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

A technical look at Turbo Basic

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

System requirements

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

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BI-1103

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Turbo C®

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

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

Turbo C: The C compiler for amateurs and professionals

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Turbo C: a complete interactive development environment

Free MicroCalc spreadsheet with source code

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

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

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

System requirements

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

Technical Specifications

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

*Introductory price—good through July 1, 1987

Sieve benchmark (25 iterations)

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

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

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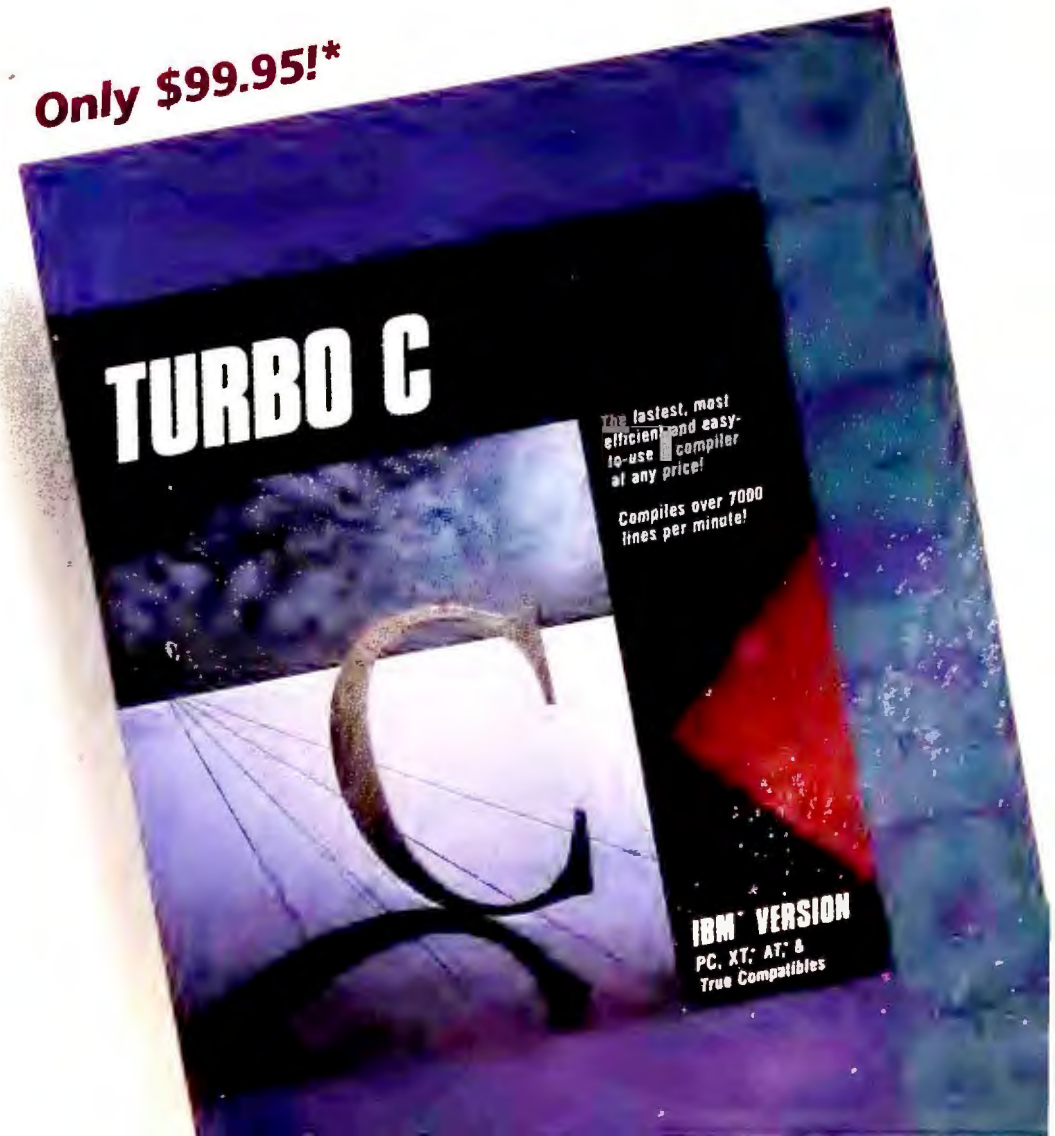

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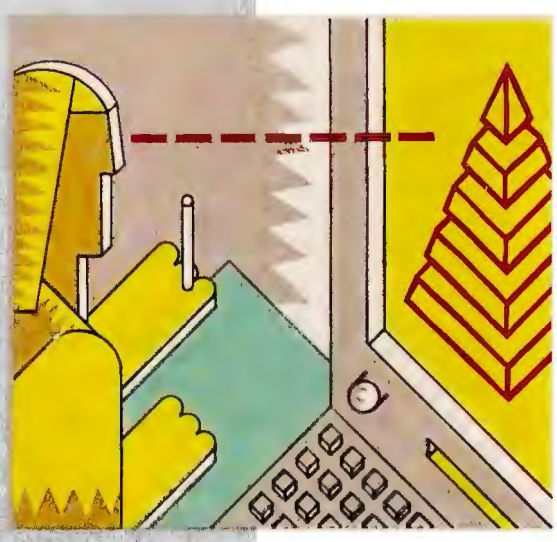

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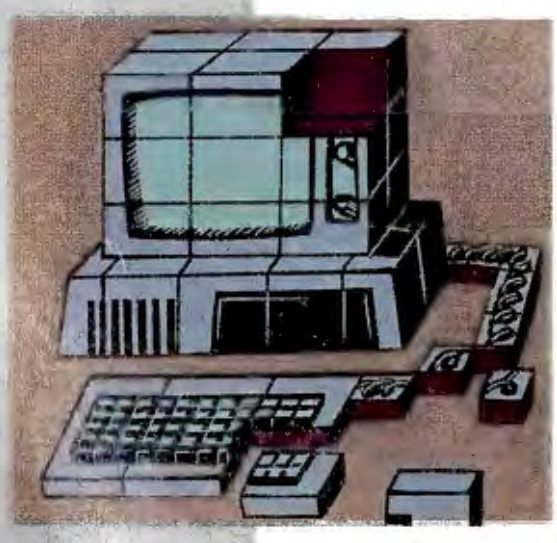
Long, complex documents need a word processor with enough muscle to hammer them into shape. A feature-laden speed demon, *Lotus Manuscript* is up to any tough job, but learning the program requires patience with some new word processing conventions.

260 **Special Report: The Future of Computing**

Just when you thought the future was here–in the form of 386 machines–new developments are peeking around the corner that promise to reshape business computing.



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If you look at your aged system and dream of bigger and faster things, take heart. You can have the computer of your dreams without spending thousands. *PC World*'s new monthly column helps you revamp your system (and peripherals) for a fraction of the cost of new hardware.

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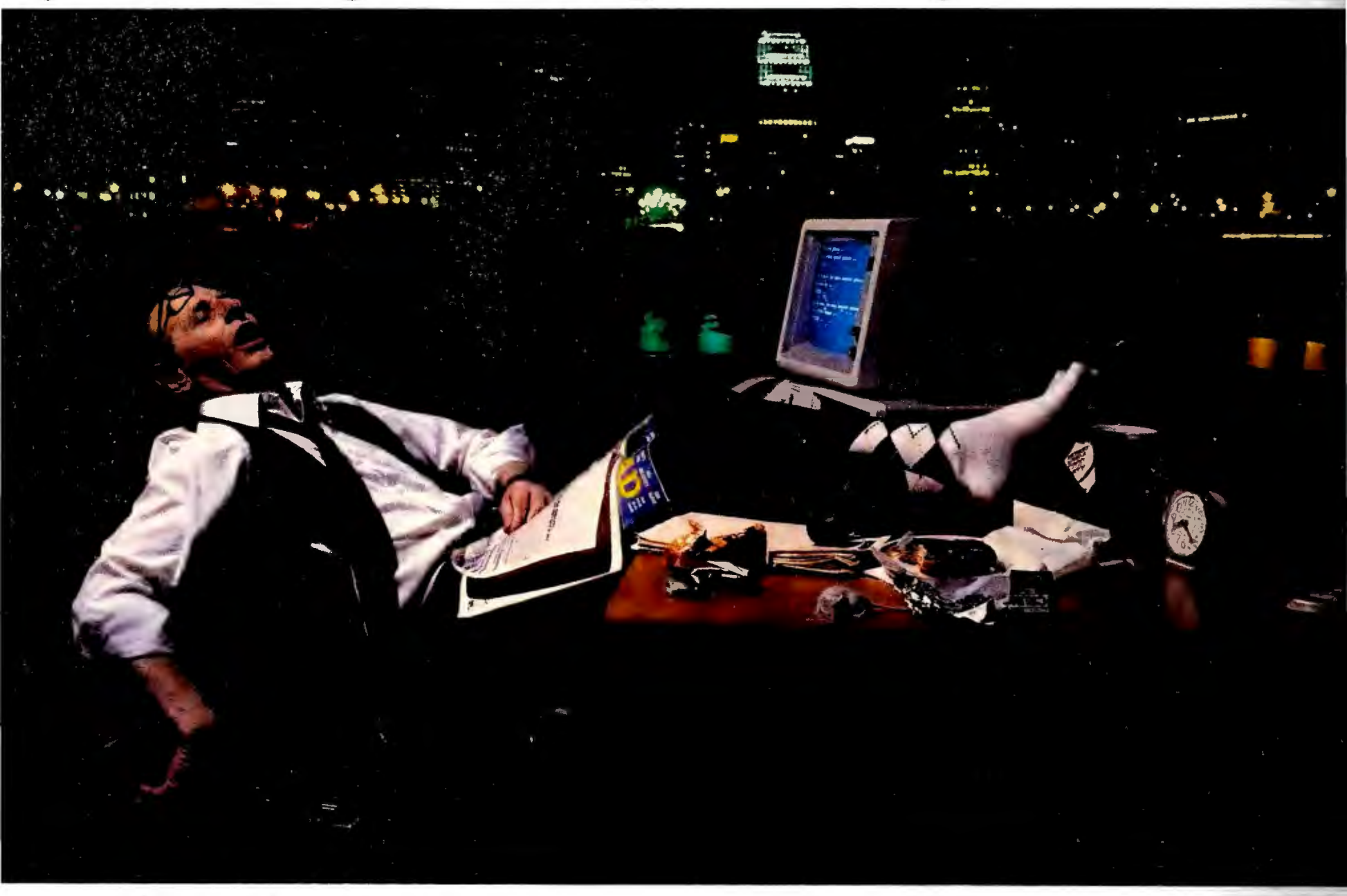

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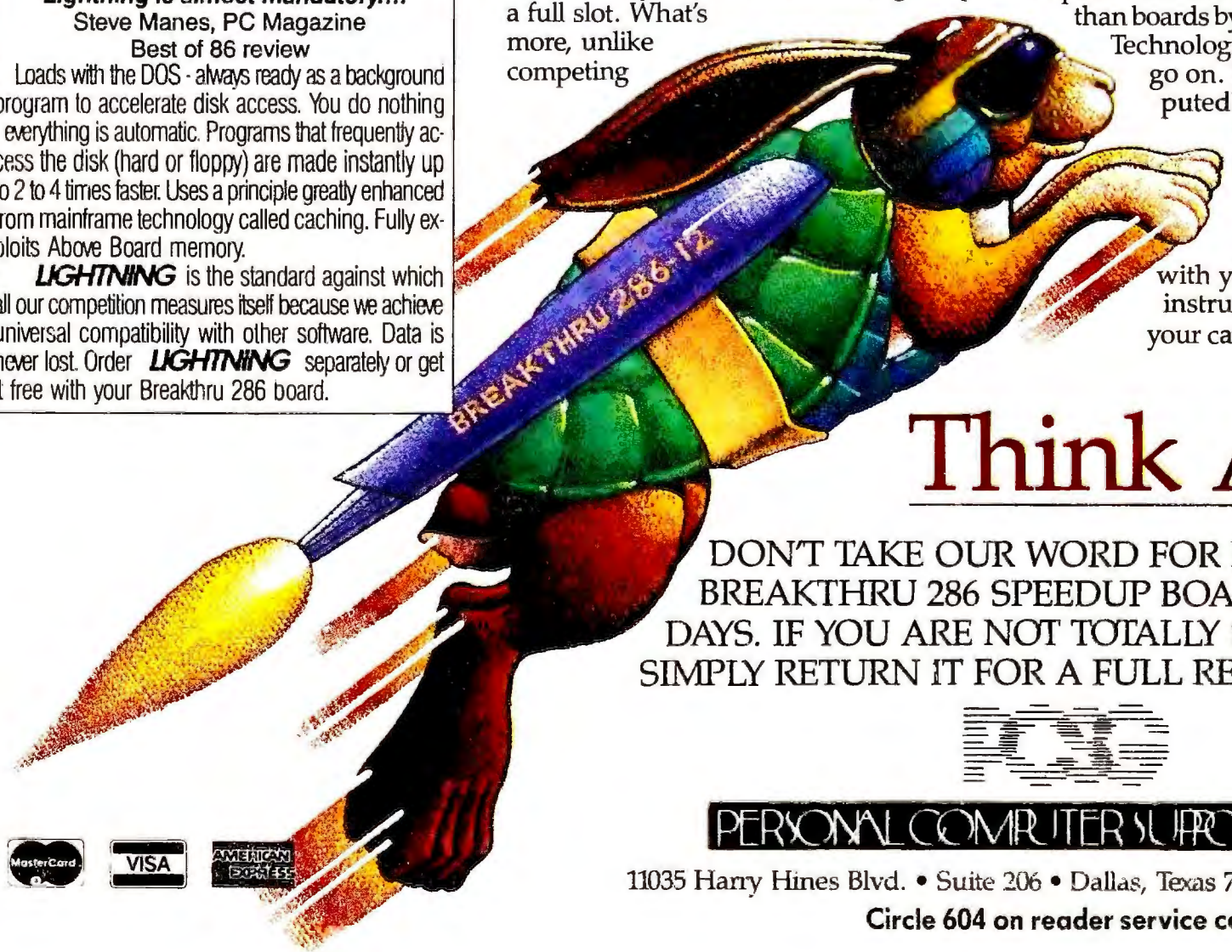

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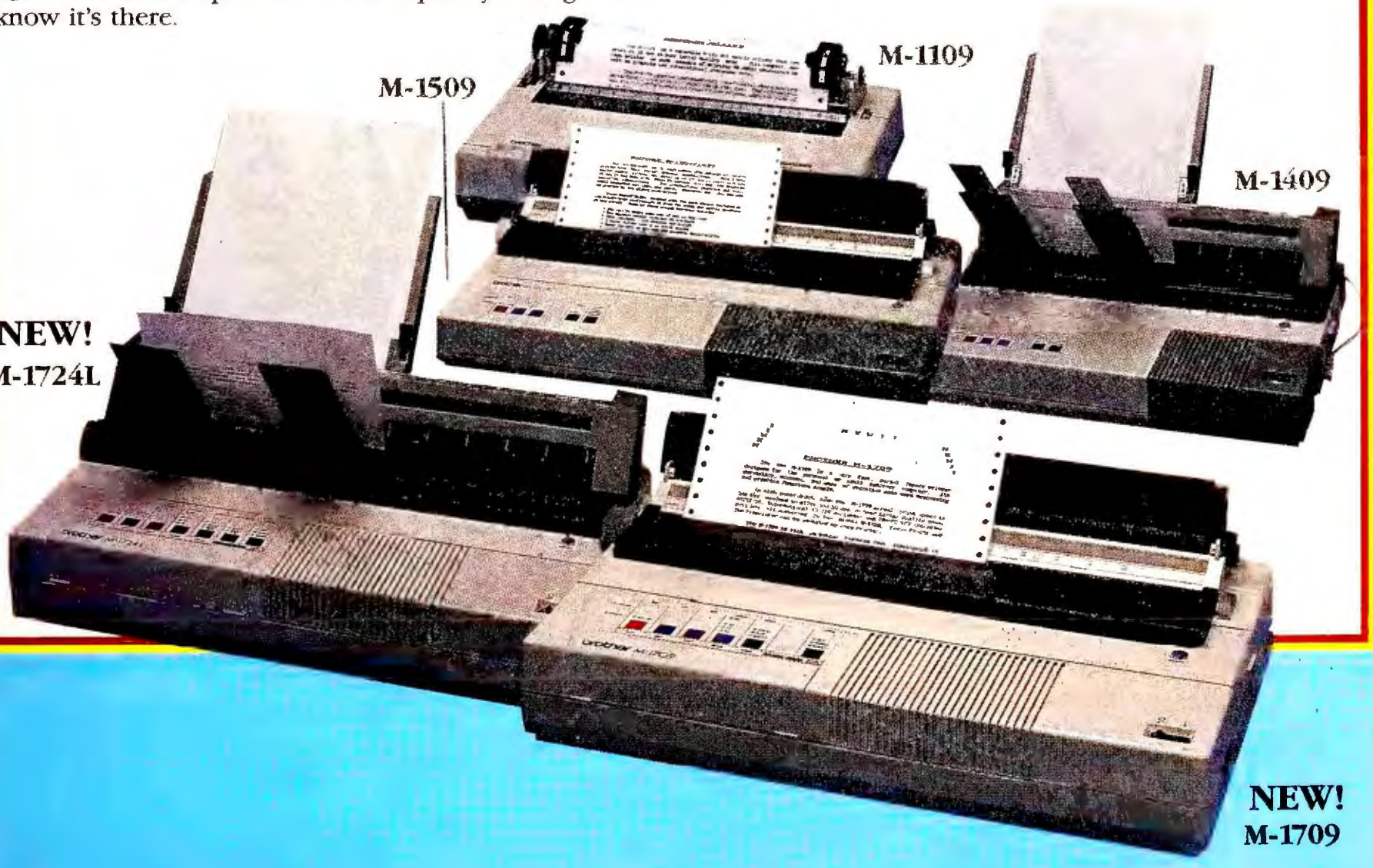

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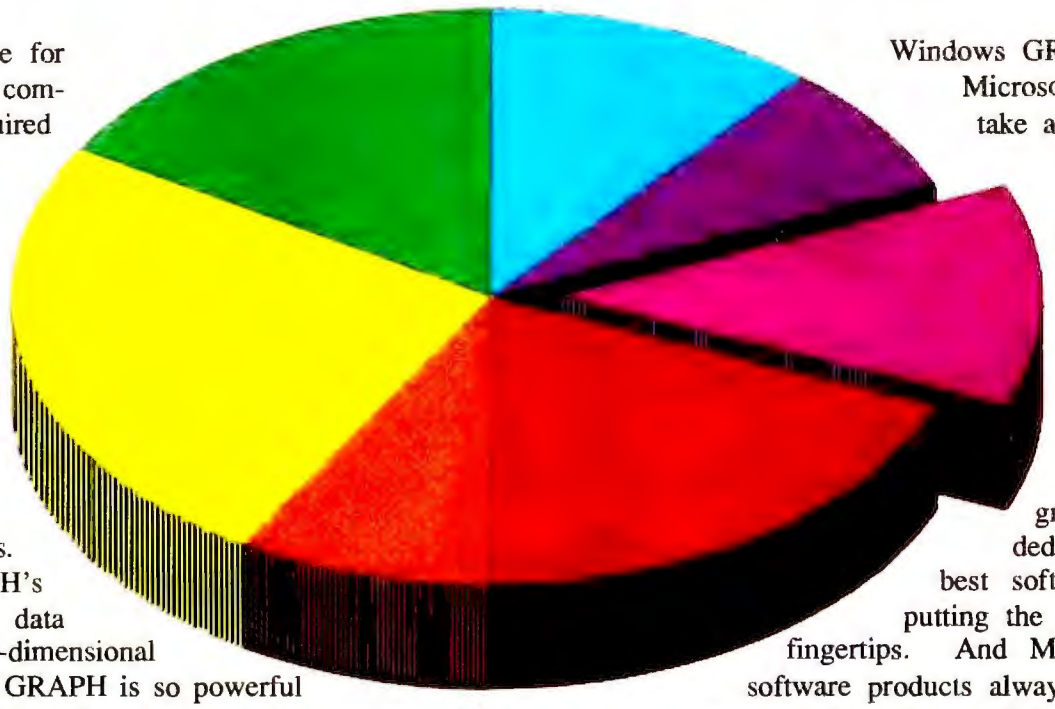

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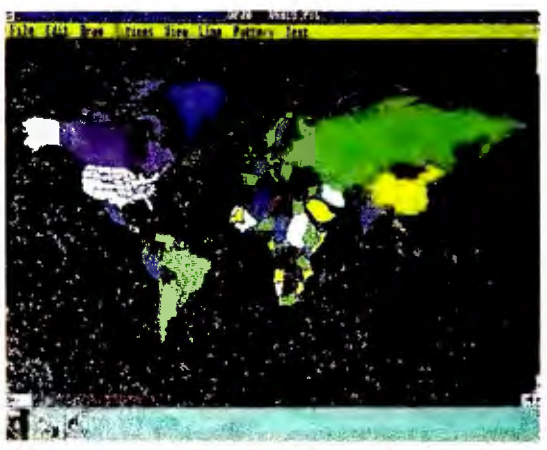

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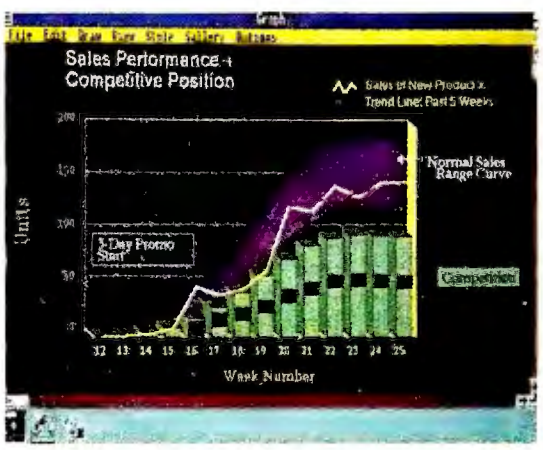

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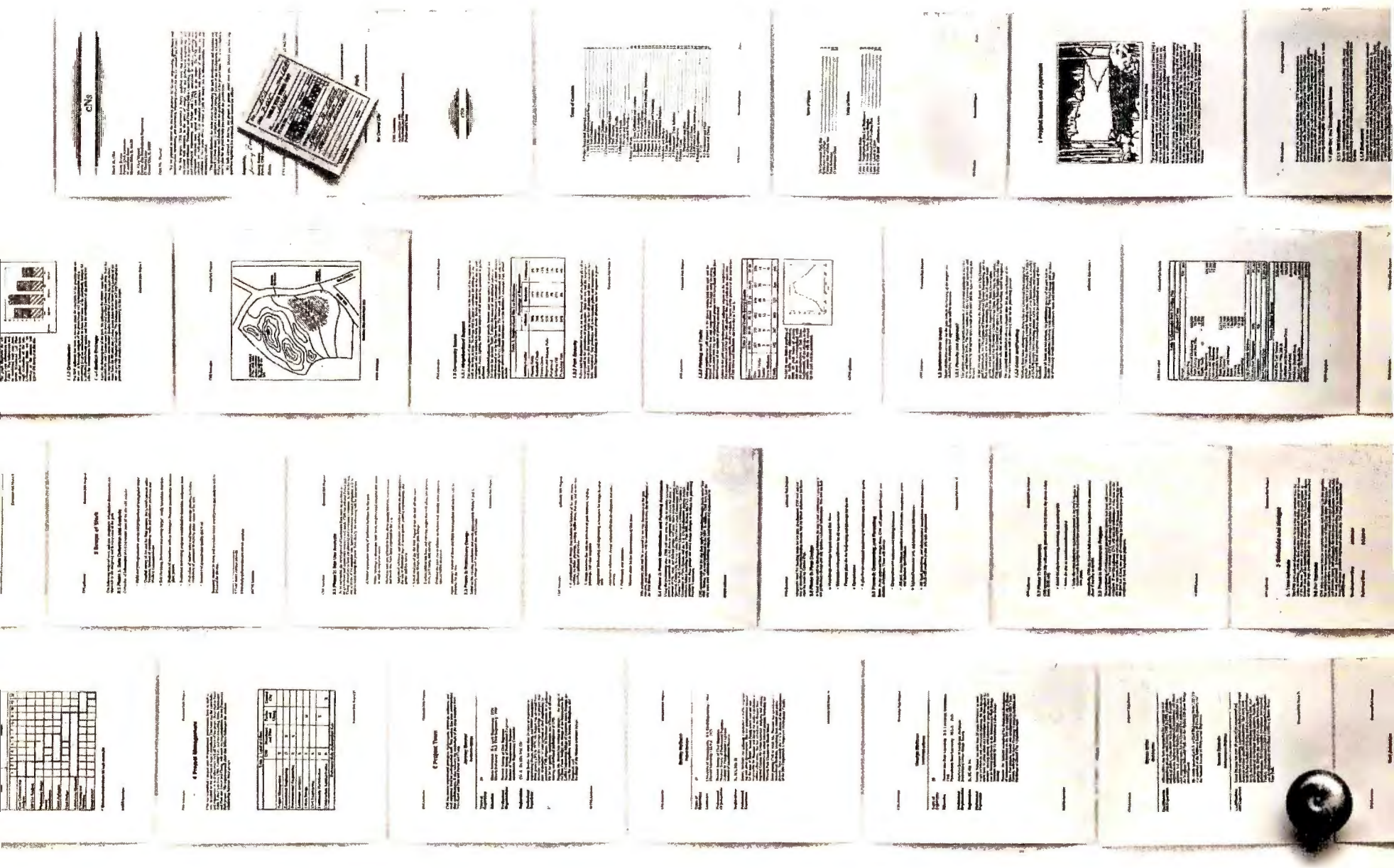

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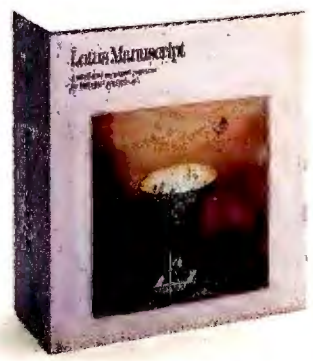

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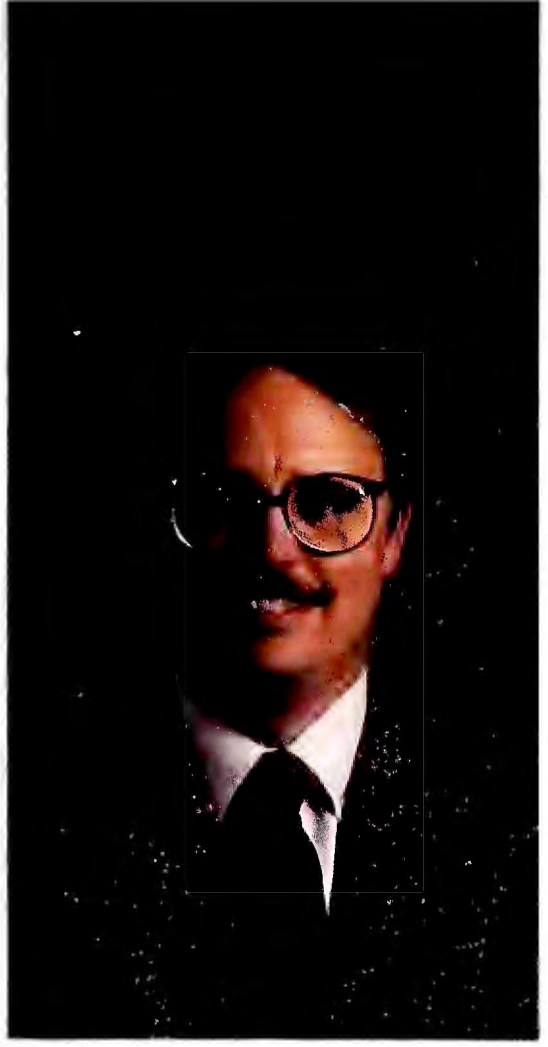

David Bunnell

The Software Inquisition

"Look and feel" is the most divisive issue facing the PC community since copy protection. How do you feel about it? The consensus among software developers seems to be: Not too good.

"Look and feel" has to rank as one of the most obnoxious bits of jargon ever to come down the PC pike. It may very well be the software equivalent to "scratch 'n' sniff," but with an odious meaning: Scratch a program and sniff out a potential copyright violator. One thing is for certain–following the recent lawsuits that Lotus Development filed against Paperback Software for *VP-Planner* and against Mosaic Software for *The Twin* over their alleged copyright infringement of Lotus's *1-2-3*, look and feel has become one of the most widely debated and explosive issues currently facing the personal computing community. At New York's 47th Street Computer discount store, director of computer sales Bobby Orbach aptly described the state of the software industry in the wake of the lawsuit: "It don't look or feel too good."

That may be putting it mildly. Already a lot of software developers are feeling intimidated. They're worried that they might be violating somebody else's look and feel copyright. Suddenly lawyers are becoming part of the software teams making design decisions.

I think we all know what that means. It means that new software products will take longer than ever to reach the market. And skyrocketing legal costs are certain to be passed down to the consumer in the form of higher-priced software. Some industry analysts are even worried that the Lotus lawsuit will throw the software industry into a five-year tailspin in the courts, causing the U.S. to lose its edge over foreign competition. Leadership will pass to Europe, Japan, Singapore, India.

All for what?

How sincere is Lotus in its motives? Does it really want to safeguard the creator's right to benefit from creative endeavor–or is this just a question of Lotus clinging to its near-monopoly on the spreadsheet market?

I recently attended Esther Dyson's Personal Computer

(continues)

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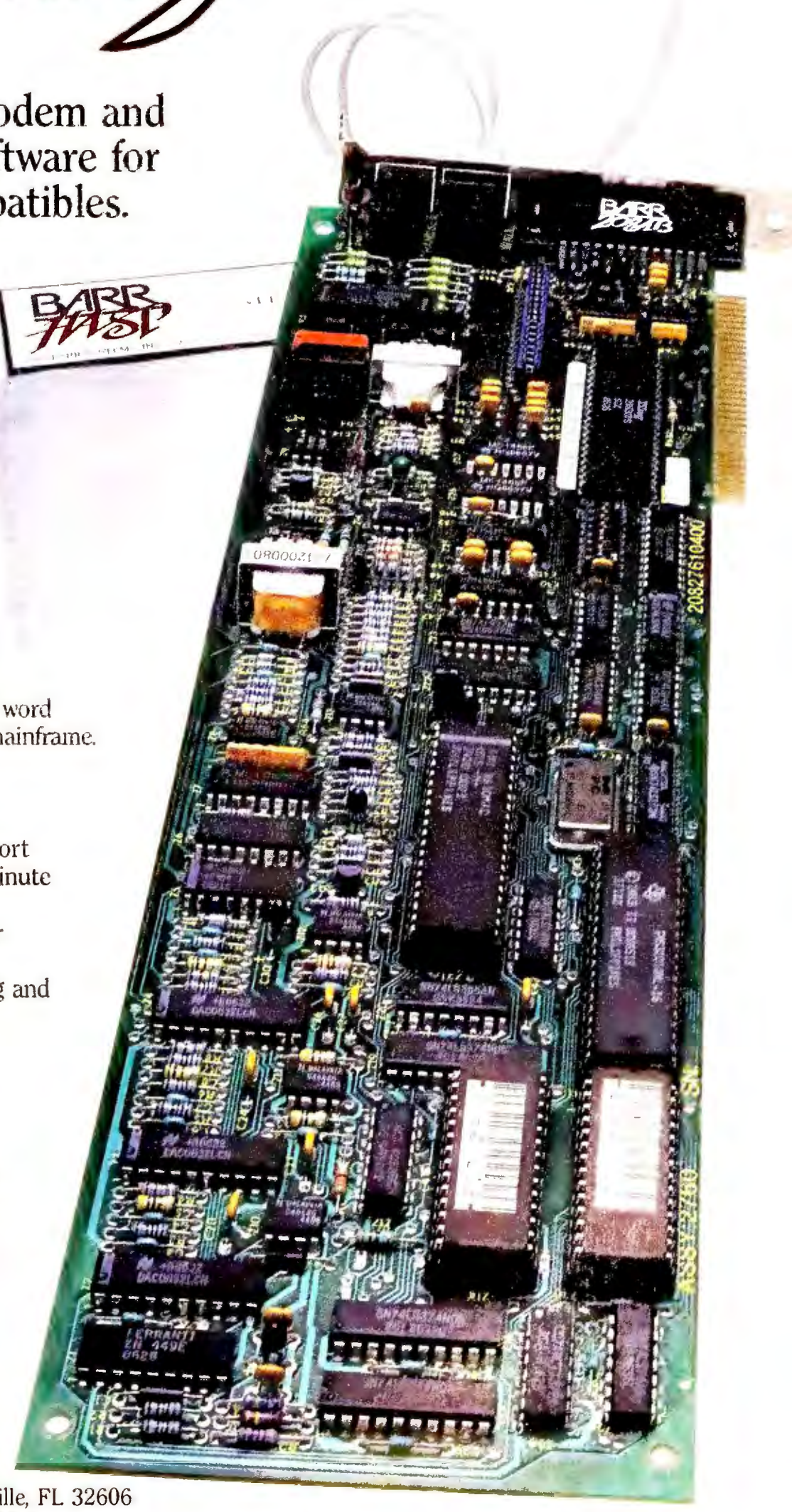

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David Bunnell

Mitch Kapor maintains that "the current litigation ... has to do with products that are keystroke-for-keystroke emulations of other products."

Ann Yow

Forum in Phoenix, Arizona. It's an annual gathering of top personal computer moguls and execs. They get together at the posh Pointe resort to network, talk shop, and shoot the breeze. This year they were also chewing on the notion of look and feel. It was one of the hottest topics of the three-day event. Everyone was extremely concerned about the consequences of the *Lotus* case.

All software companies have a look and feel skeleton rattling somewhere in their development closet. Where do you draw the line? After all, Lotus itself copied the look and feel of *VisiCalc*. MS-DOS is a CP/M look-alike. I've even heard that an early version of MS-DOS has Gary Kildall's name embedded in the code.

Is Digital Research going to sue Microsoft? Is Xerox PARC going to sue Apple over its pulldown menus, windows, and mouse? Will Doug Engelbart sue Xerox PARC? The potential hit list is endless.

At Dyson's forum I decided to find out more about Lotus's lawsuit from none other than Mr. Look and Feel himself, Mitch Kapor. It was a rare opportunity, I might add, since Mitch has been a less-than-public figure ever since he left the helm of Lotus last year. He gave an interview to *Inc.* magazine, then dropped out of sight.

In Phoenix he was as big as life in his trademark Hawaiian shirt—a surprise guest on a panel that discussed the coming of the 80386 machine. Even though my topic was a tad off the mark, I couldn't pass up the chance to ask Mitch the Big Question: "How would Lotus have been different if you hadn't been able to copy the look and feel of *VisiCalc*?"

(continues)

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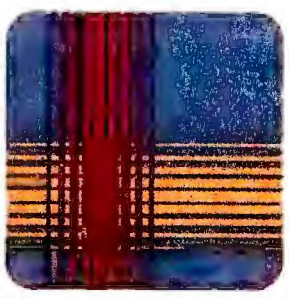

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[redacted]

While refusing to comment on the case specifically, Mitch went on the record by declaring that "the current litigation ... has to do with products that are keystroke-for-keystroke emulations of other products—in other words, clones. The current litigation is not taking a position on issues other than that."

Now, my mind is pretty much an open system, as those of you who know me personally can attest. While I'm opposed to the general thrust of Lotus's look-and-feel offensive, I'm not insensitive to the issue of protecting intellectual property rights—within reason. If the look and feel of an interface has some truly unique aesthetic characteristics, then I think a case could be made for those characteristics to be copyrightable.

It seems odd to me, though, that "keystroke-for-keystroke" emulation should be the issue here, as Mitch insists it is. In fact, I think the opposite is true. It's the look and feel of the screen that is really in contention. I believe that users would be deprived of a lot of potentially great software if the keystroke-by-keystroke standard becomes the rule.

For one thing, there are little kernels of familiar steps inside new programs, which make those programs much easier to learn. In this case, familiarity breeds competence.

I wasn't the only one at the forum who had arrived at this conclusion. Vern Raburn, chairman of Symantec, concurred.

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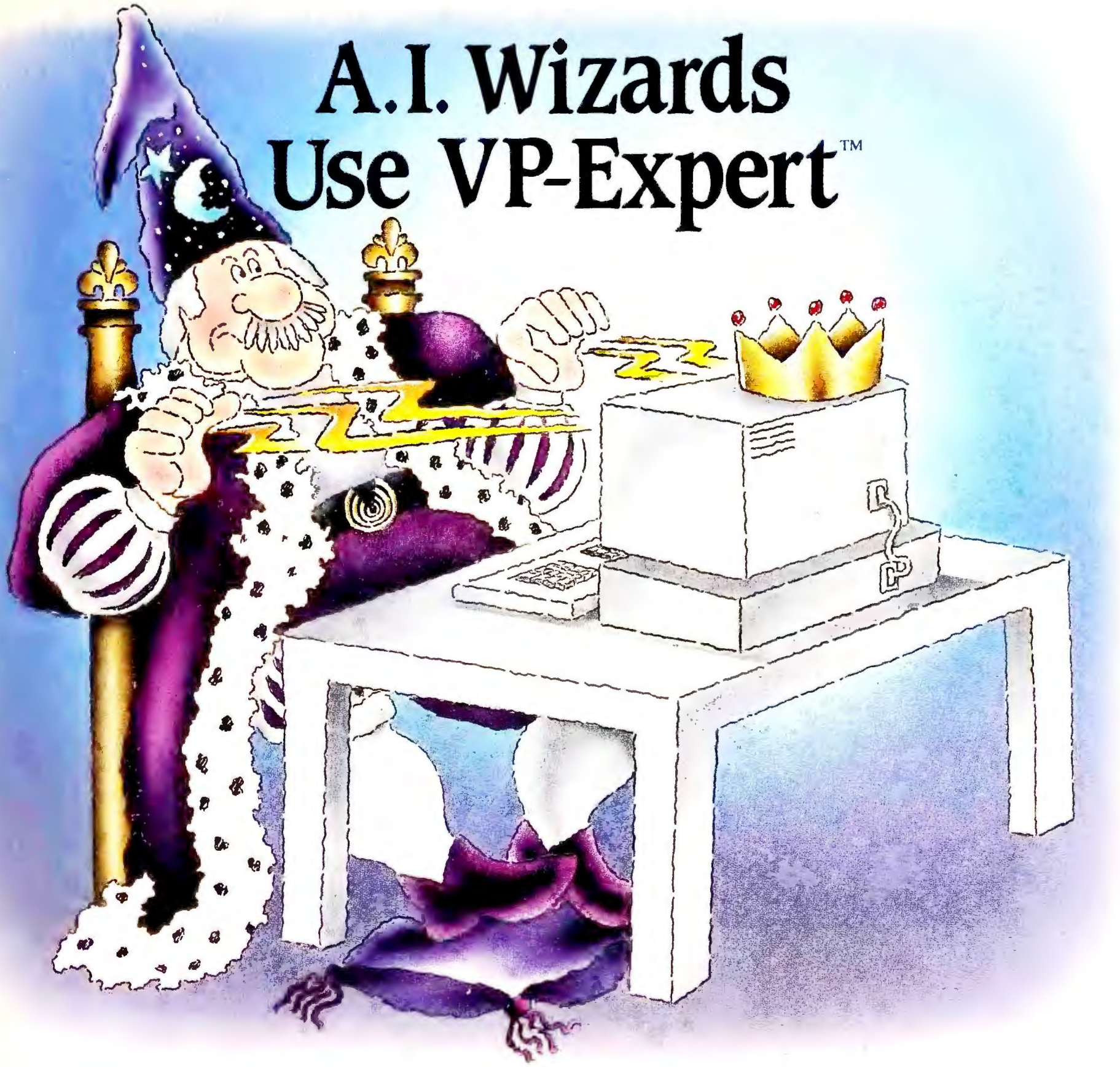

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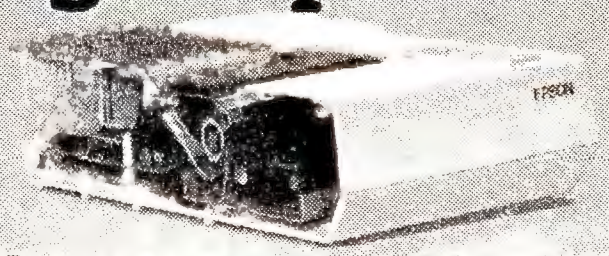

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"People really benefit if we take existing interfaces instead of making them learn a whole new sequence just because we've got to come up with a product that doesn't infringe on look and feel." Raburn also noted the tremendous expense that corporations would have to incur to train employees to learn a new program from scratch.

Other cogent and powerful voices were raised at the forum against Lotus's position, particularly at the software litigation panel. Dan Bricklin, Software Garden president and cocreator of *VisiCalc*, is one of the prime drivers of the anti-Lotus movement. "Most of the developers I talked to ... would like to be free to borrow from others as they see fit, in terms of the human interface," Bricklin declared. "They're aghast at borrowing code; they wouldn't consider doing that. In general, software advances by evolution. There are revolutionary steps, but lots of things are done through evolution. It occurs whenever somebody has to rewrite from scratch and that person's ego gets involved. You never copy exactly; you always embellish because of your ego. That's how we get the genetic mutation that makes evolution. Then you test the product in the marketplace to see if that mutation is good enough."

Bricklin's views were echoed by Ashton-Tate's chief scientist Robert Carr, who spoke out as a concerned member of the personal computer community. "The notion that the first person who happens to file for a particular look

(continues)

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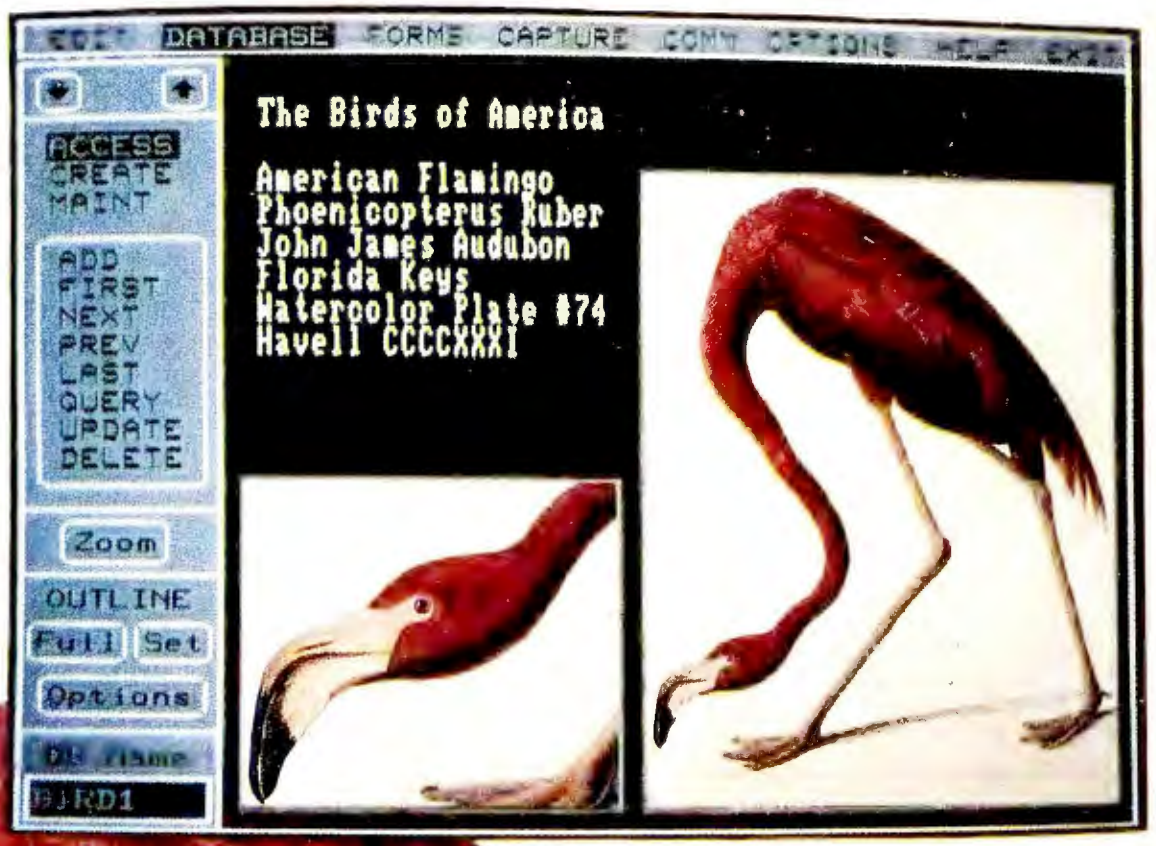

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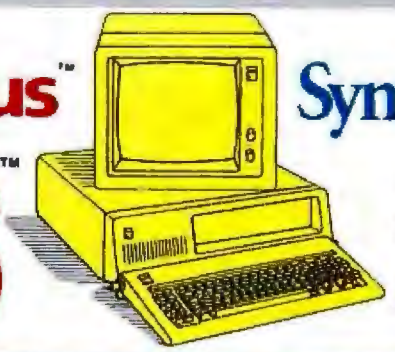

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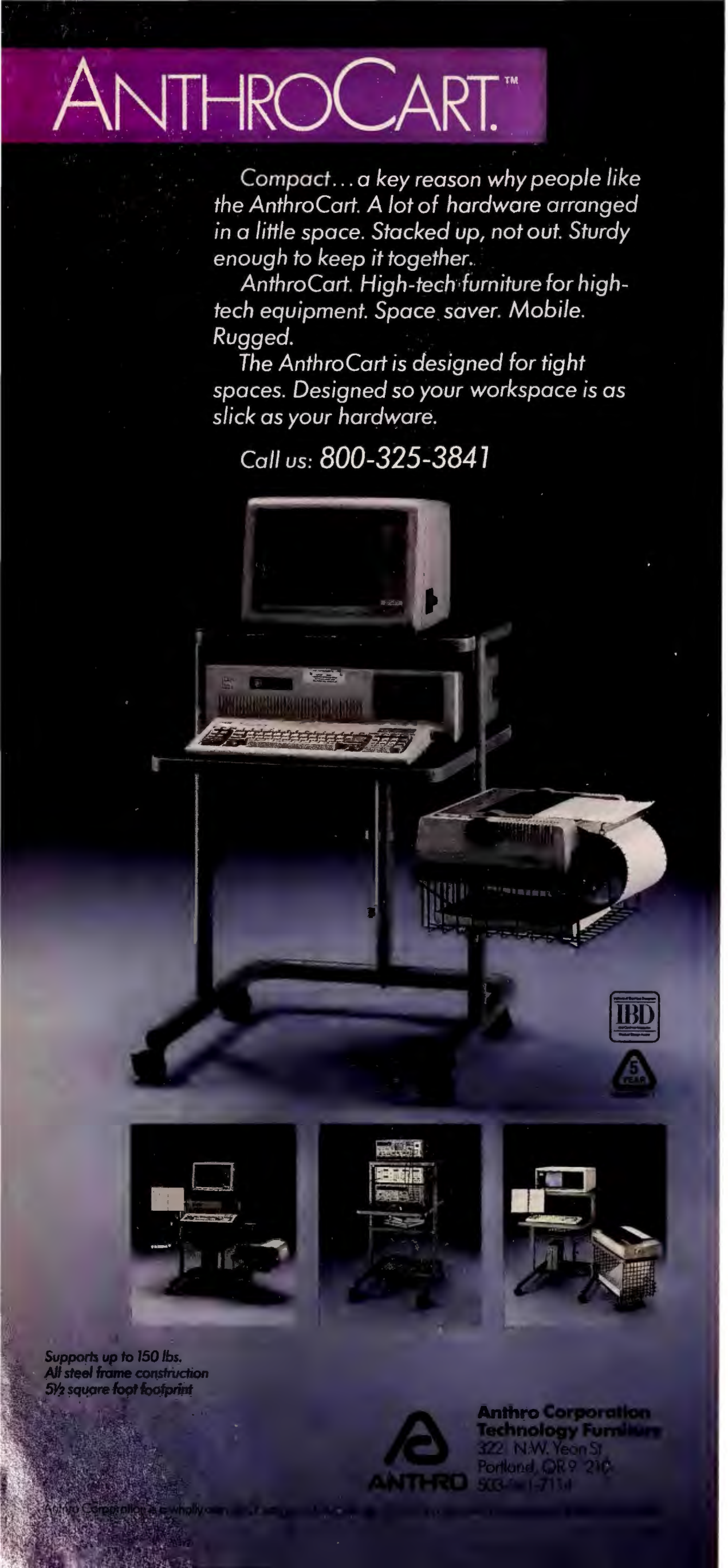
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David Bunnell

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and feel is the one who can license it to everyone else and get rich from it is really destructive. We're all working with a very small screen," Carr observed. "There are only so many ways to have intuitive, transparent, easy-to-use interfaces, and we're all slowly borrowing from each other and evolving—getting closer and closer to convergence on a few very successful paradigms, metaphors, and syntaxes to use in interacting with the screen," he said. "If we make what I call arbitrary deviations—if for no other reason than to protect themselves legally, people purposely make their user interfaces noticeably different—that's going to stunt the growth of the industry. No one wants to learn five or ten different user interfaces."

Camilo Wilson, Lifetree Software president, was no less withering in his criticism of Lotus's position. "The history of this industry, going all the way back to mainframes, is that we have always built on the shoulders of others' accomplishments. So why should Lotus get away with it when they have been a main beneficiary of that tradition? Not having that freedom anymore is outright damaging."

What really surprised me was how strong the anti-Lotus mood was among the industry leaders who attended the forum. In a show of hands at the litigation panel, only a few people out of the several hundred attendees were on Lotus's side. Clearly, the consensus of those present was that Lotus has made a serious mistake

(continues)

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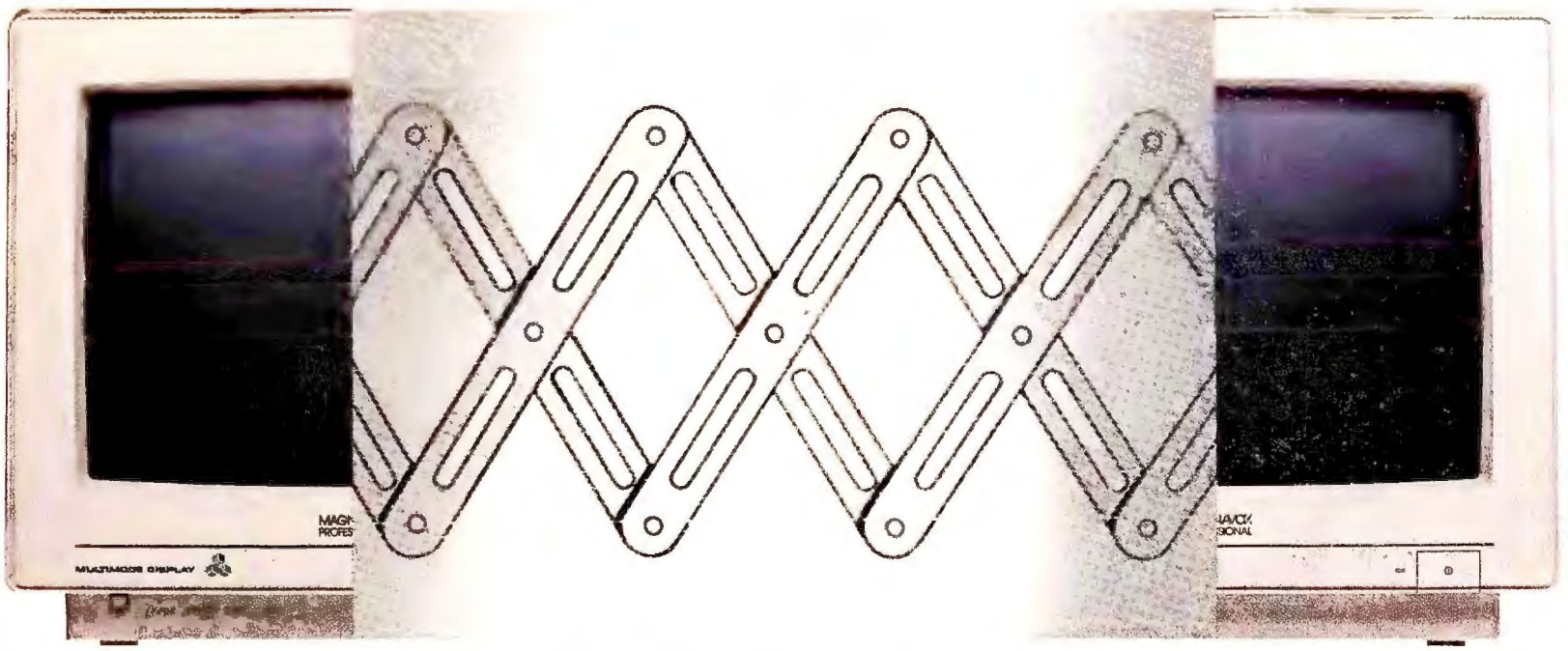

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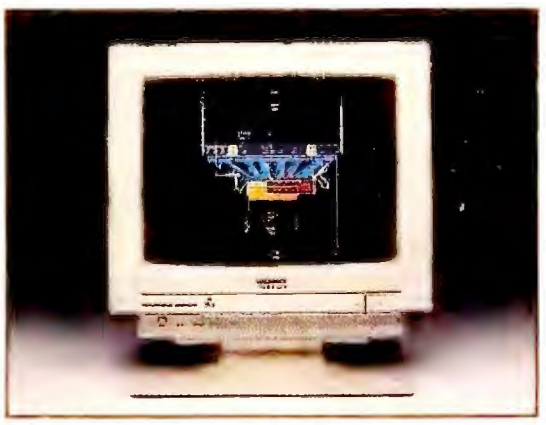

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in pressing the look and feel issue. Reportedly, Paperback Software has vowed to fight this case "to the death."

On the other hand, there are some very vocal proponents of the lawsuit. Bill Gates, Microsoft chairman and CEO, belongs to this camp. "When is something plagiarism?" he asked. "Is some drawing of a mouse stealing the image of Mickey Mouse? When is music stolen? These are all tough questions, but we've managed to do well with the laws we have. Having a lawsuit will eliminate confusion, not create confusion. We're going to have a ruling from a judge."

I, for one, have my doubts about the wisdom of going the courtroom route. In my opinion, letting the lawyers and the courts decide an issue that is so vital to the community as a whole is a big mistake. For that matter, the final decision may come out in a way that even Lotus may not welcome. Meanwhile, the whole software industry will grind to a halt while everyone sits around giving depositions.

I believe this issue should be resolved by everyone who has a stake in the outcome of the look and feel affair. There should be a consensus on policy by all the players involved. Once we agree, we can forge the path to legislation and get a proper law passed for the industry to follow.

I strongly urge you to pay close attention to the debate and to let your voice be heard. After all, this may seem like look and feel, but the crux of the issue is really freedom of expression and the future of personal computing. Let's look before we leap—and feel before we act.

You can participate in this month's PC World Reader Poll: The "Look-and-Feel" Controversy—see page 70

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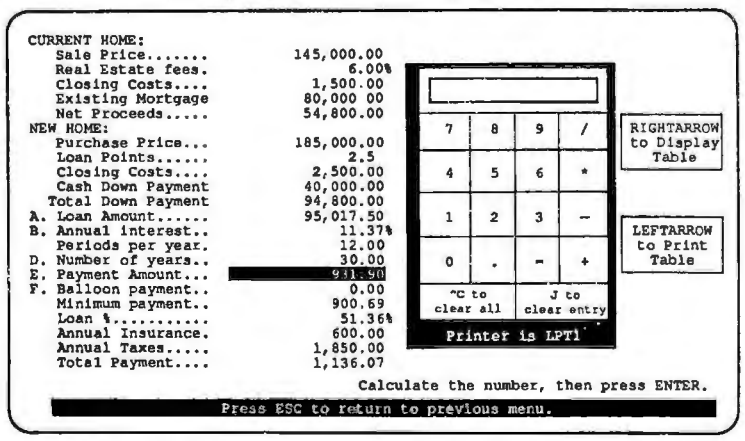

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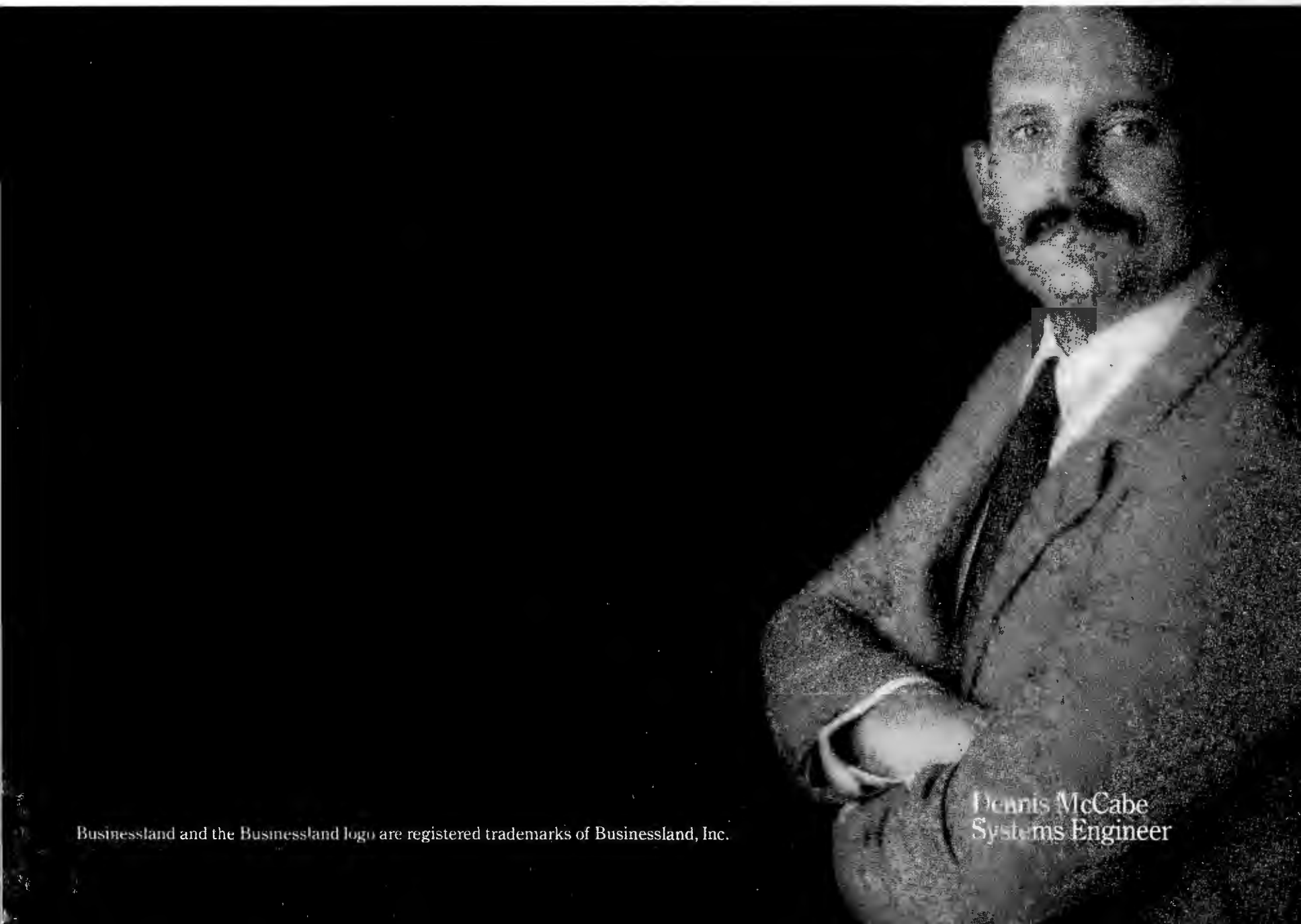

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Letters

Reactions and responses from the PC World community

Where Have All the Hackers Gone?

David Bunnell's Personal Computer Achievement Awards [*David Bunnell, PCW,* January 1987] made me nostalgic for the good old days of personal computing. All the gentlemen who received Bunnell's recognition certainly deserve kudos for their achievements, but their button-down appearances and corporate backgrounds seem far removed from the more casual attire and diverse credentials of the people who ignited the personal computer revolution.

The industry that sprouted from garages and university back rooms has finally gone commercial. Have spontaneity and a sense of adventure disappeared from the PC scene? I know times have changed, but I like to think that squirreled away in some quiet room is the next-generation hacker preparing to unleash the PC of the future.

Jonathan Nobles
Boston, Massachusetts

The Business of Games

I'm glad David Bunnell gives due recognition to Trip Hawkins and Electronic Arts in his Personal Computer Achievement Awards. It's refreshing to see a company that has focused its efforts on the much-maligned home and entertainment market doing well enough to stand alongside companies that produce business software.

I think recognition is long overdue for computer games in general. Games left the arcade stage long ago and now represent some of the most sophisticated and creative applications for personal computers. Most users have several challenging games in their software libraries right next to the spreadsheets, word processors, and data base managers.

Business-oriented personal computer magazines tend to look down their nose at computer games, but companies like Electronic Arts, Mindscape, and Infocom generate substantial annual incomes. These boys play in the big leagues, and no doubt they'll be around for a long time to come. They deserve some respect.

Julie Wong
New York, New York

A Modest Nomination

Let me applaud David Bunnell's selections for the 1986 Personal Computer Achievement Awards. I'd like to nominate Mr. Bunnell as someone who has made significant contributions to personal computing. His influence extends to every domain of the computer revolution, and his standards of excellence and acuity of judgment serve as a model for the industry. Mr. Bunnell also deserves recognition and appreciation for his publications, which more than any others reflect a discerning insight into diverse user needs and trends.

David Becker
Kent, Washington

Mac Attack

The "PC World Graphics Forum" [*PCW,* February 1987] vividly illustrates a sad state of affairs in the IBM PC kingdom– the confusion and gnashing of teeth over graphics. Apple, in the meantime, cruises along, free from the chaos and confusion.

(continues)

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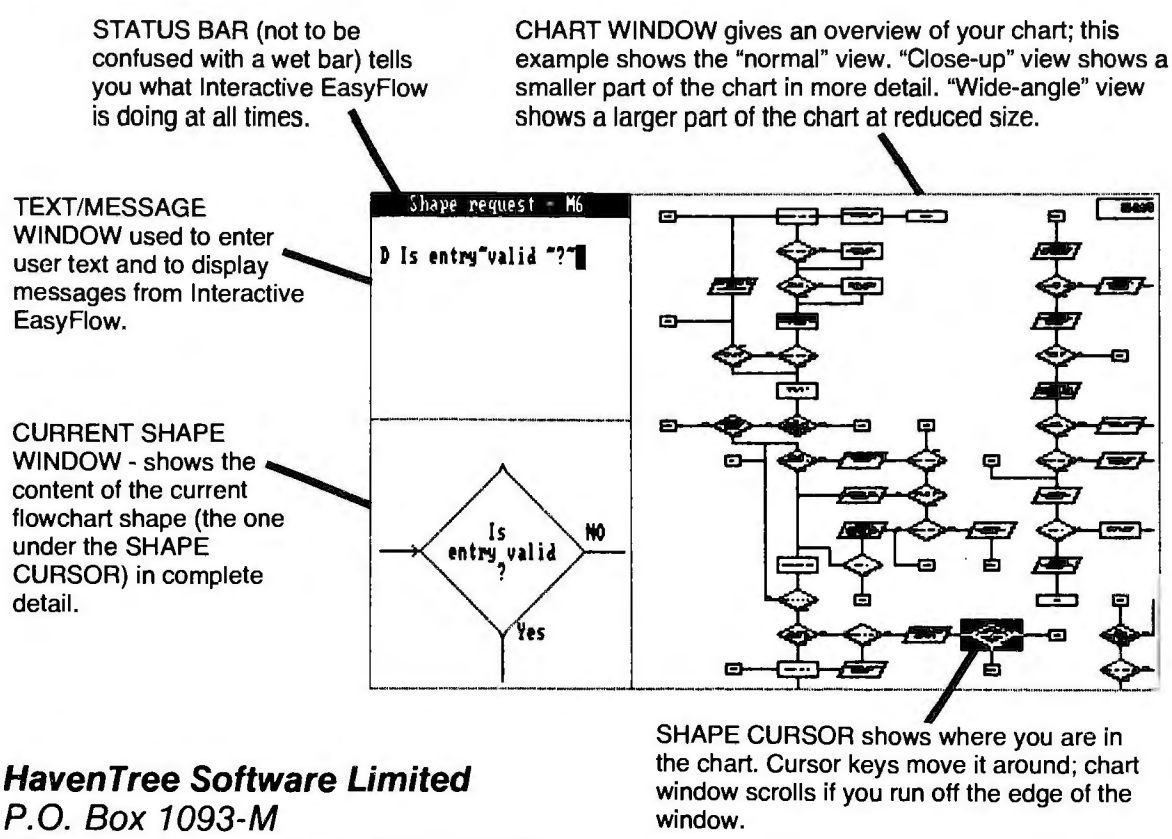

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Just how little PC [industry luminaries] comprehend the Macintosh user interface is evident in several quotes. David Wilcox states, "The moment you move into a Macintosh-style environment, you have to point and click with a mouse," and John Butler replies, "That's a failure . . . in the design of the Macintosh's user interface; it's something we had to clean up in *Windows*. You want to be able to access functions in an expert fashion. . . . " Perhaps these gentlemen have never heard of the Mac's Command key or of the many macros built into Mac software. Point-and-click is a superior input method for many applications, in fact indispensable for some, but Mac users have always had the option of accelerating commands by typing them.

This article brings to mind Apple's famous "lemming" TV commercial—the one where a long line of grey-suited PC users determinedly follow each other over the side of a cliff.

Arden Henderson
Angleton, Texas

Industry Develops Healthy Habits

The Semiconductor Industry Association (SIA) has taken to heart a University of Massachusetts study revealing an inordinate number of miscarriages among 35 pregnant women who worked at Digital Equipment Corporation. The SIA is sponsoring its own study that reportedly will cover 2000 pregnancies at several plants.

(continues)

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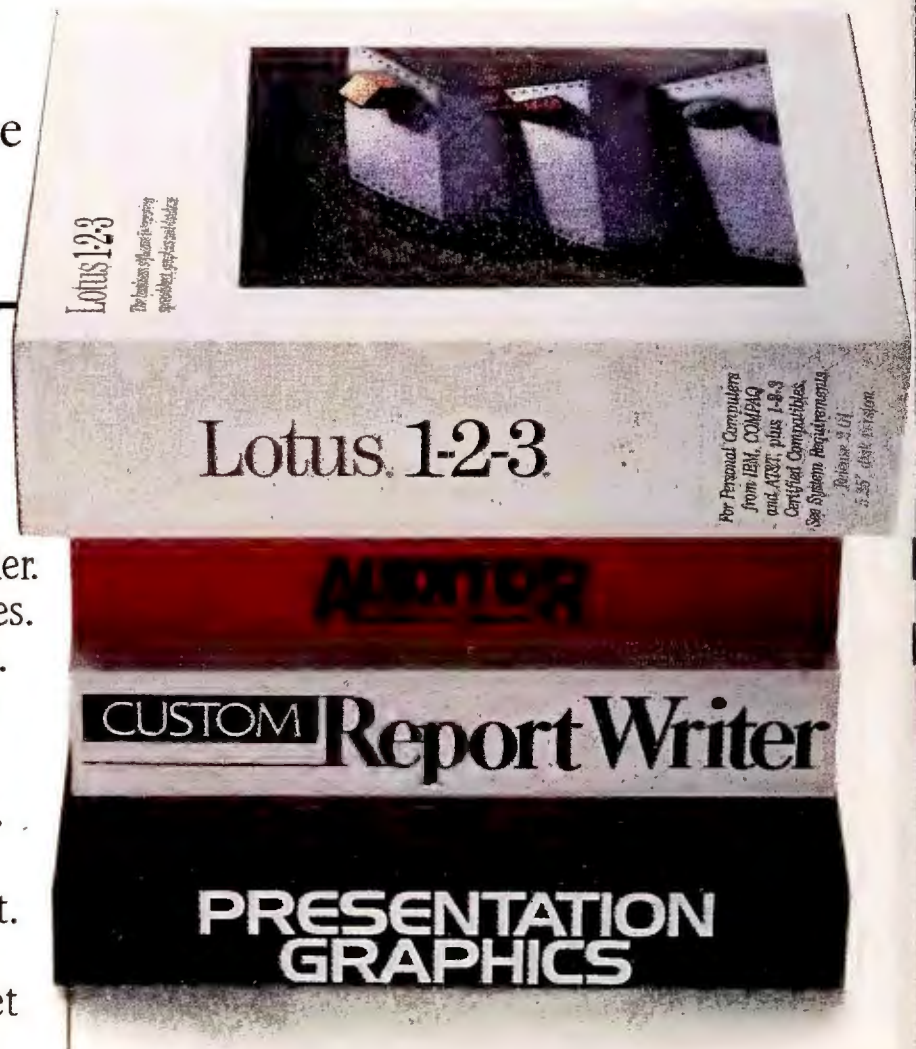

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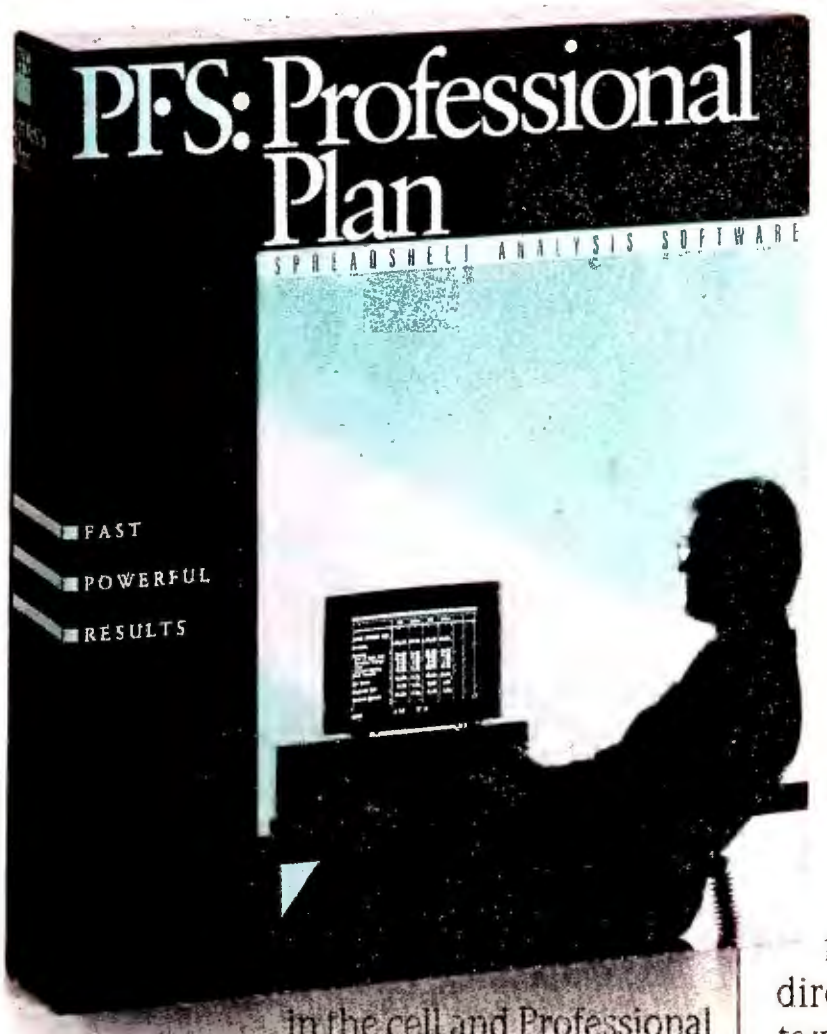

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The University of California at Berkeley is studying the effect of VDTs in the workplace. IBM admitted that its manufacturing facilities polluted the groundwater in San Jose, California. Investigations into similar occurrences continue in the Silicon Valley area.

These issues should have received serious consideration a long time ago. I hope this trend continues.

Eve Spence
Santa Clara, California

Group Therapy

I'm glad to see *PC World* pay tribute to PC user groups ["PC Users Unite!" *PCW*, January 1987]. I was in a software jam at the office once and under a tight deadline. While the manufacturer's tech support took its time returning my frantic calls for help, a local user group came to the rescue. I've been a member ever since.

I've found user groups a reliable source of answers to problems. Members are very helpful when it comes time to make hardware and software purchases. Their frank opinions on various products can sometimes be more cogent than magazine reviews, and user group meetings provide face-to-face feedback. User group newsletters often contain useful information and reviews of less-well-known products that magazines don't have the space for. All PC owners would do well to investigate the local user group.

Pat Gale
Seattle, Washington

(continues)

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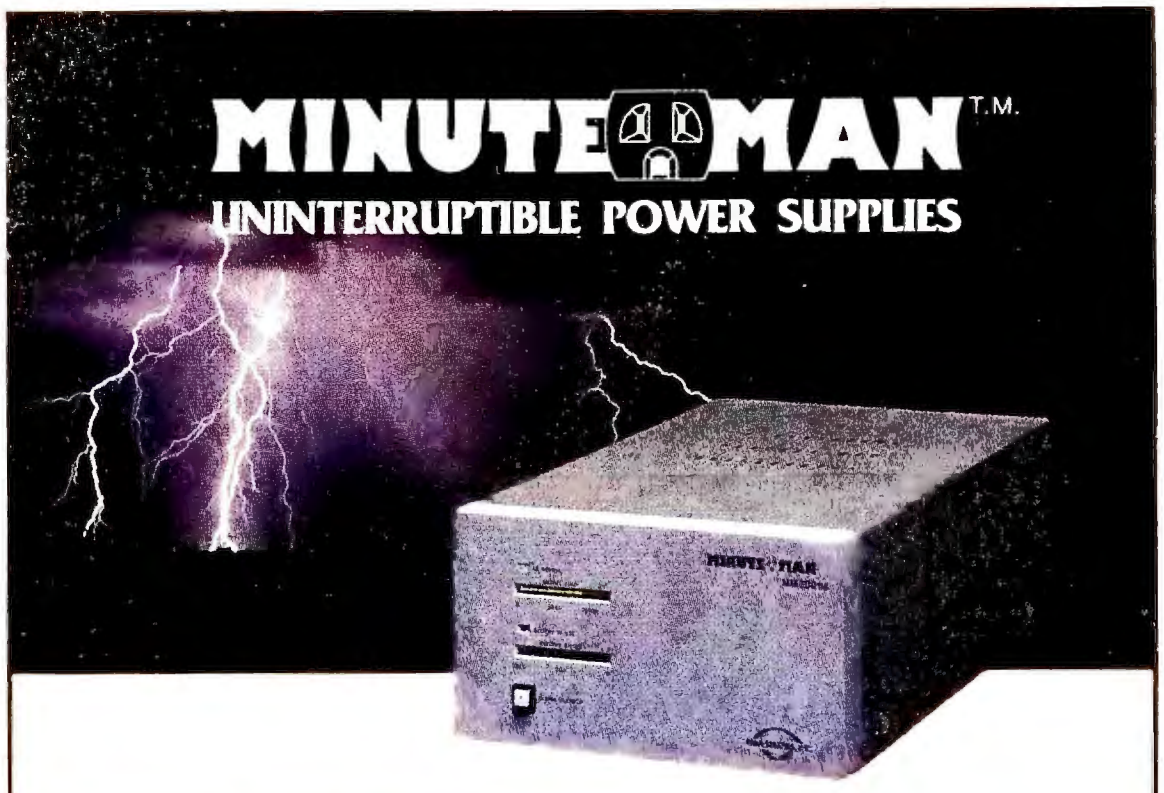

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Second Thoughts About AI

Howard Rheingold's article "Thinking About Thinking PCs" [*PCW*, December 1986] provides a refreshing perspective on today's typical artificial intelligence hype. Our use of language is situation- and culture-bound. It depends on underlying cognition and intelligence. Rheingold's examples are wonderful illustrations of these principles, which have unfortunately been overlooked in the rush to derive commercial advantage from a technology not yet in its infancy.

Kevin Markey
Denver, Colorado

Copy Protection in the Mist

I'd like to comment on the exchange between Mr. Frank Meschler and Mindscape's Ian Hadley regarding copy protection of *The Mist* [*Letters*, *PCW*, January 1987]. Mr. Hadley's obsession with the possible loss of revenue in the absence of copy protection is all too typical of software publishers who don't understand software users. Saddling customers with an archaic and seriously limiting copy protection scheme can be far more costly than a less obtrusive protection scheme or no protection at all.

Most users, like myself, do not buy copy-protected programs, because their performance is slow and they lose files. Few software companies analyze the total cost of copy protection in terms of lost or limited sales and negative user

(continues)

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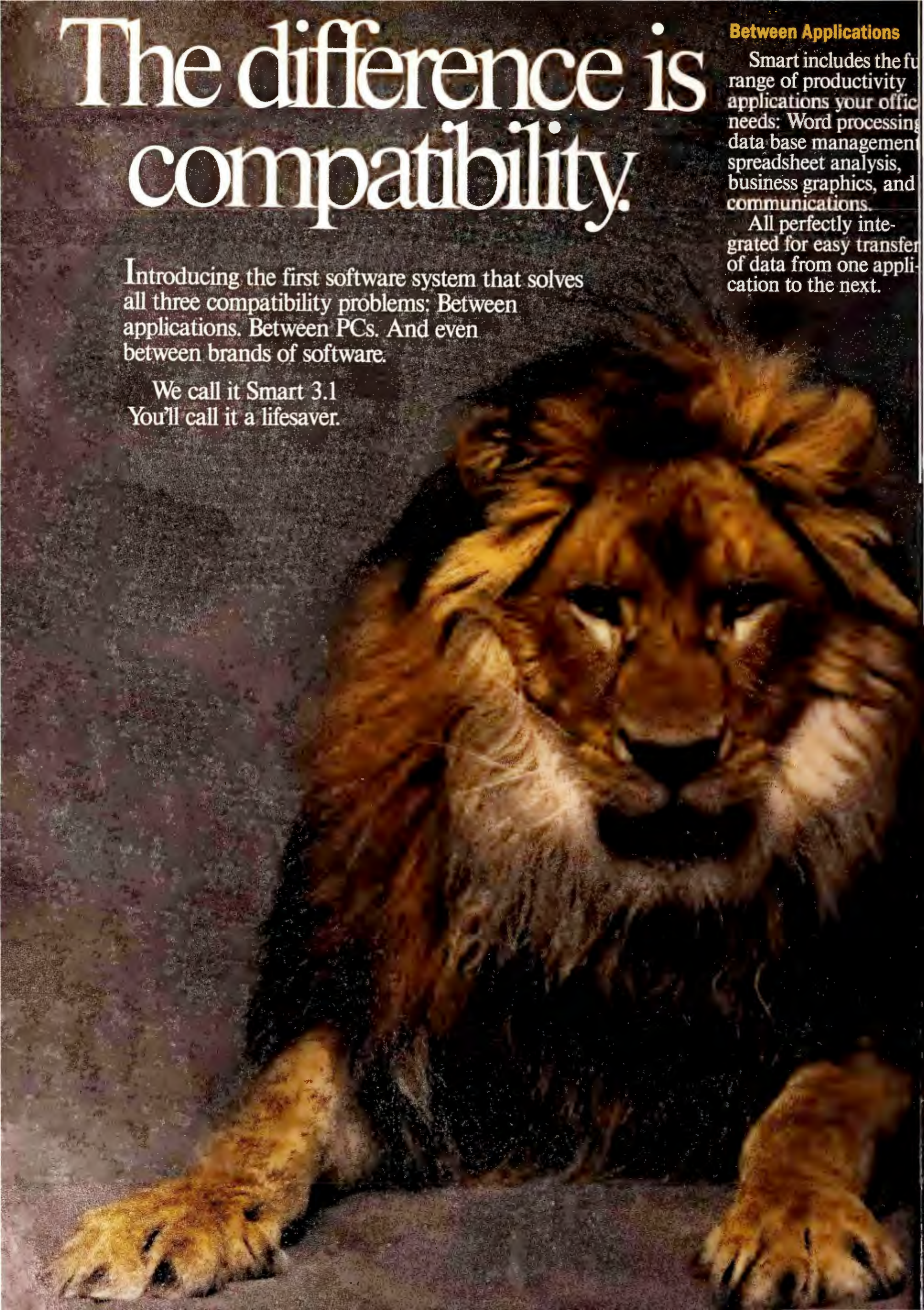

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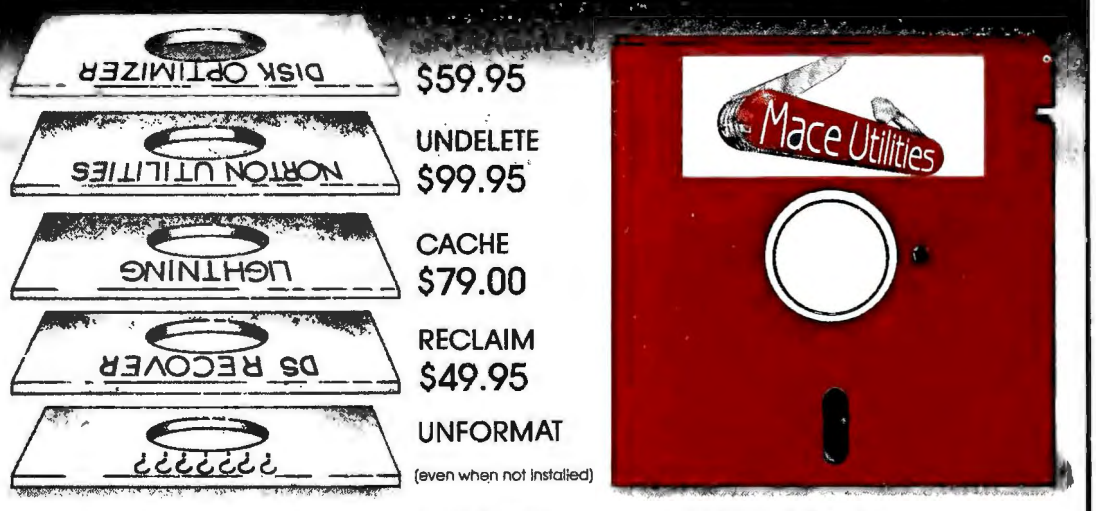

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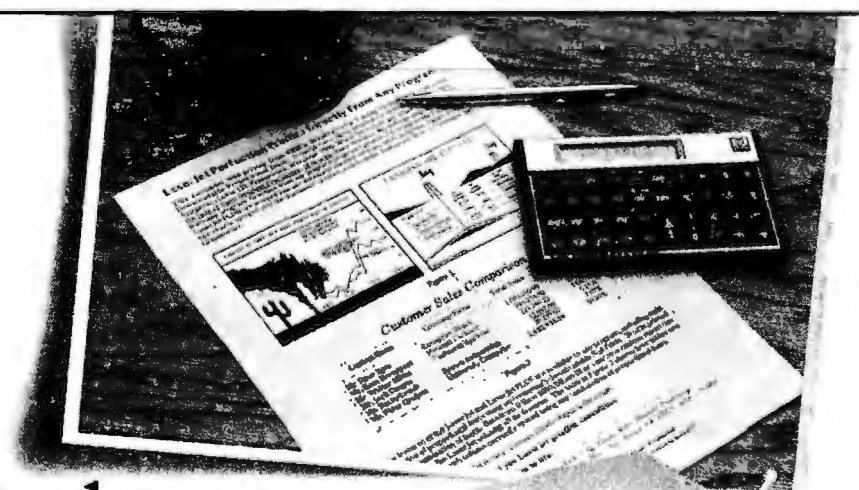

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attitudes. Losses increase if competitive unprotected programs are available. Lotus, for example, lost hundreds of thousands of dollars in government sales because of copy protection and the availability of competitive unprotected programs.

R. W. Tackett
Paoli, Pennsylvania

An Epson Solution

I recently purchased an Epson LQ800 printer and experienced the same tractor feed problem described in "Print Along the Dotted Line" [*PCW*, February 1987]. A phone call to Epson revealed a simple solution.

The paper release lever must remain in the forward postion. The platen and the tractor move at slightly different speeds, causing the paper to jam if the lever is closed. I tried keeping the lever forward and printed a 180-page document on cheap paper with no problems. If you read the manual very carefully, it tells you to move the paper release lever forward at the beginning of the installation procedure, but it makes no further mention of the lever. So much for clear documentation.

Barbara Hersch
New York, New York

Basic EGA

The Help Screen [*PCW*, February 1987] discusses EGA color graphics support in Microsoft's QuickBASIC 2.0, but the latest version of IBM's BASICA, version 3.20

(continues)

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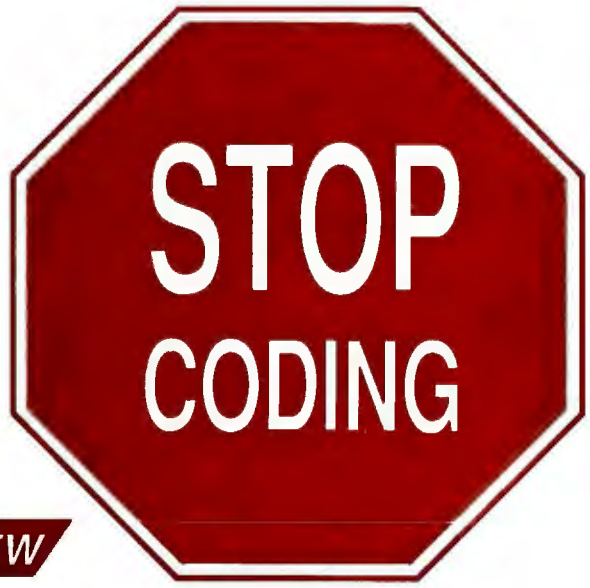

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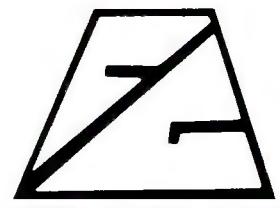

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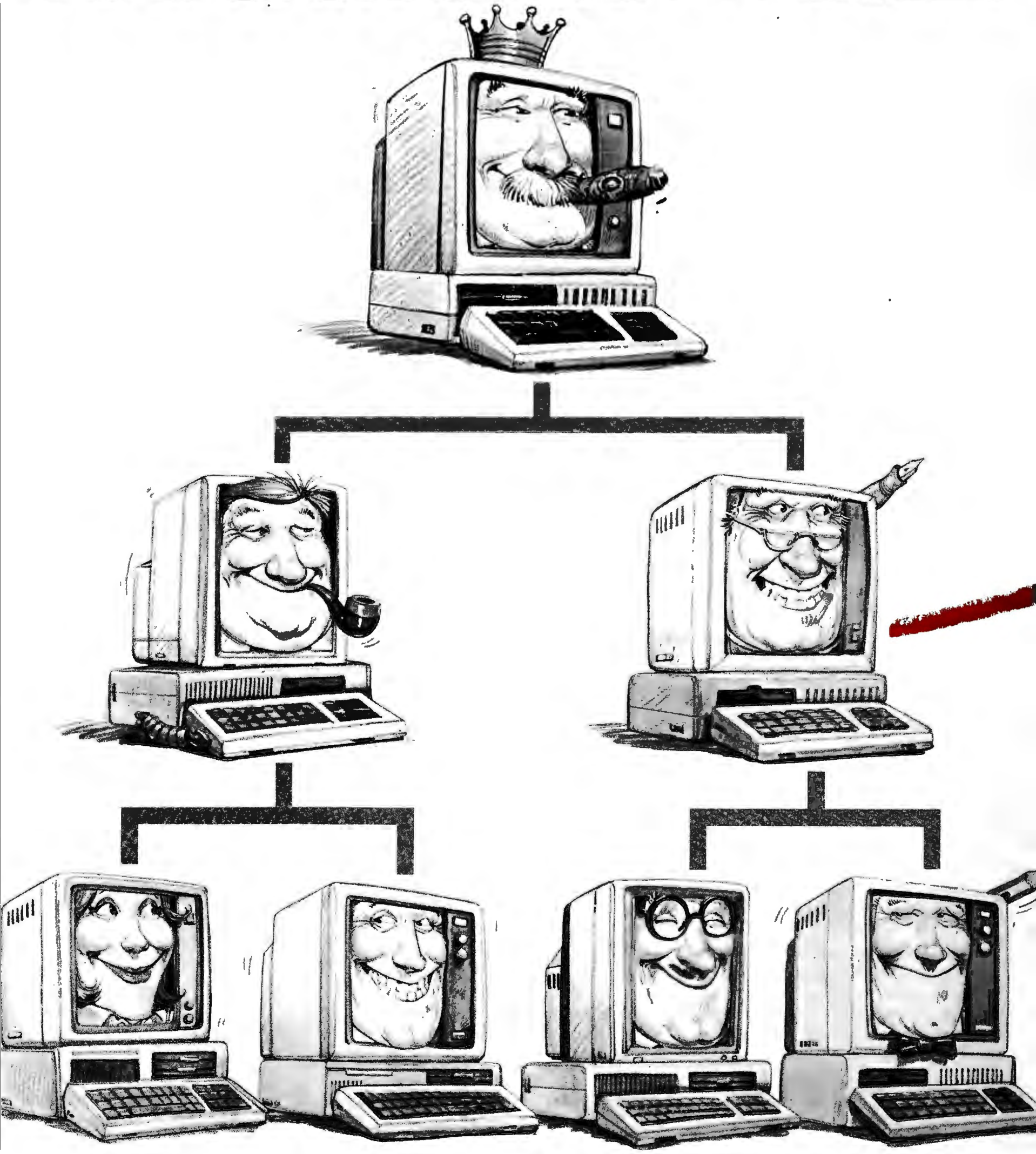

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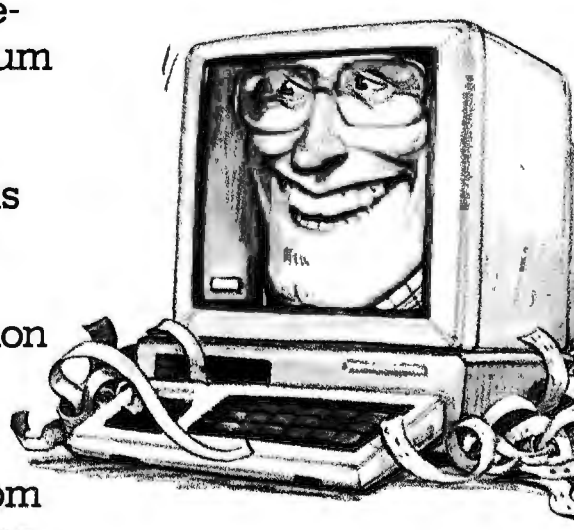

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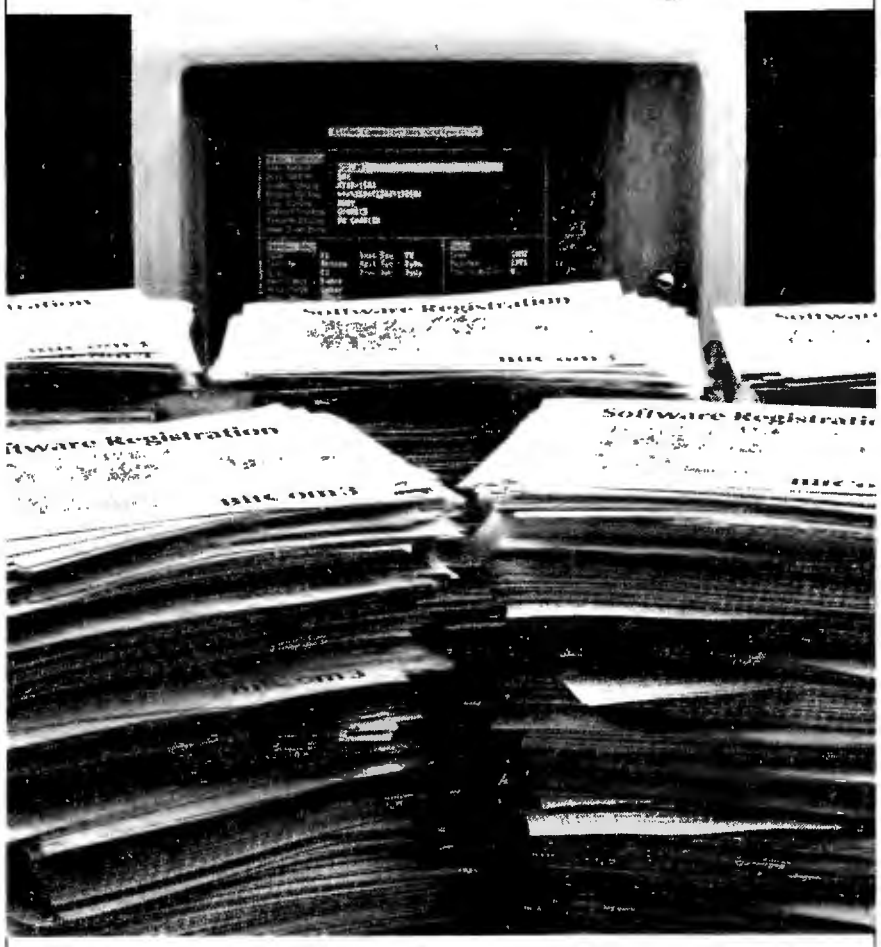

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Circle 783 on reader service card

(supplied with DOS 3.20), also provides similar support and commands. While this version of the BASICA interpreter is slow, requires line numbers, and lacks separate subroutines, it does offer EGA color capability as an incentive to upgrade to the latest DOS.

Pete Goffinet
Wilmington, Delaware

System V Support

An addendum to William Urschel's "R:base: The Promise Expressed" [*PCW*, February 1987]: I believe one important consideration when selecting a data base manager is the quality of technical support. I've found Microrim's to be excellent.

My experience has proven Mr. Urschel's statement that "unless you are thoroughly prepared or very familiar with data management and programming structures, your application will probably end up snarled." But between Microrim technical support and *System V*, anyone can create exceptional applications.

Dorothy Levy
Columbus, Georgia

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For example, it might stop on a sentence like "I feel I should have won the Grammatik II contest", tell you that "feel" is probably incorrect and suggest "think" instead. You can ignore the suggestion and move on (calling this your writing style), or mark the problem to be edited later. Grammatik never, never automatically fixes anything for you. It's a coach, not a dictator.

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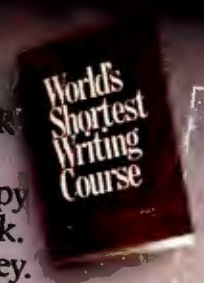

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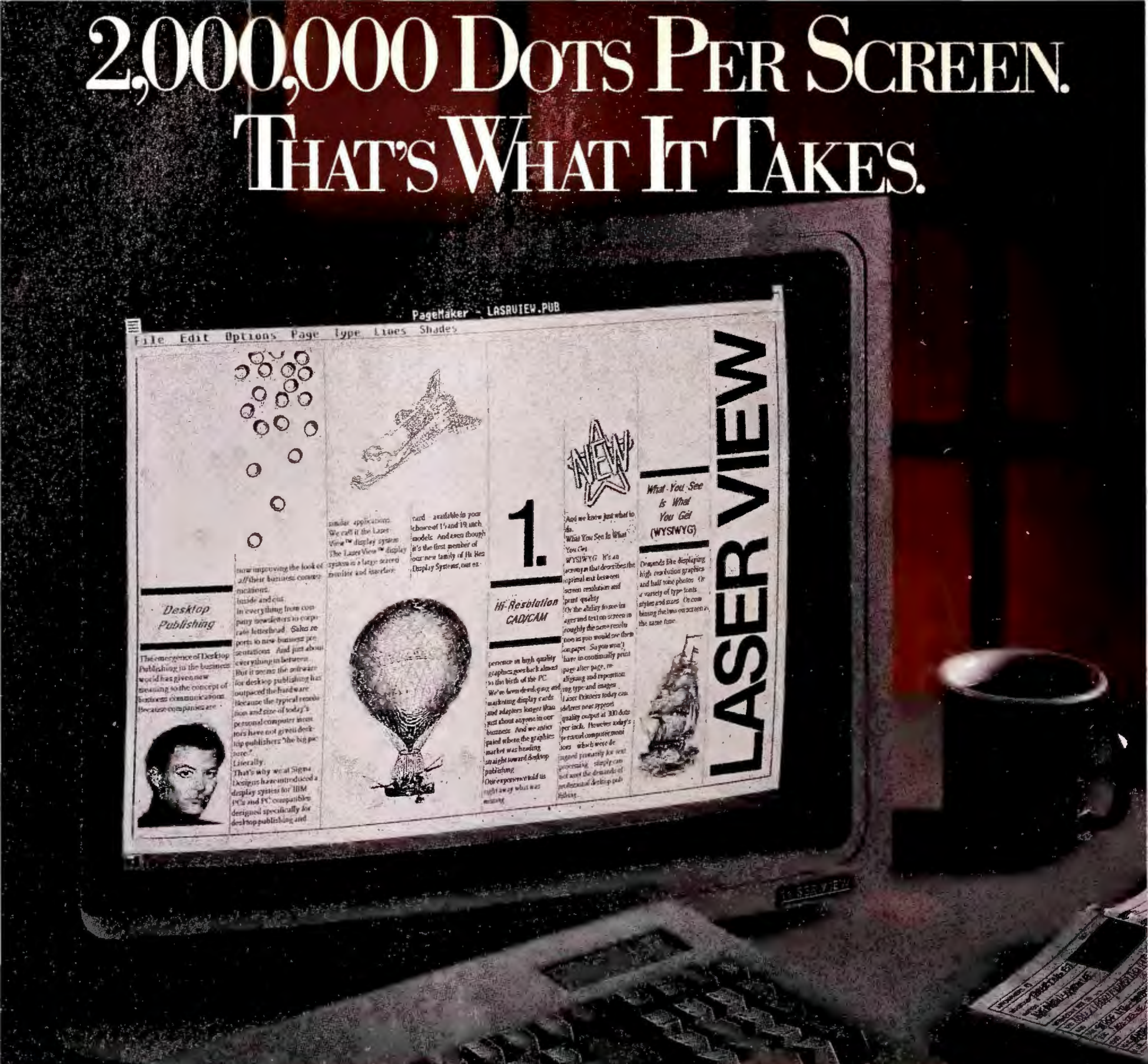

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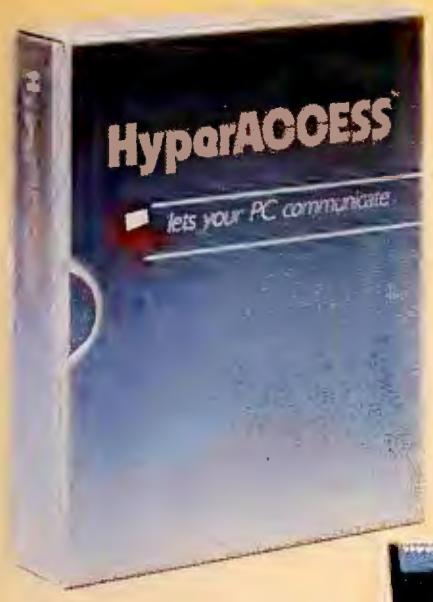

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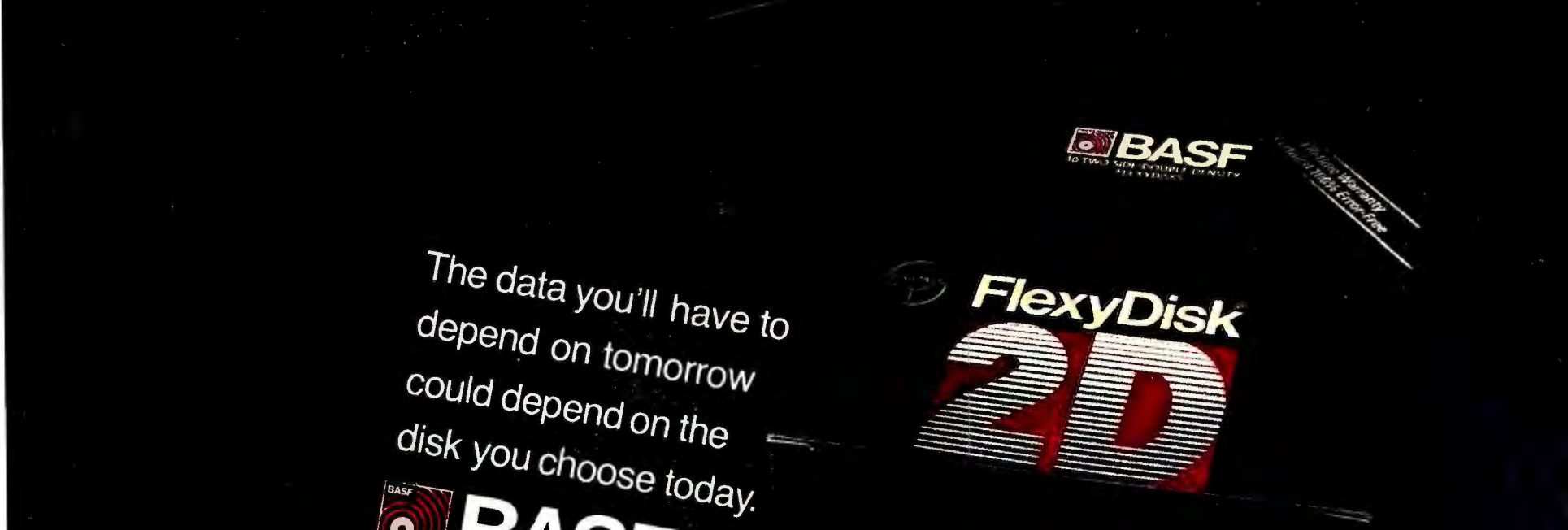

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F O R E V E R

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Harry Miller

Gentlemen, Rev Your Engines

As battles rage over the "look and feel" of software, some firms discover a more lucrative means to protect their investment: They're giving it away.

Most experienced personal computer users like learning a new application about as much as they like doing their taxes. Although it may sound strange to the uninitiated, there's a subtle kind of comfort in pressing the slash or <F10> key to disclose the familiar *1-2-3*-style menu.

Taking advantage of that phenomenon, several of the leading software companies are setting out to establish their application programs as "engines" or "cores" onto which other developers can build new functionality. *Microsoft Windows* is recognized as such an environment, but few people think of *1-2-3* or *SideKick* in that vein. Yet Lotus and Borland are indeed promoting their products as engines, publishing specifications that enable third-party developers to create add-in or add-on applications. And they're not the only ones.

These application program interfaces (or APIs) provide a substantial foundation for add-ons. Think about the time and energy a developer saves by not having to recreate the calculation capabilities of *1-2-3* or the memory-resident core manager of *SideKick* or Lotus's *Metro*. Further consider the effort saved by leaving decisions about menu style and other screen-design questions to the program core developers. If you were creating a tax preparation add-on for *1-2-3* or a filing application to work with *SideKick* or Borland's recently announced *SideKick Plus,* such savings could mean the difference between profitability (or at least feasibility) and failure. And the large installed base might make the difference between the program's acceptance and obscurity.

One nice aspect of this development is that the Lotus and Borland engines and their add-ons are designed to perform well on 8088-based PCs. So not only do users avoid struggling to install and learn a whole new program, but they also protect their capital investment in what some consider obsolete equipment.

(continues)

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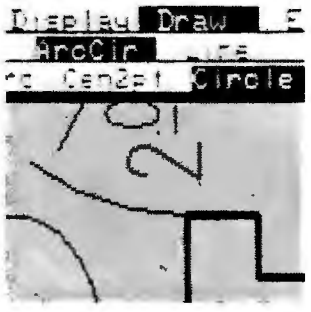

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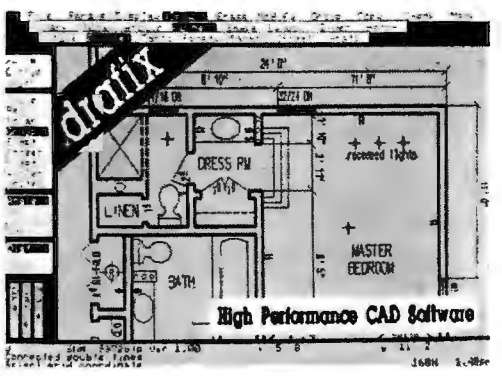

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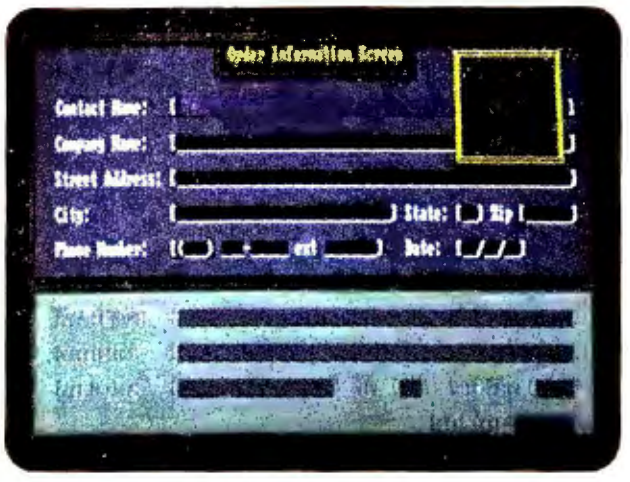

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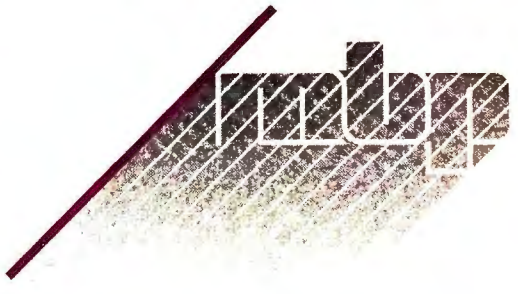

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This seems to be a good deal all around: The core developers extend the life of their products by entrenching them even further as standards, the add-on developers save development time and gain a well-defined target audience, and the end users skip the irksome learning curve they usually face with every new function. Meanwhile, the useful life of the current installed base of 8088 PCs is extended in the process.

It's another example of the personal computer industry creating what Compaq president and CEO Rod Canion terms innovation within an established standard. It looks like the kind of competition where everyone wins. It's certainly a more fruitful endeavor than litigation that seeks to closely guard the "look and feel" of products.

There has been, and will continue to be, a lot written about the "look and feel" issue that's been brought to the fore by Lotus's litigation against Paperback Software and Mosaic Software. For better or worse, the suits will be settled in the courts, not at industry forums or on magazine pages. However, there are larger issues than legalities at stake here. Personal computer users deserve the highest-quality, most innovative products possible: products that add functionality but don't force you to climb the learning curve from ground zero. They also deserve the availability of fully capable products at all price levels.

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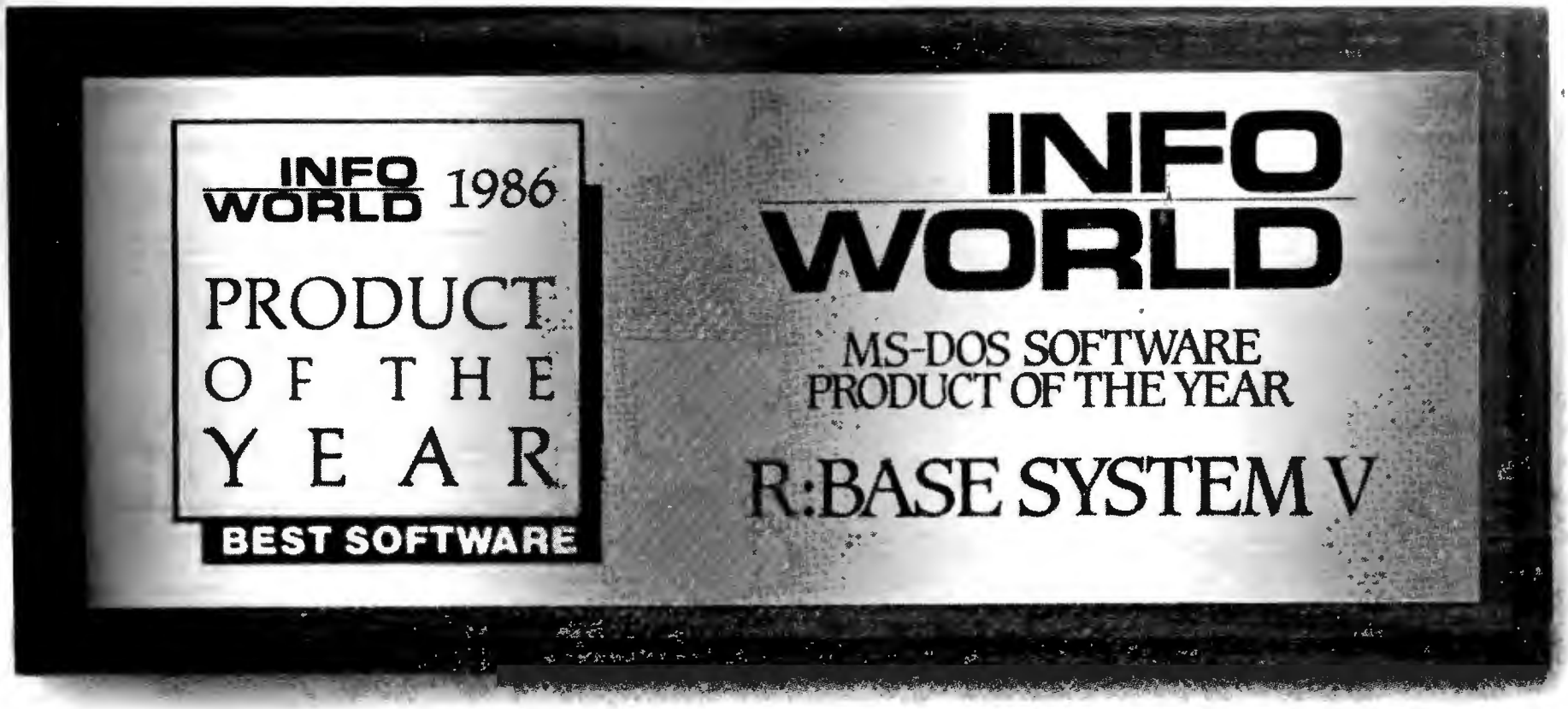

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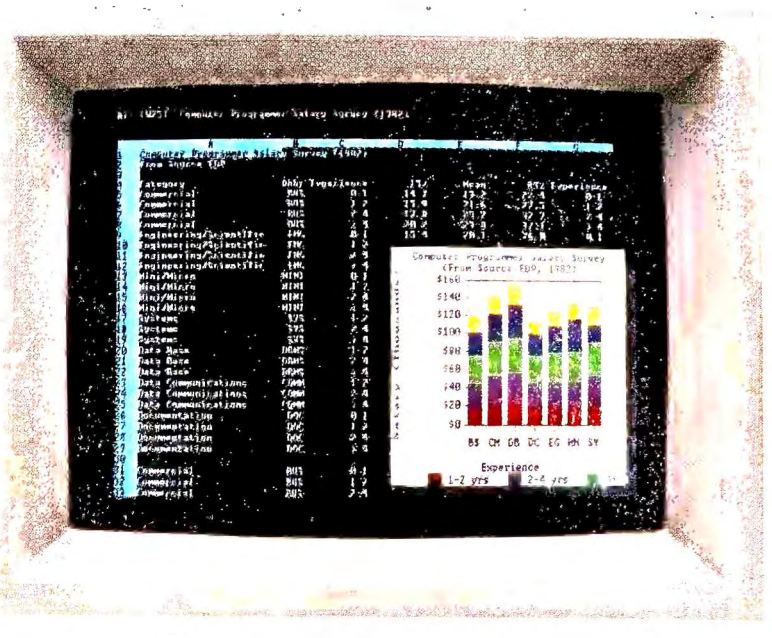

The InColor Card's RamFont mode gives Lotus 1-2-3 a pop-up graphics window and lets you view nearly twice as much spreadsheet data—all in full color.

Runs more software.

All Hercules-compatible text, graphics and RamFont software runs on the InColor Card in black and white, or at least two colors.

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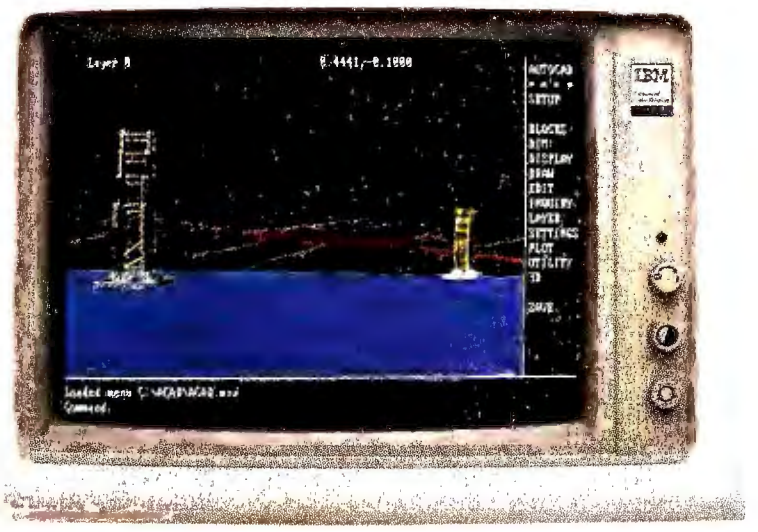

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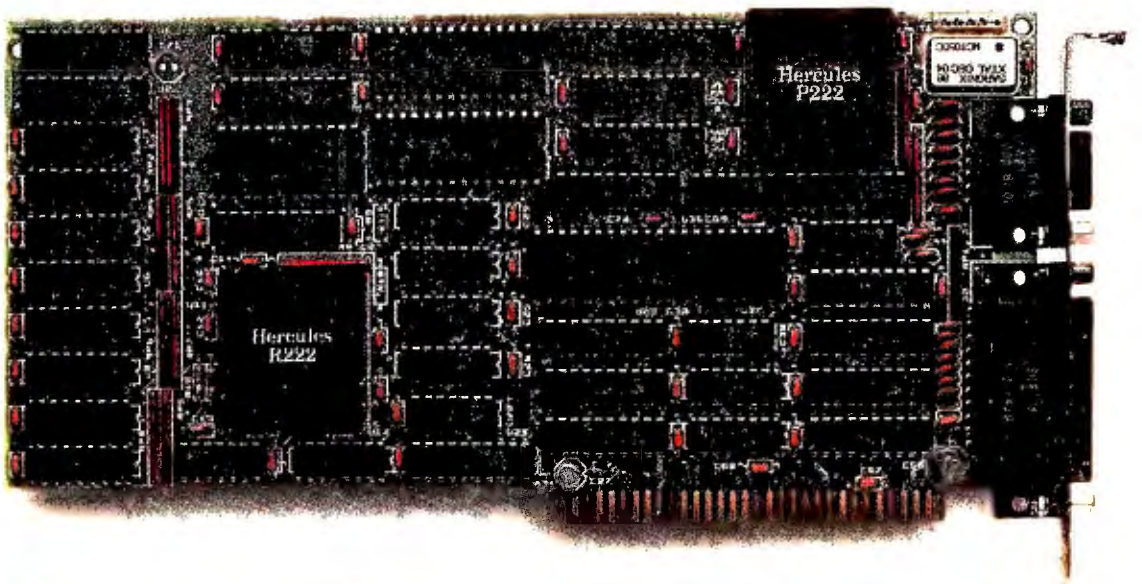

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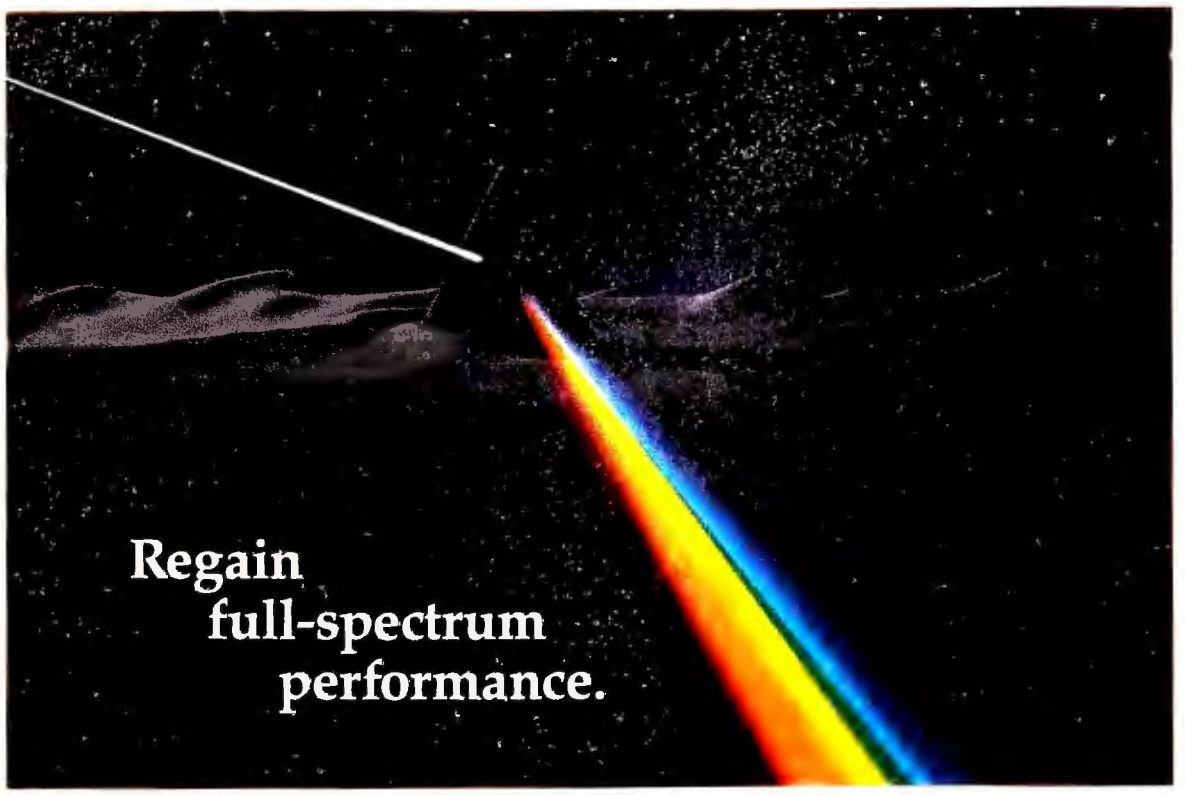

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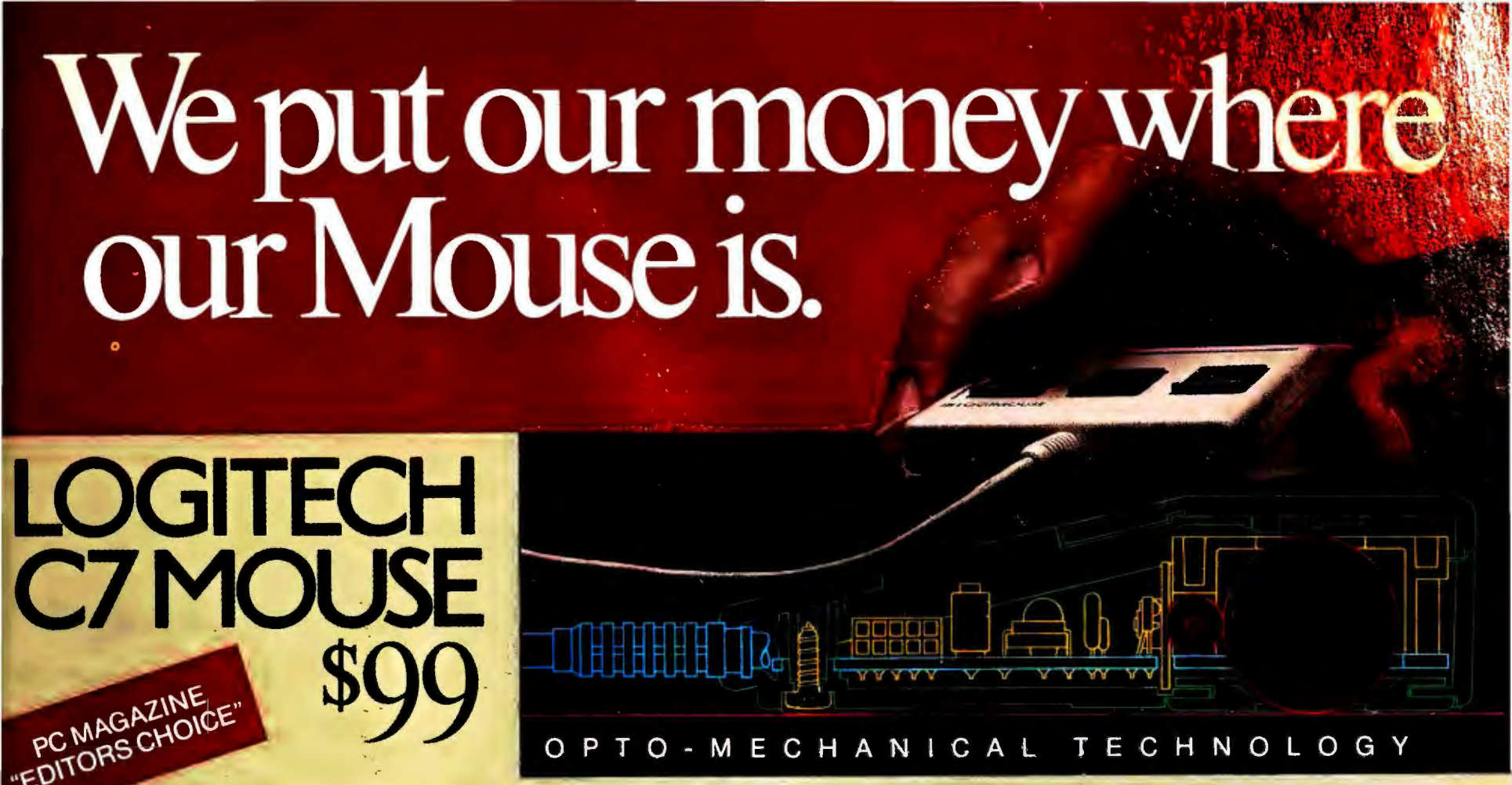
[redacted]

revolutionary. Innovation has usually taken the form of adapting and combining concepts and procedures from existing products. This is as true for Lotus and *1-2-3* as it is for the companies Lotus is suing. While I believe that people should have the right to protect their property from theft, that protection may backfire if directed at those who use the "property" as a platform for innovation. Protection should apply only to exact copies—emulations of screens and keystrokes—without added value. In my opinion, none of the products currently on the market fits that description vis-à-vis *1-2-3*. And let's not be taken in by the argument that without such protection, developers will lack the motivation to innovate. If developers see a potentially lucrative opportunity, they'll be motivated.

All we can do is express our opinions. To facilitate that, *PC World* is running an opinion poll in this issue, and we will publish the results in an upcoming issue. This is your opportunity to send a clear message to the software industry as to what you think about the "look and feel" issue.

In sum, we encourage the industry to put the needs of the users—its customers—first and to do those things that make it easier and more convenient to get work done on personal computers. As users, we won't look kindly on actions that look and feel like selfish squashing of innovation.

We put our money where our Mouse is.



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PC MAGAZINE "EDITORS CHOICE"

"...To sum up my feelings about this mouse and menu generating system: this is the one I want." *Phil Wiswell*
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PC World Reader Poll: The "Look-and-Feel" Controversy

RECENTLY, Lotus Development Corporation has been in the news for its lawsuits against Paperback Software and Mosaic Software, two publishers of Lotus *1-2-3* "clones." Without considering the relative merits of the *Lotus* case, please express your opinion on the subject of software publishers copying or emulating the "look and feel" of established software products. Make your voice heard by calling the telephone number below. All responses must be called in by April 18 to be included in the survey. The results will be published in an upcoming issue of *PC World.*

How to Participate

Dial the telephone number 800/345-3550.

A computer will answer: **"Please enter control number."**

If you're using a push-button phone, enter the control number at the top of the answer sheet, then press the star (*).

Look at your answer form and punch in your answer to Part I, then press the star. The computer will respond: **"Enter Part II."**

Repeat the above procedure for Parts II through VI. Don't forget to enter the star at the end of each part.

For processing purposes, wait for the computer to thank you, then hang up.

In case of error, press # and 0 for assistance.

If you're using a rotary-dial phone, dial the telephone number. Wait for the computer to ask for the control number twice; an operator will then come on the line to assist you.

Please remember: Your response must be received by April 18 to be recorded.

PART I

Are there any forms of emulation or copying of the "look and feel" of a software product that you think are wrong? (Enter all that apply.)

Emulation of a program's appearance and menu style—the "look" **Enter 1**

Emulation of a program's commands and keyboard sequences—the "feel" **Enter 2**

Emulation of a program's appearance *and* commands **Enter 3**

Copying the actual program code **Enter 4**

None of the above are wrong **Enter 5**

Don't know **Enter 6**

PART II

Should a company be required to secure a license or permission if it wishes to emulate the "look and feel" of a product from another company? (Enter one response.)

Yes, a company should be required to get permission **Enter 1**

No, a company should not be required to get permission **Enter 2**

Don't know **Enter 3**

PART III

Does it increase or decrease a software company's sales if others emulate or copy the "look and feel" of its product? (Enter one response.)

It increases sales **Enter 1**

It decreases sales **Enter 2**

It neither increases nor decreases sales **Enter 3**

Don't know **Enter 4**

PART IV

Would you prefer to buy a "brand-name" software product, or would you prefer to buy a "work-alike" clone? (Enter one response.)

I would prefer to buy a "brand-name" product **Enter 1**

I would prefer to buy a "work-alike" clone **Enter 2**

I have no preference **Enter 3**

Don't know **Enter 4**

PART V

In which cases is it fair for one company to emulate the "look and feel" of a product produced by another company? (Enter all that apply.)

It is fair when a small company emulates the product of a large company **Enter 1**

It is fair when a large company emulates the product of a small company **Enter 2**

It is not fair in either case **Enter 3**

Don't know **Enter 4**

PART VI

When you buy new software, which forms of emulation of the "look and feel" of established software products help you to learn the new product more quickly? (Enter all that apply.)

Emulation of the menu style helps **Enter 1**

Emulation of the overall appearance helps **Enter 2**

Emulation of keyboard command names and sequences helps **Enter 3**

No form of emulation helps **Enter 4**

Don't know **Enter 5**

Answer Sheet

Telephone number:
800/345-3550

Control number:

2	5	9	9	1	1	5	*

PART I							*
PART II							*
PART III							*
PART IV							*
PART V							*
PART VI							*

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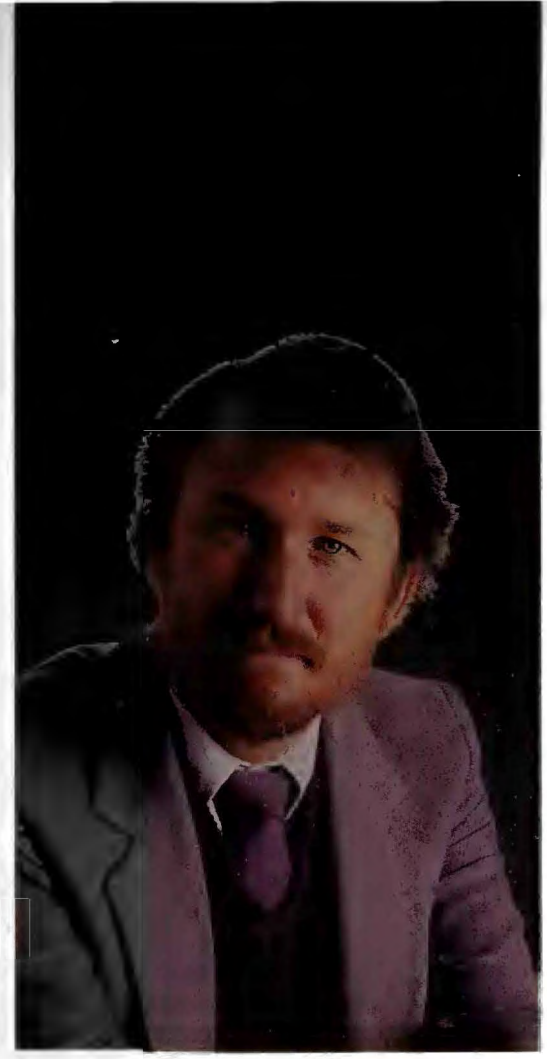

Richard Rawles

REMark: The Myth of Technology Transfer

Do the costs of technological research funded by the military outweigh the benefits? At a time when government is proposing massive expenditures for SDI, it may be wise to examine the Pentagon's track record.

In the early 1940s, mathematician Norbert Wiener conducted experiments designed to help antiaircraft weapons accurately target enemy bombers. Wiener's pioneering work in cybernetics, the discipline he originated, helped launch the computer revolution. It also marked the beginning of a debate over the civilian value of defense-related research and development, a conflict now nearing its zenith over the billions being poured into the Strategic Defense Initiative (SDI), also known as "Star Wars."

Proponents of SDI point to a variety of spin-offs from defense-related research as evidence that defense needs spur technological innovation and benefit commercial interests. On the other side, critics charge that Department of Defense (DOD) spending promotes technology that is largely useless in all but wartime, siphoning off resources and talent that would otherwise benefit the civilian economy.

Historically, the Pentagon has stimulated growth in the computer industry by purchasing promising new technology before it's marketable and then subsidizing efforts to improve its quality and reliability. For example, the DOD was instrumental in the growth of the infant semiconductor industry in the mid-1950s. As the Pentagon bought more and more microchips for its advanced weapons systems, chip manufacturers were able to hone production techniques and ultimately to lower prices for the civilian market.

But as commercial applications emerged, designing high-volume, general-purpose processors became far more profitable than creating expensive, low-volume, application-specific circuits for the military. In 1960, 50 percent of semiconductor sales went to the DOD. By 1978, the DOD's market share had shriveled to 7 percent.

When the military's role as primary consumer declined, so too did its power to direct general technological development. This prompted the DOD to begin funding its own research. The result

(continues)

has been high-performance technology geared to specific military applications, with fewer and fewer commercial applications.

In 1980 the Pentagon's Defense Advanced Research Projects Agency (DARPA) began the VHSIC (pronounced *vizzick*, for Very High Speed Integrated Circuit) program to fund VLSI (very large scale integration) chip research aimed at achieving the higher processor speeds needed for military signal processing. VHSICs, however, require costly radiation hardening that leaves room for few applications beyond the nuclear battlefield or outer space. The program elicited a fair amount of criticism from industry analysts who feared it might undercut this country's leadership in semiconductors at a time when Japan was taking over the market for dynamic RAM chips.

Clark Thompson, a VLSI specialist, believes that the short-term forecast for commercial applications from the VHSIC program is cloudy. "That doesn't mean that companies in the VHSIC program can't make a profit," he says, "but it's not going to change the way PCs are built or help provide computers for the masses. It isn't cheap technology." Given the $1000-per-chip price tag, that is a considerable understatement.

Thus IBM, for instance, has no plans to market its VHSIC chips commercially. Interestingly, Intel did not participate in the original DARPA program, but its 286 and 386 chips have qualified as VHSICs anyway. Once they are radiation hardened, these chips will be available for PCs aboard the space shuttle and the space station. Intel based its approach to the VHSIC market on the belief that the civilian sector would demand performance levels equal to or surpassing those required by the military. Working under restrictive Pentagon specifications, it felt, would have delayed development of the faster chips.

In 1984 the Pentagon, continuing its drive to fund mission-oriented research, focused on artificial intelligence (AI) and supercomputers. The Strategic Computing Initiative (SCI), launched that year, seeks to build specific high-tech military projects such as an electronic copilot, a robot tank, and naval battle management software.

According to David Parnas, a software scientist working on defense systems, SCI has failed to develop an operational AI system. "Very little of the work that the Pentagon sponsors leads to results that are useful," he notes.

Nevertheless, says Jay Stowsky, a policy analyst at the Berkeley Roundtable on the International Economy, many researchers must turn to SCI and military applications to obtain government funding for AI. Japan, on the other hand, he notes, has earmarked all its AI monies for business applications, consumer products, and social services. Given the scarcity of talent and resources in artificial intelligence, he believes the net effect may be to tie AI advances to military applications for years to come.

SDI, or "Star Wars," however, is by far the DOD's most ambitious mission-oriented research program. Its budgets for battle management programs and other computing systems add up to $627 million for fiscal year 1988 alone —three times the annual budget of the Strategic Computing Initiative and more than five times that of the VHSIC program in its prime.

This massive funding specifically targets the complex computing problems surrounding space-based defense, for which VHSICs are critical. SDI sensors tracking a "threat cloud" of hostile ICBMs (intercontinental ballistic missiles) and their decoys through space, for instance, must feed their data to microprocessors that perform between 10 million and 1 billion floating-point operations per second. And the wide area networks that compose the nervous system of SDI's defensive shield need to transmit data between constantly shifting orbital battle stations at speeds of 1 to 10 megabits per second.

If the hardware obstacles seem daunting, perfecting SDI software presents the most challenging task. "What makes SDI's software needs incredible," says Parnas, "is that it has to work the first time." Even plans to test SDI by computer simulation, he argues, are unrealistic. "Because simulations are based on your idea of what's

(continues)

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going to happen, they're likely to contain the same mistakes your programs do."

Even SDI proponents acknowledge that software technology is decades away from the state of the art necessary to make the program a viable defense against nuclear attack. Coupled with the DOD's need for secrecy, this technology lag makes commercial applications unlikely for the near future.

In fact, Stowsky expects SDI to affect commercial software development adversely, because small software companies, from which much innovative programming springs, may become entirely dependent on Pentagon funding. He also believes that SDI will create a "brain drain" of software engineers as new programmers are trained in military-oriented projects isolated from commercial concerns.

A number of industry leaders agree that SDI spending may even jeopardize civilian commerce. In recent testimony before the California Assembly's Committee on Economic Development and New Technologies, Robert Noyce, vice chairman of Intel and a pioneer in semiconductor technology, expressed concern over the expansion of SDI funding. Noyce cautioned: "We should look at the correlation between a high economic growth rate and low military expenditures around the globe and ask ourselves if we've made the right compromise between economic and military security."

There is more to strategic computing than weapons development. Stowsky maintains that the Japanese "strategically" planned to break into the U.S. chip market by "taking advantage of the fact that American firms are concentrating on military and mission-specific designs." Put another way, Bernard O'Keefe, president of the Massachusetts electronics firm EG&G, has written: "While we and the Soviets drain our resources into military competition in outer space, our economic competitors will be eating our lunch."

Mission-oriented programs like SDI are far less likely to produce commercial spin-offs than are the more basic forms of research that the military has funded in the past. Robert Taylor, director of Digital Equipment Corporation's Systems Research Center in Palo Alto, California, cites DARPA's work in time-sharing and networks, noting that the agency has been more effective in advancing the state of computer technology "when the thrust and motivation is to understand general scientific and technical problems as opposed to solving specific military missions."

Just as Norbert Wiener's work with antiaircraft weapons and the Pentagon's support for semiconductors led to unexpected advances in computer science, SDI

(continues)

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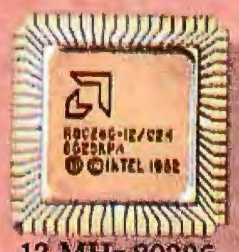
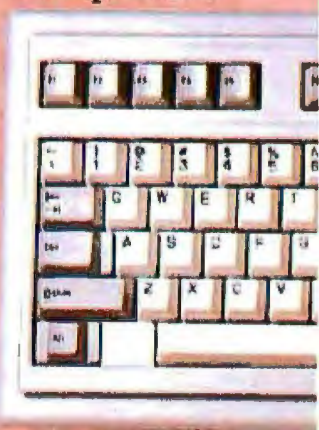


12-MHz 80286 microprocessor



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Uses industry-standa 5¼″ diskettes

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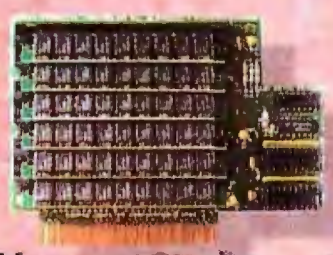

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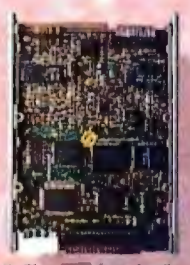

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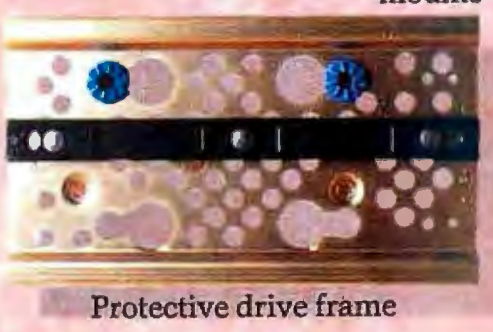

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Their diskette drives are usually 3½" drives which make it impossible to use industry-standard 5¼" diskettes. Compaq, on the other hand, uses industry-standard fixed disk drives. And our drives maximize compatibility with your desktop personal computers, so you don't have to transfer your data. Plus, our detachable full-size keyboard doesn't force you to use one that's small and cramped.

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

It feels like the others

They did.

age capacity. The most RAM others offer is 2.6 Megabytes, which looks very small next to our 6.6 Megabytes. Storage is another story. The internal storage capacity of all our major competitors put together can't equal the storage capacity of a single COMPAQ PORTABLE III. We even offer an attachable, portable expansion unit, with two full-size industry-standard slots so you can add features of your own.

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We run even faster since

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We obviously designed the COMPAQ PORTABLE III for the open road. But what makes it exceptional is that it can also hold its own on a desktop. Its speed, memory, and storage capacity help it outperform most desktop PC's. As an executive power tool, it can handle your biggest spreadsheets and largest data bases. And its ability to network and communicate with mainframes will also surprise you.

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

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

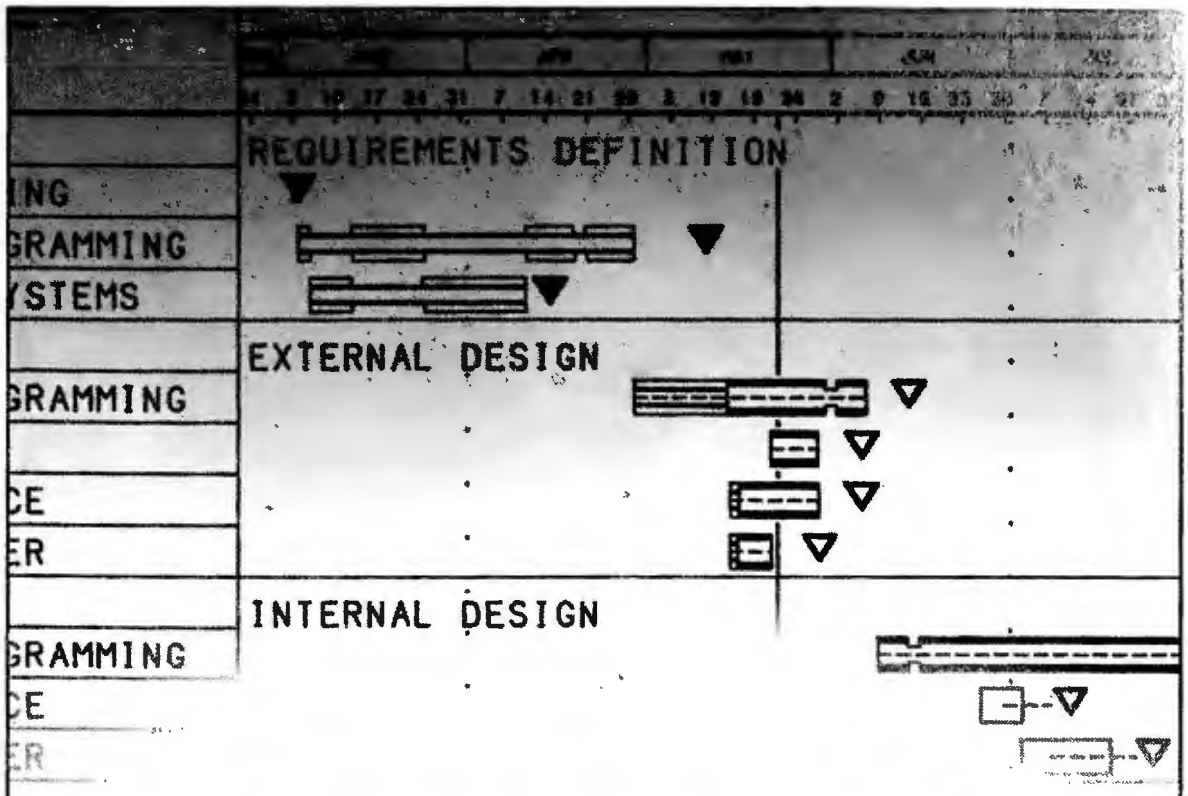
It simply works better

COMPAQ PORTABLE III™

research may result in improvements applicable to PC technology, most likely in the area of network communications. PCs, however, are already driving the commercial market in this direction. But, as Intel's experience with the VHSIC program demonstrates, both the military and industry may benefit most by letting the market set the pace of innovation. Japan's Nippon Telegraph and Telephone, for instance, recently announced a 16-megabit dynamic RAM chip, which is four times larger than IBM's latest microchip. This seems to put the lie to the Pentagon strategy of military-to-civilian technology transfer once and for all.

In fact, the DOD's Defense Science Board (DSB) has belatedly acknowledged that the decline of America's leadership in semiconductors (on which American military superiority depends) has reached a crisis. Ironically, the DSB suggests competitive, high-volume chip production in commercial markets as the way to reverse the downward trend. The lesson? Beware of Star Warriors bearing gifts.

Richard Rawles is a freelance writer in Oakland, California, who covers issues related to nuclear technology.



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PC WORLD

Speed Thrills

So who's buying the Compaq Deskpro 386?

Brian Brainerd

For Rich Gonzalez, the new Compaqs act like minicomputers.

Compaq is pumping out Deskpro 386s at an impressive clip—tens of thousands of them, dwarfing the production of all the company's competitors combined. But no application software exists to truly exploit the new Intel 80386-based machine, so today's early adopters get raw speed and raw speed alone. Is that enough?

Absolutely.

"It's tough to explain to someone that you can't wait 20 extra seconds," says Dr. Heinz Smirmaul, president of the Dallas Eye Institute. "But when you work with these machines all day and you consistently save seconds, it makes a difference."

Smirmaul's experience is proof of the 386's instant versatility. *Reflex* is his mainstay application; he uses it to measure and cross-tabulate astigmatism as a guide in monitoring surgical procedures. He also performs spreadsheet analysis, manages data bases, designs surgical instruments with a CAD package, and produces scientific charts via Software Publishing's *Personal Publisher*. "I started doing desktop publishing on the Compaq-Plus," he says. "There's a phenomenal difference in using the 386."

"We bought [the Deskpro 386] for speed," says Joe Micikas, manager of computer applications at Tensor, an engineering consulting firm in Pittsburgh. According to Micikas, some CAD packages perform 20 times faster on the 386 than on the AT. For him, the 386's software drought is a nonissue.

Designers who once held impromptu coffee breaks while waiting for ATs to complete regenerations now barely have time for a swallow. "On the 386, with CAD files larger than 600K, regeneration takes about 10 seconds. You're talking dollars here," Micikas says.

The novelty of it all doesn't exactly dull the 386's sheen either. "We want to be very aggressive in staying on top of the technology," reports David Swatzell, manager of technical support at Gibraltar Savings Association in Houston. With six machines in hand, Gibraltar is about to get "tons" more, he says.

For Swatzell, saving time is more than a convenience—it's crucial. "We're responsible for the purchase and sale of mortgage-backed securities," he notes. "The

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

View

News and notes for the computing community

investment and trading processes are time-sensitive. We have to respond to brokers in very limited time frames."

Swatzell's group developed a securities trading system using Cosmos's *Revelation* and installed it on a local area network of 286s (which he calls the primary data entry vehicles) and 386s (the engines for data base processing). With 386s zipping along, Swatzell reports, "We traded as much as 20 times our average dollar volume in securities in a single day."

Alexander and Alexander Financial Services, the world's second-largest insurance brokerage, placed its order for 386s "right after they came out," says Lee Youngblood, manager of financial systems at the firm's Towson, Maryland, financial headquarters. Youngblood's department received an allotment of 17 machines, all of which are linked via a 3Com network.

Steven Pumphery

Stephen Wippel bought two 386s to speed software development.

"Once people tried them," Youngblood recalls, "they'd say 'take my XT—please.'" The 386s run everything from *1-2-3* to *DataFlex* to *MultiMate* (which simply allows people to type faster, he says).

"We get twice the speed on a 386 that we do on a 286," says Stephen Wippel, manager of applied resources for Geosim Corporation in Houston, which designs software for geophysical exploration companies. Wippel's group has two 386s, plans to buy more, and appreciates the way the 386 crunches through development chores. "We expect to have a 386-based operation," he says. "We're very interested in UNIX systems that might be developed down the road."

Rich Gonzalez, manager of micro systems at Denver's Great West Life Insurance, feels the 386 is more than simply a fast AT. His four 386s run the multiuser *Informix* data management system under Santa Cruz Operation's Xenix System V. "For all intents and purposes, our 386s operate as minicomputers," he says.

Gonzalez isn't hurting for lack of a suitable operating system. "The 386 functions extremely well today—six months or a year from now, or whenever the operating systems come out, it'll just function better."

Peter Diana

CAD software accelerated dramatically, John Micikas found.

But for Yefim Schukin of Schukin and Associates, a northern California software house, what he terms "very high speed, excellent design, and 100 percent compatibility" aren't enough.

"The Deskpro 386 is very fast when you're doing straight program development," he acknowledges, "but the speed of the input/output channel is a real bottleneck." That means that disk access will never be as fast as the machine itself.

Some people are just never satisfied. —*Marina Hirsch*

First Class Advice

Traditionally, the knowledge-based software that lets computers handle tricky problems is large, complicated, and best run by the high priests of LISP. But as technology marches on, some tasks that initially seem fierce can look surprisingly smooth on a PC. And today, nontechnical types can often crank up the software themselves.

Such are the guiding design principles of William Hapgood's *First Class* expert system shell. The software, built to automatically generate a small advisory system after the user enters examples, has paid off in a big way for some customers. One firm estimates that its process-control application—created with a bit of quick *First Class* programming—accounts for annual savings of $5 million.

Other kinds of jobs may not yield rewards that rich, but many prove that problem-solving needn't be an arcane science. "Finding broad-based applications is hard, because most problems that this technology suits are both complicated and specific," Hapgood notes. Telephone-based sales and diagnostic support problems top the applications list.

An inventor with more than 70 patents to his name, Hapgood markets *First Class* from Programs in Motion. The small firm is housed in a building next to his home, up a dirt road in a Boston suburb.

Two years ago he quietly introduced *First Class,* which features a spreadsheetlike interface and (like *Expert Ease, KDS,* and a few other competitors) performs *example-based rule induction.* That is, it can take tabular data and generate rules—building an expert system without an expert programmer.

In the process the package frequently simplifies what look like nasty problems. "Often people say, I need to look at eight factors, but *First Class* comes back and says, maybe you only need six, or three," Hapgood says.

Within its tightly defined limits, the program is a remorseless logician. People often have difficulty figuring out a string of causes and effects. "This kind of shoehorns them into it," he says. *First Class*'s penchant for displaying decision trees also helps, Hapgood explains.

"It's research into decision making," Hapgood summarizes. "At the end, users often say, 'That looks simple, I should have written that down when I started.'" *—E. B.*

Grass-Roots Gala

The founding of the Boston Computer Society (BCS) in 1977 is already the stuff of legend. Thirteen-year-old Jonathan Rotenberg held the first meeting in his high school library. It was "not exactly a smashing start," as he recalls. "Two people showed up—one of whom was working late at the school and wandered in by accident."

Today BCS, which has always focused on PCs for the masses rather than just for techies, has reached a remarkable size. It claims 23,000 members, half of them IBM PC users, with affiliates nationwide and overseas. Rotenberg, the fast-talking wunderkind, is now 24 and busily overseeing a paid staff of eight.

This year BCS kicked off a grand celebration with a Battle of the Industry Pundits, followed by a cease-fire with birthday cake, champagne, and live music. But the big event, what Rotenberg calls *The* Bash, is scheduled for autumn. This will be a weekend reunion for several hundred key designers, inventors, and entrepreneurs, with workshops and demonstrations. And Rotenberg promises a mysterious "spectacular event" followed by a black-tie party that will run into the wee hours.

PC World promises to investigate. *—E. B.*

Breaking the Bootleg Bands

Debbie Drechsler

Targeting bootleg software in raids reminiscent of Elliot Ness, Canadian authorities have effectively shut down three software rental firms and crippled a fourth.

The software rental business is no stranger to controversy. Rental firms say the practice simply enables customers to test programs; the Software Publishers Association and IBM counter that such firms violate copyright laws by selling programs under the guise of providing preview copies. But the recent Canadian experience departed from traditional rental procedure: In those cases, the companies apparently failed to ask for the rented software back. Instead, they advised customers to erase the disks after a 21-day preview costing $10 per program.

When a five-member legal team tried to serve a court order on the Softsave Preview Club of Vancouver, the team was barred from entering the premises. Employees then taped paper over the windows to prevent the group from peering inside.

"One employee threw a box of files and credit card charge slips out of the upper-floor windows," recalls Ashton-Tate technical support supervisor Richard Goepel, who participated in the raid. "He obviously had called someone on the phone because a guy was there ready to pick the stuff up."

Softsave management kept the raiders out in the cold for two hours before deciding the search could not legally be prevented. Goepel's party then seized cartons of charge slips and hundreds of copies of top-selling programs, he says.

"No country is worse than Canada for not protecting software and for the quantity of illegal software sold," maintains Tom Chan, international counsel for Ashton-Tate. "The people in Hong Kong can't compare with the professionalism in Canada. Softsave had a 24-hour phone number with about 20 phone lines, and we estimate they sent out about 1000 disks a day."

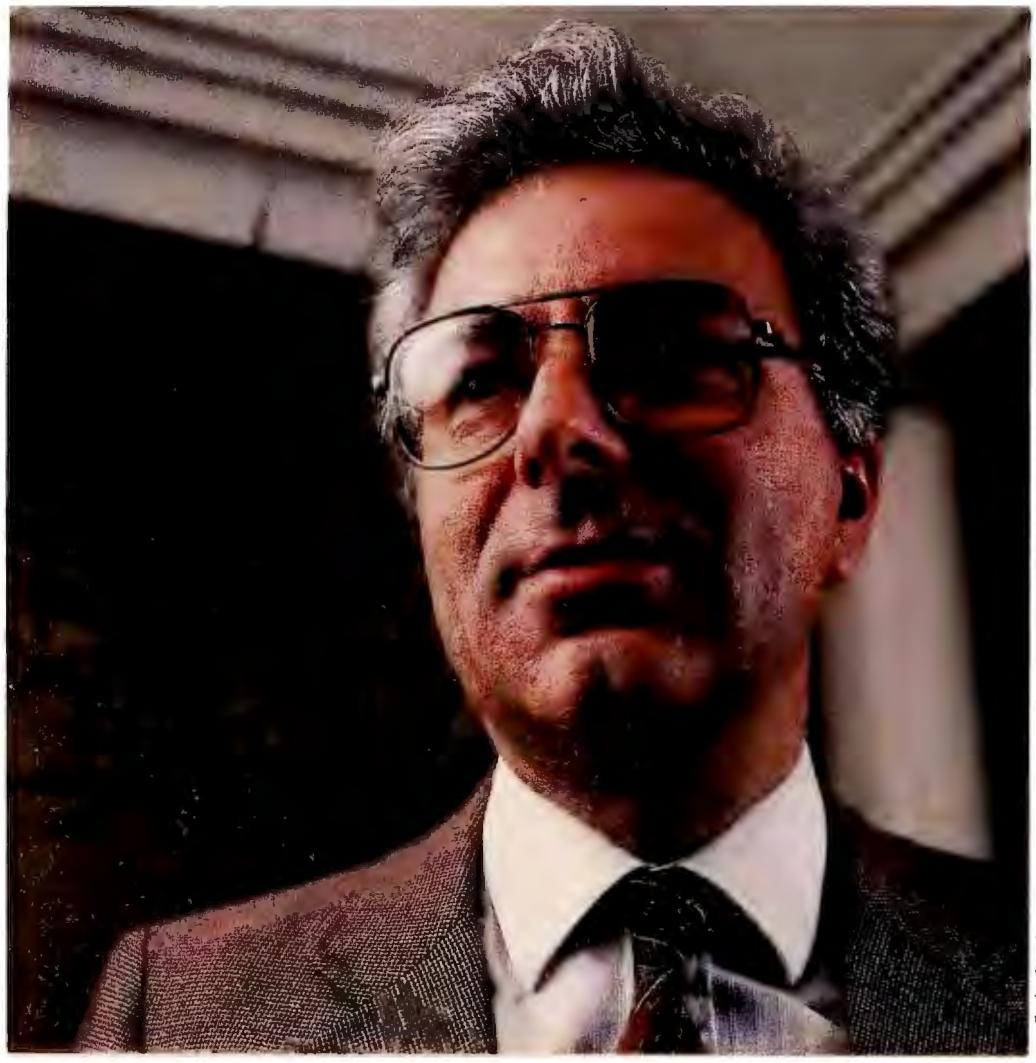
Chan refused to identify Softsave's customers, but one raid participant says clients ranged from teenagers interested in games to Fortune 100 customers "renting" spreadsheets and accounting programs.

The client list mirrors that of three software rental firms the Royal Canadian Mounted Police raided in Toronto last Thanksgiving. Constable Bill Crich's team filled four station wagons and two other cars with duplicated software, rental receipts, and equipment used to copy programs.

Prodding the Mounties in Toronto were IBM, Ashton-Tate, Microsoft, and Open Systems. In Vancouver, authorities were responding to complaints from Activision, Ashton-Tate, Brøderbund, Infocom, Lifetree Software, Lotus, and Microsoft. *–John Eckhouse*

Nervous for the Next Generation

Microprocessor pioneer Federico Faggin embarks on a new kind of trailblazing.



Jerry Spagnoli

Federico Faggin, here at Synaptics headquarters, leapt from microprocessor design to PC communications to the new wave of neurocomputing.

In the latest twist in a distinguished career, Federico Faggin recently joined Synaptics, a small San Jose firm more at home with cells than semiconductors. The company is plunging into *neurocomputing*, a field of research that promises to spin off high-performance silicon modeled on animal nervous systems.

Instead of poking around the insides of PCs, Faggin and his colleagues can now be found picking apart a rat's brain, exploring hypotheses about the biochemical basis of memory.

Longtime Faggin associate Carver Mead, an authority on very large scale integration (VLSI) chip technology, has, among other feats, designed chips that imitate the workings of the inner ear and the eye's retina. Another key player at Synaptics is neuroscientist Gary Lynch, who has developed a model of how nerve cells transmit data in a *neural network*.

Neural nets, which store and access information based on content rather than a specific location, can process data many times faster than today's computers. By casting neural nets in silicon, researchers hope to transfer these capabilities to computer hardware. One-year-old Synaptics, which is backed by

more than $1 million in venture capital, is one of the first enterprises to investigate neural nets with an eye to commercial applications.

"This research is clearly going to take a lot of work, but it could lead to interesting developments," says Faggin. Unlike research on the microprocessor, which was aimed at refining existing technology, today Faggin's working at an earlier phase of the developmental process. "With neural networks, the metaphor of how the brain works is not at all clear," he notes.

Faggin suggests this new generation of chips could produce significant advances in computerized pattern recognition and speech recognition. And in so-called artificial intelligence applications, a computer designed around neural networks could be capable of much greater reasoning and adaptability than current systems.

The 45-year-old Faggin knows something about adaptability. He left his native Italy in 1968 for a job at Fairchild Semiconductor in what was not yet Silicon Valley. He soon moved to Intel, where he designed the world's first microprocessor, a 4-bit chip that proved to be a forerunner of the PC's 8088 CPU. Next he formed Zilog, home of the Z-80, a popular microprocessor found in many of the PC's 8-bit progenitors.

Five years ago, Faggin founded Cygnet Technologies in Sunnyvale, California, a firm (recently sold to Everex) on whose board he still sits. Cygnet's first product was the CoSystem, a sophisticated pairing of telephone and modem that works with the PC. More recently, Cygnet entered the software business with its *Get* RAM-resident communications program.

Although product payoffs are years away for Synaptics, Faggin is excited by the possibilities. But with personal computers, "a lot of the novelty has worn off and become embedded in the fabric of the way we do things," he says. "With the exception of optical recording applications for PCs, everything that could possibly be done has been explored."
–David Needle

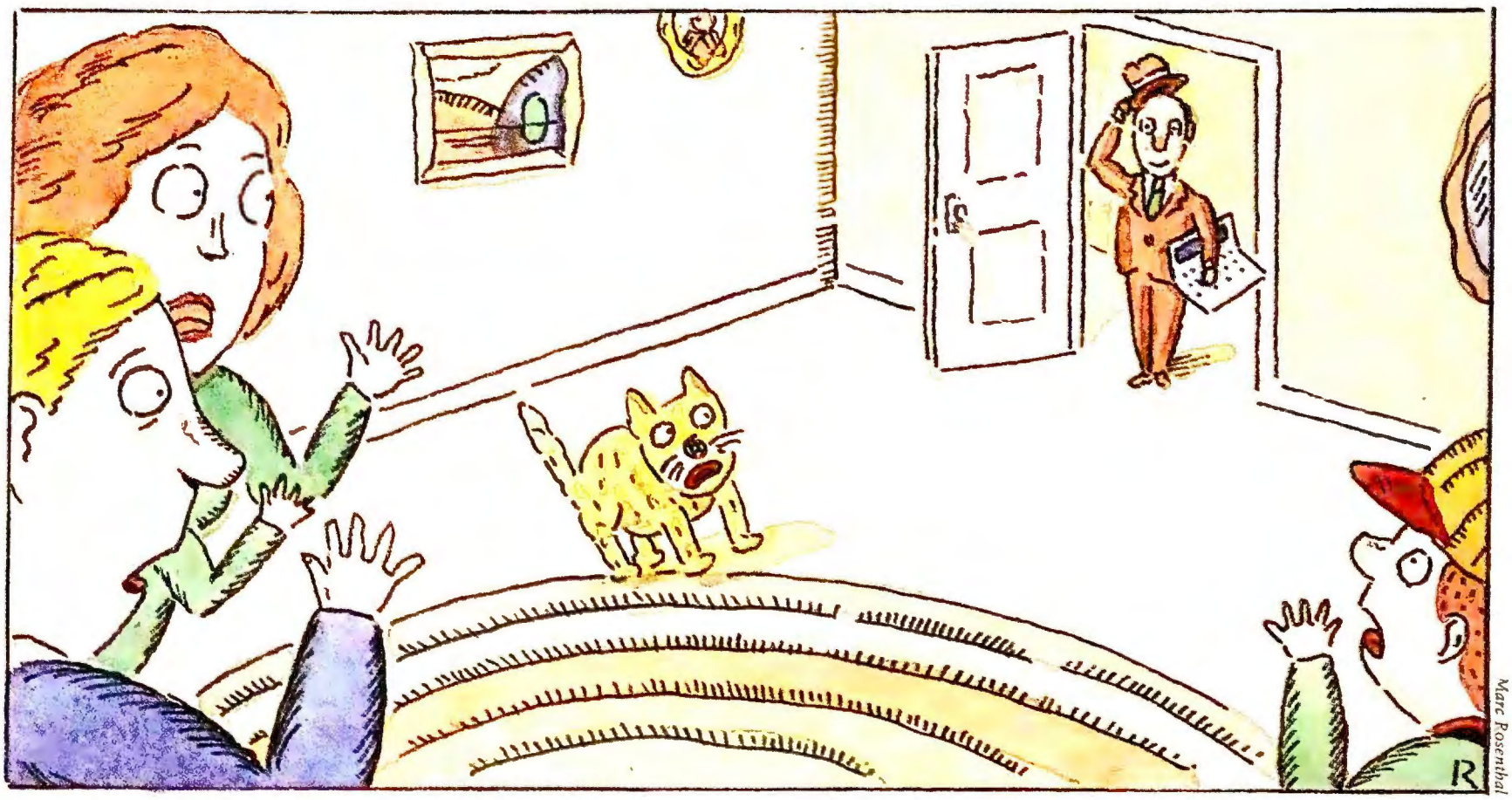
Stockman's Spreadsheet

Fifty years ago humorist James Thurber penned "If Grant Had Been Drinking at Appomattox," a historical fairy tale in which a besotted Ulysses S. Grant cheerfully surrenders his army to an astounded Robert E. Lee. Fifty years from now historians may speculate on the likely turn of events "If Stockman Had Run *VisiCalc*."

Throwing together the first budget of the Reagan presidency in a few hectic weeks early in 1981, budget director David Stockman hastily accepted some critical errors–including an absurd inflation estimate and an incorrect starting baseline for defense spending–that threw the budget way out of whack.

Toting up the figures on a pocket calculator or a time-sharing terminal, rather than a PC-based spreadsheet, the nation's chief bean-counter didn't get all the numbers together for a few critical days–and then it was too late.

"The next President will inherit a publicly held federal debt nearly *triple* that accumulated by all of Ronald Reagan's thirty-nine predecessors," Stockman notes in *The Triumph of Politics* (Harper & Row, New York, 1986). As the best-seller now reveals, the greatest nonspreadsheet error of all time opened the floodgates for that river of red ink. *–E. B.*



Lapping Up the Taxes

These days if the Internal Revenue Service finds that you've been doing something naughty on the side, the auditor is likely to arrive toting a laptop computer to figure the tab.

In March of 1986, the IRS awarded a $27 million contract to Zenith Data Systems for 15,000 Z-171 laptop computers, software, and the training to use them. As of this spring, nearly 10,000 of the computers had been deployed.

Bob Dooley, IRS product manager for automated examination systems, says the laptops are being issued to agents who perform audits on taxpayers' home turf. The machines help compute taxes, figure depreciation schedules, analyze a taxpayer's finances, and the like.

In addition to The Software Group's *Enable* integrated package, the IRS has distributed *Workcenter,* a program developed internally for agents' specialized needs. The goal is a "paperless audit," according to Nick Gaudioso, an IRS office automation coordinator in Newark, New Jersey. That aim may, however, prove as elusive as the paperless office for the moment, since final reports must be made on paper. "The paperwork goes to the reviewers, who have not computerized," he says.

"In some instances, we can see a significant time savings," Dooley says. He cites one recurring audit that was trimmed from eight weeks to just three and a half. Portable PCs are also helping agents get a better handle on intricate cases, like one in which an international examiner needed to scrutinize some 400 subsidiaries.

Laptops have boosted agent morale as well, according to Dooley. "The enthusiasm and acceptance are exciting," he says. "We can't get machines fast enough." And, in a phenomenon familiar to most PC users, agents are already looking for more support and more hardware. Dooley says agents in several of the IRS's 63 districts have established user groups and newsletters.

Pat Gallagher, director of sales for Zenith's federal group, reports that requests for internal hard disks and similar devices have been sporadic. Gaudioso would applaud those requests, noting that *Workcenter* claims no fewer than 12 5¼-inch floppies.

Still, the current models are doing the job. "By springtime," Gallagher says proudly, "the probability of your not being audited by a Zenith laptop is extremely low." *–Daniel J. Rosenbaum*

Courting "Copycats"

So far, 1987 has been a good year for software firms and a great year for software litigation. That makes many of us—like those who remember the VisiCorp-Software Arts debacle that wiped out two highly innovative firms—extremely uneasy.

Ashton-Tate rang in the new year by suing *dBASE* creator C. Wayne Ratliff and five other ex-employees and consultants, claiming they had carried off "secret technology" to Migent, their new firm. This seemed like a classic bite-the-hand-that-feeds-you suit, although there was some debate about who exactly was doing the feeding and who was doing the biting.

Ratliff joined Migent (home of *Ability* and *Enrich*) last September 1, the day after his legal relationship with Ashton-Tate expired. Migent has heralded Emerald Bay, the ongoing development project that Ratliff oversees, as heavyweight competition for *dBASE*. Migent and Ratliff vehemently deny lifting anything from Ashton-Tate and are known to have purchased a hefty chunk of program code from an independent Southern California developer.

A week later Lotus Development filed suit against Mosaic Software—a neighbor in Cambridge, Massachusetts—and Paperback Software International of Berkeley, California. The emperor of spreadsheets charged that Mosaic's *Twin* and Paperback's *VP-Planner* "deliberately recreate, with only trivial variations, the 'look and feel' and user interface of Lotus *1-2-3*."

Paperback's Adam Osborne responded that *1-2-3*'s file formats and commands are firmly entrenched as de facto standards, and that *VP-Planner* bundles in data management and other features absent from *1-2-3*. He also pounced on the resemblances between *1-2-3* and earlier spreadsheets. "Improving upon popular market standards is an important part of the development of the personal computer industry," he protested. "It is not a new concept, nor is it illegal."

Although Osborne's outrage at Lotus was percolating even before the suit, his points were firmly supported by many leading developers—among them Dan Bricklin, the co-inventor of the electronic spreadsheet. Numerous sources sided with the smaller firms, viewing a successful legal action as a likely death blow to those firms.

Lotus chairman Jim Manzi didn't give other developers much comfort by noting that a number of announced *1-2-3* look-alikes haven't yet shipped and vowing to "investigate others ... at the right moment."

But, Manzi continued, "People are mistaken about our trying to copyright the *1-2-3* interface. That is absolutely not what we're doing. We're making no claims on a two-line moving cursor menu, with English words in the menu. What we're making claims against are actually two products that ripped out, word for word, structural features, look and feel features, the organizational sequence, and the syntax of *1-2-3*.

"We think the 1980 copyright act is sufficiently clear and clean to afford us all the software protection we need," he added. "The good news is that case law interpretation is supporting it as well." *—E. B.*

John Eckhouse reports on business for the San Francisco Chronicle; *Marina Hirsch is a writer and editor for Autodesk; David Needle is editor of* Computer Currents, *a biweekly personal computer magazine based in Emeryville, California; and Daniel J. Rosenbaum writes on AT&T, the IRS, and other major bureaucracies.*

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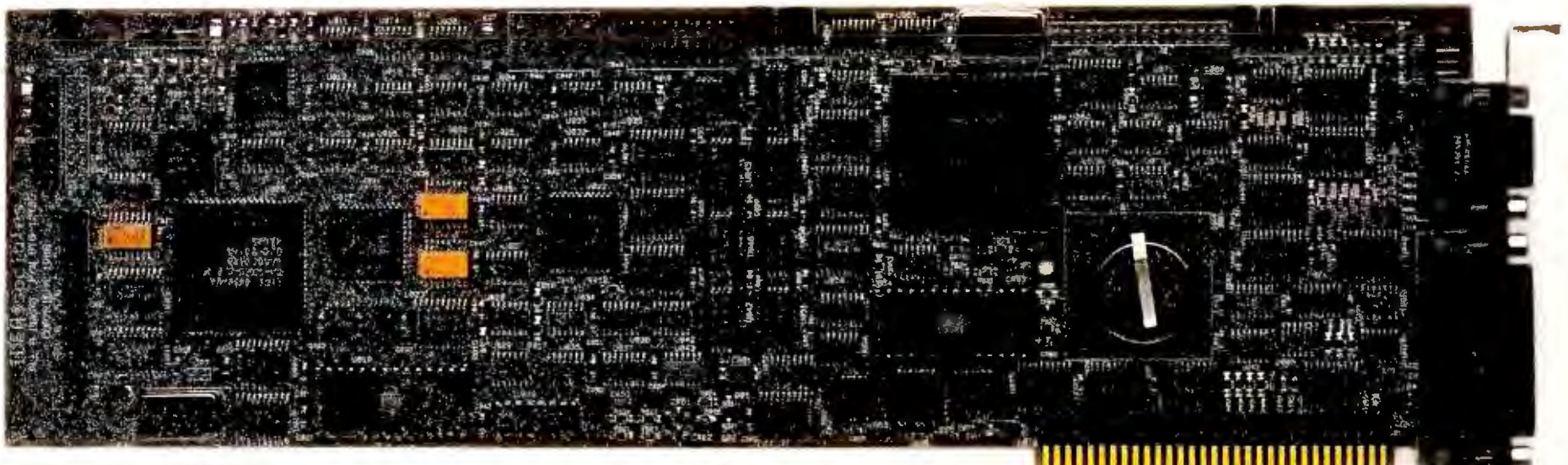

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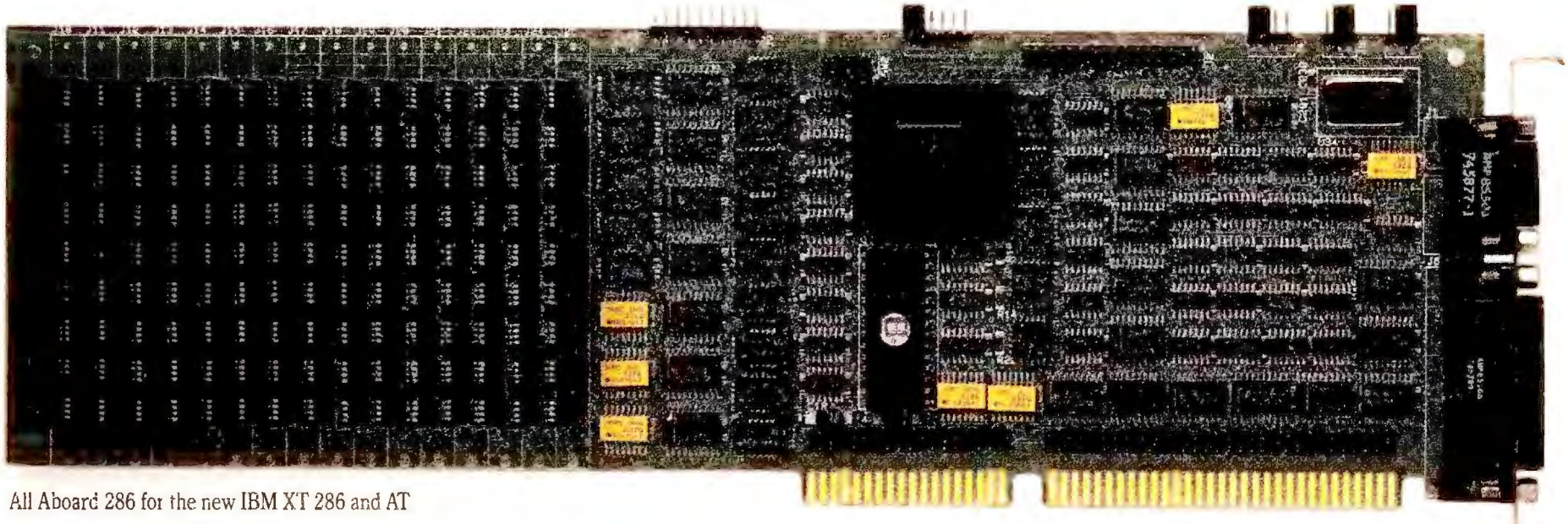

All Aboard 286 for the new IBM XT 286 and AT

As proof, the new All Aboard 286 takes the IBM XT 286 to its limits. With an astounding 16MB of memory (up to 4MB can be used as EMS), serial port, parallel port and EGA graphics. All Aboard 286 also works with the IBM AT, and is the perfect card for the future introduction of DOS 5.0.

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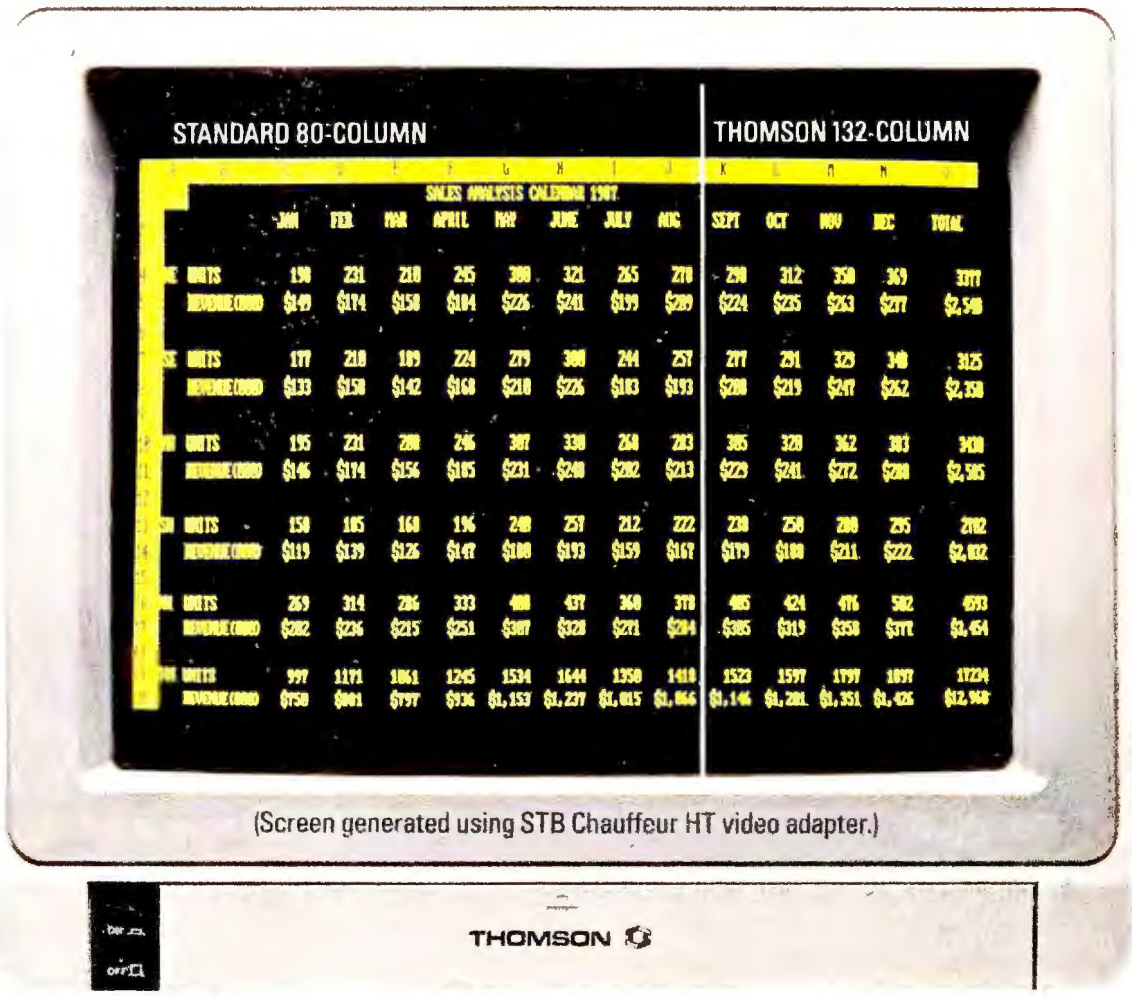

(Screen generated using STB Chauffeur HT video adapter.)

The Thomson Spreadsheet Monitor

Standard 12″ monitors let you work with about eight months of spreadsheet data at once. Which is fine if you live by eight-month years.

Most people, however, are used to *twelve* months on the calendar. But unless you enjoy scrolling and squinting—and a lot of it—you can't work with a full twelve months of data on a regular 12″ monitor.

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Product Outlook

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

Desqview sprouts muscles, a serious spreadsheet from Software Publishing, a pair of intriguing 1-2-3 add-ins, all-in-one networking, systems across the price and performance spectrums, and much more

Ken Greenberg

Desqview Grows Up

You need to run several programs simultaneously and would prefer to avoid slamming into a hardware wall. If you see yourself in that scenario, ◆***Desqview 2.0*** may able to help.

Beneath a layer of cosmetic alterations is a profound facelift of *Desqview,* Quarterdeck Office Systems' plucky character-based window manager. At $129, *Desqview 2.0* now includes a full API (application program interface)—good news for resellers and micro managers who'd like to fine-tune the program for turnkey applications. Like version 1.3, this latest release exploits the 80386's virtual 86 mode, but it jacks up the number of simultaneous windows from 9 to a whopping 250.

Although still character-based, *Desqview 2.0* is appreciably more adept at handling graphics than version 1.3. The program's EGA support gives teeth to the promise of multitasking, particularly for graphics-intensive applications. *Desqview* can, for example, now host *AutoCAD* in one window while *1-2-3* cruises along in character mode next door; it'll even run *Microsoft Windows* (and *Windows*-specific applications) in its own windows. By storing EGA data in expanded memory, *Desqview* lets you scroll graphics windows and retain the full image—with nary a performance hit.

Desqview is similarly more responsive to applications that only momentarily claim the stage. Communications and pop-up programs can now emerge from the wings and then recede. Elsewhere, you can exert greater control over window sizing and placement, main menu contents, program setup, task processing, and memory usage. Separate windows can be assigned to multiple monitors.

Desqview macros are now both elegant and efficient. You can copy an entire worksheet range with a single keystroke—a big improvement on the old cell-by-cell cut and paste. The program overhaul adds just 15K to the *Desqview* kernel, half of which can be parked in expanded memory. Quarterdeck is releasing a 2.0 runtime version for developers. Upgrades of 1.3 are $30; upgrades of other versions, $50. Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405; 213/392-9851.

The Year of the Spreadsheet

If you've been a reluctant shopper in the *1-2-3* aftermarket, sifting through front ends and graphics modules and report generators, you may find ◆***pfs:professional plan*** just what the spreadsheet grocer ordered. *pfs:professional plan* rolls a wealth of *1-2-3* enhancements into a release-2-compatible spreadsheet, tying it all together with a striking pulldown menu interface. Managing the rows and columns becomes less formidable with the program's integrated auditor, macro editor, report writer, goal seeker, and presentation graphics. And with its idiosyncratic striped screen, "look and feel" shouldn't be a problem.

(continues)

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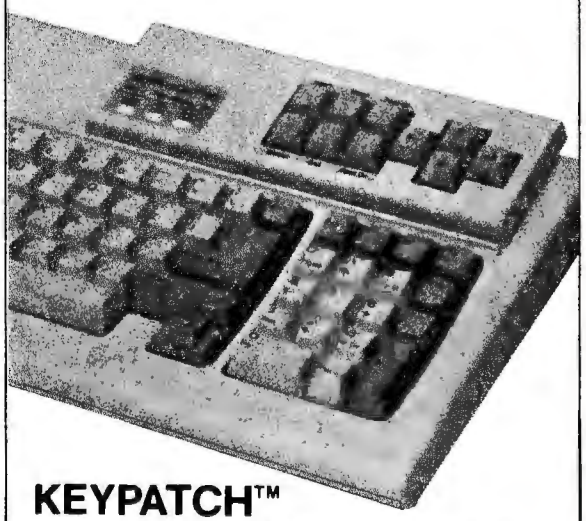

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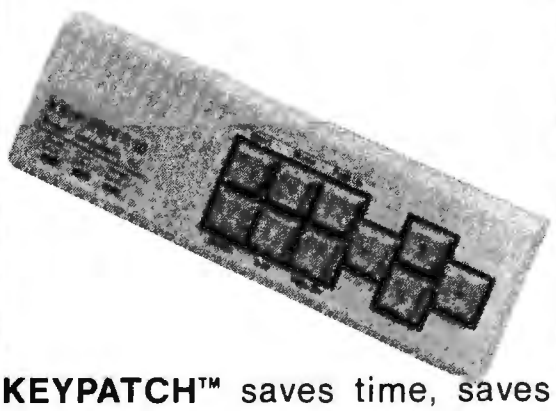

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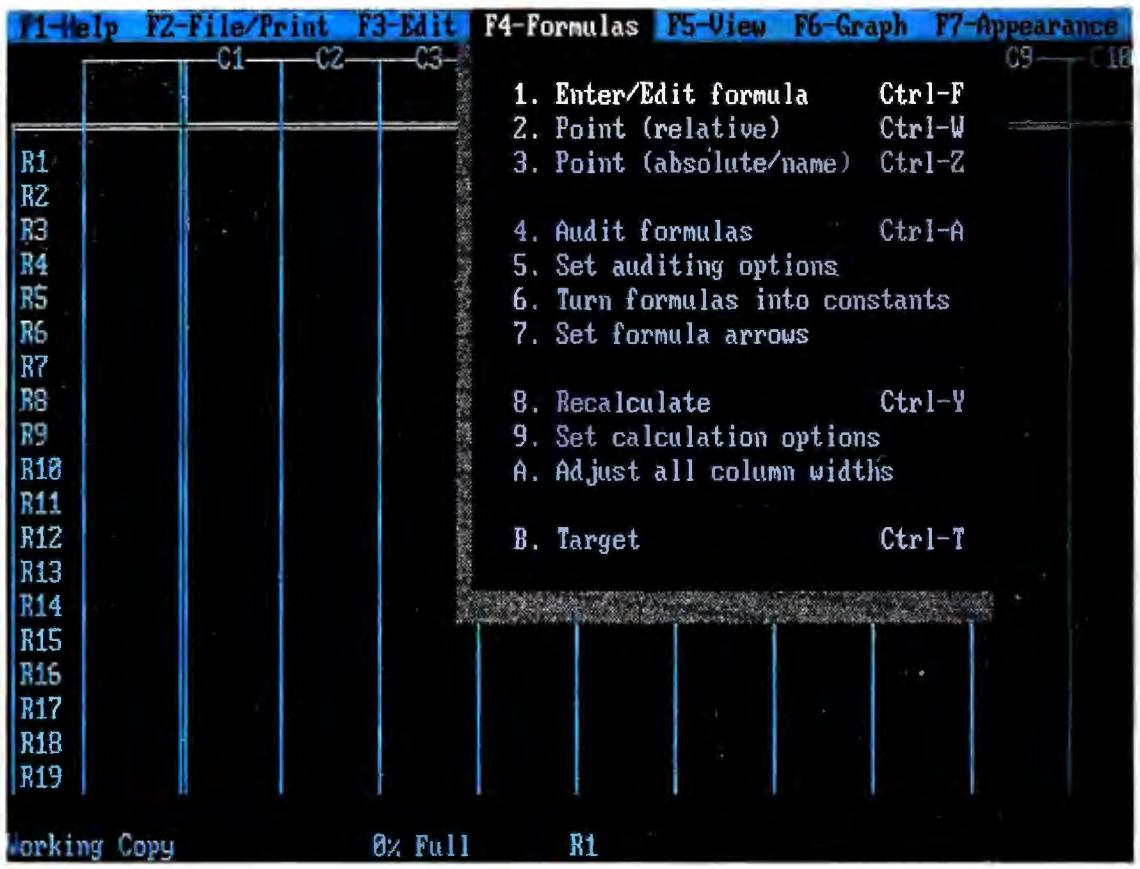

Attractive pulldown menus, activated with the function keys, make navigating pfs:professional plan a breeze.

Any resemblance to the *pfs:plan* of old can scarcely be found. So thorough is this rewrite that, Software Publishing boasts, reading *1-2-3* files is now easier than importing data from the original *pfs* product. At $249, *professional plan* can also write .WKS and .WK1 files. More than 90 math, statistical, financial, date, and string functions are at the ready. You can enter plain English formulas directly into cells or assign formulas on a row or column basis rather than cell-by-cell. With the selective recalculation option, you can update only affected cells, and *professional plan* encourages data consolidation from multiple worksheets.

In nods to both power and convenience, the program's macro capability features a learn mode and a macro library good for linking macros to multiple spreadsheets. With the *professional plan* auditor, you can examine, edit, and print formulas immediately adjacent to the relevant data, and the auditor lets you recalculate while in audit mode. When it's time to commit calculations to paper, the reporting component's View function will display, sort, and print any set of rows and columns—contiguous or otherwise. *professional plan*'s page design tools enable you to shape layouts with custom headers, footers, and page breaks.

The program generates output consistent with Software Publishing's *Harvard Presentation Graphics* and offers more than a dozen kinds of graphs with multiple type styles. The graph-printing exercise

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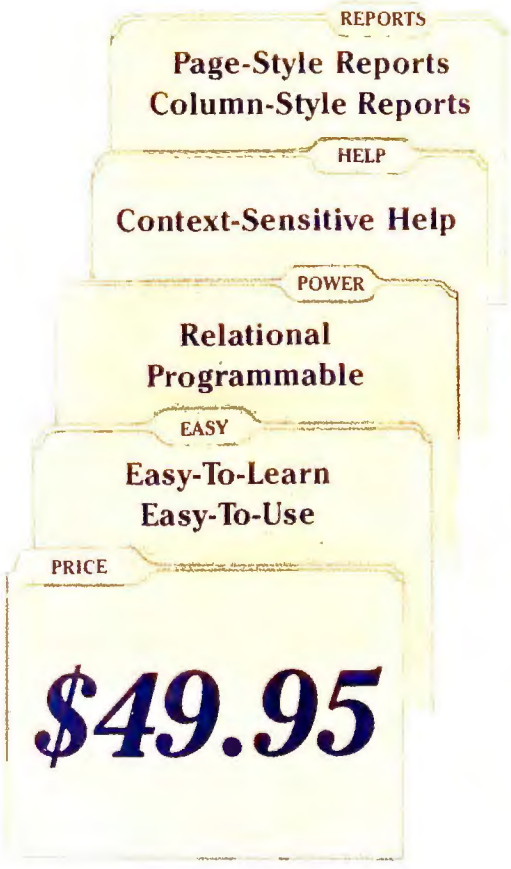
"Dac-Easy Base Lives Up to Its Name, Sets New Low-Cost DBMS Standard."

PC Magazine
March 10, 1987



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Dac-Easy Base is indeed both powerful and easy to use. It offers a multitude of unique features to help you organize, locate, and sort all kinds of alphabetic and numeric data. Dac-Easy Base continues the low price/high performance tradition of the Dac-Easy Series. With worldwide sales of over 300,000 systems, Dac-Easy has become the new leader in software designed for small businesses.

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Dac-Easy Base is actually two systems in one. If you are a novice you will appreciate the special Beginner Menu which contains the most commonly used features for creating, editing, and printing files. The more experienced database user will find the Advanced Menu allows instant access to each and every one of the powerful routines. In both menus, you are only a keystroke away from the context-sensitive help screens. The help screens in Dac-Easy Base are so complete you may never have to consult the accompanying 200 page manual.

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Design professional-looking data input screens without leaving the menu structure. There is no need for complex programming. Once created, the edit screen allows you to input and edit your information in a matter of minutes. Also attach special notes to any of your records with the built-in MemoWriter. The MemoWriter is the perfect way to attach specific information to a single record. Custom reports are easy to create without using the available programming language. Column or page-style reports can be created quickly, and viewed on your computer screen or printed to paper. As with all reports generated by Dac-Easy Base, you can select which records will be included in your report and how they will be sorted. Special headings and subtotals can be added to give you the exact information you need.

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Yes, Dac-Easy Base is easy to use, and it is also very powerful. An unlimited number of records with up to 60 fields per record, ability to access up to three files at a time, date arithmetic capability, formula fields for calculations within files, dynamic abbreviations, and keyboard macros are just a few of the powerful features available at your fingertips. Dac-Easy Base can read and convert dBASE II files and can run DBASE II programs.

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"Dac-Easy Base is similar to dBASE II in appearance, yet it improves upon it in ease of use, system limits, on-line and contextual help, numeric accuracy to 15 digits, security by password, storage of more and larger memory variables, and on-screen report layouts. The program can interface with dBASE II files and emulate its dot prompt, though Dac-Easy's menus are the better matrix.

Everyone will be pleasantly shocked by its $49.95 price."

PC Magazine
March 10, 1987

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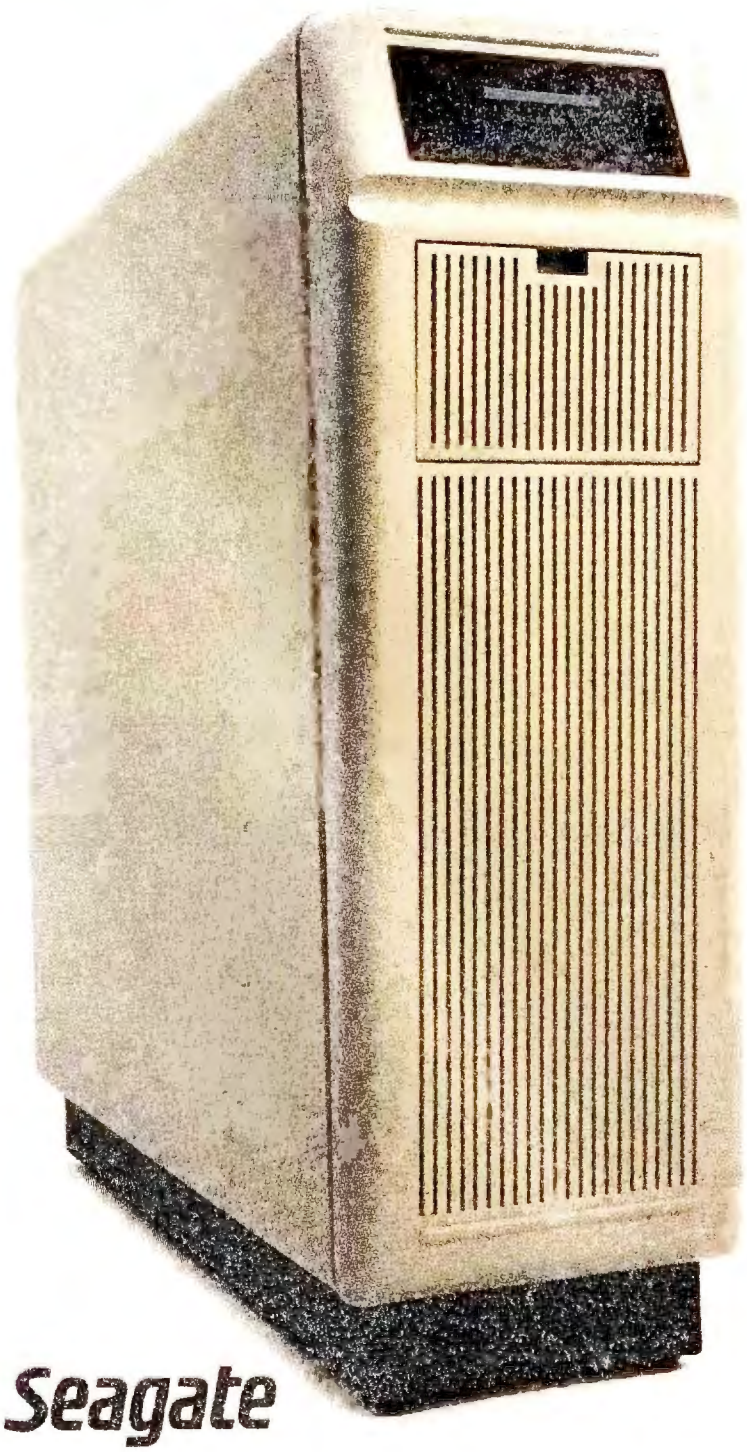

Seagate

has been distilled to a single keystroke. *professional plan* will run as a single-user application on a network; coupled with *pfs:professional network*—a $499 companion product from the *pfs:professional* family—the spreadsheet supports file locking and handles up to five simultaneous users. Software Publishing, 1901 Landings Dr., Mountain View, CA 94039-7210; 408/962-8910.

Is It Live . . . ?

These days you scarcely need to venture beyond the protective confines of *1-2-3*. Add-ins have become a compelling reason to buy release 2 and, incidentally, to forever forgo an integrated package. Blossom Software's ◆ ***Write-In*** stuffs a full-fledged word processor inside *1-2-3* and displays a nice propensity for graphics.

As a text editor, *Write-In* handles the basics—cut and paste, search and replace, automatic justification, and so on. Using its preview option, you can scrutinize headers, footers, line spacing, and pagination prior to printing. The $99 program is a respectable graphics editor, capable of capturing, displaying, and manipulating *1-2-3* .PIC files. Scaling charts on screen is a simple matter, as is mixing up to half a dozen images on a single page. The ability to scale .PIC files makes preparing overheads for presentation a snap. The program also boasts support for line drawing and more than a dozen print attributes.

Write-In is piggybacked on *1-2-3* to good effect. You can build macros—here dubbed "power strokes"—with a learn facility and then activate them for one-keystroke text manipulation. *Write-In*'s mail merge runs on autopilot as well; worksheet ranges can serve as fields for form letters. Should you move ranges within a document, worksheet formatting remains intact. Similarly, because *Write-In* files are *1-2-3* files, documents automatically reflect worksheet amendments.

Blossom knows whereof it blooms; company president Eric Schultz, a Lotus veteran, designed the add-in environment. Blossom Software, One Kendall Square #220, Cambridge, MA 02139; 617/577-8879.

. . . Or Is It Lotus?

While endowing *1-2-3* with word processing wizardry may be a trend in the making, users interested in grafting a data manager onto that program are in for an even more satisfying time. Informix Software's $149.95 ◆***Informix Datasheet Add-In*** pokes through *1-2-3* and discreetly conceals the Goliath below.

Datasheet essentially treats *1-2-3* as an operating environment and front end for Informix's relational data management engine. You can call on *1-2-3* commands

(continues)

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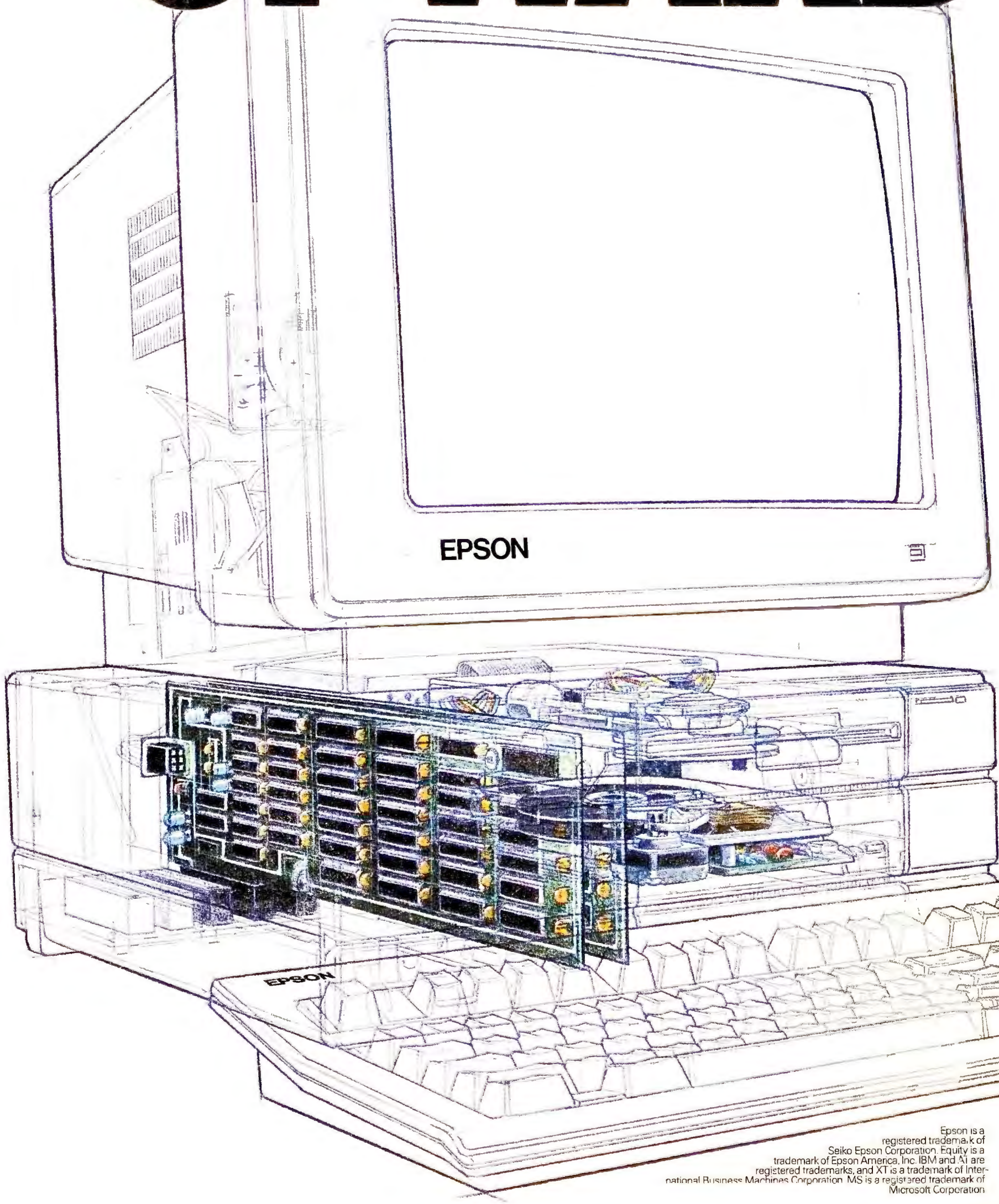

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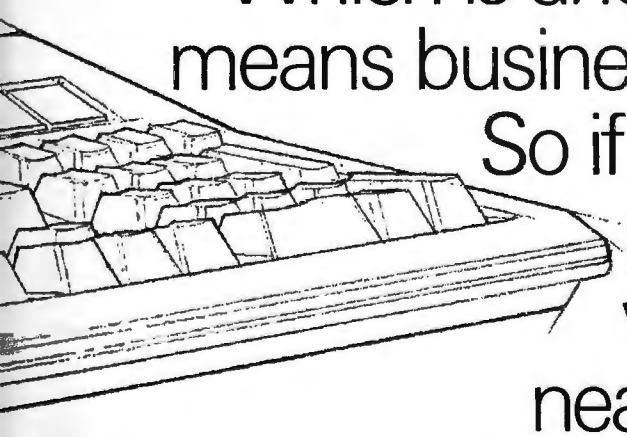

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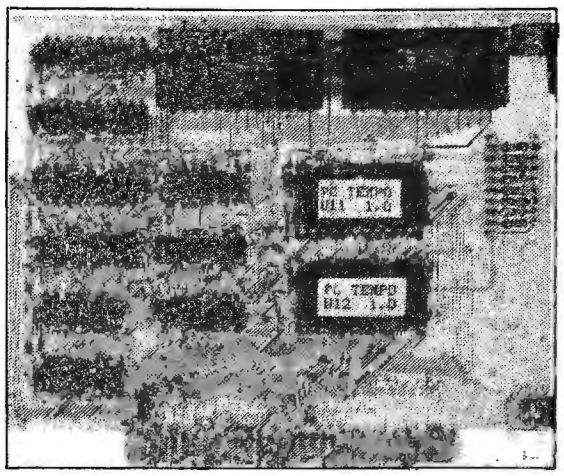

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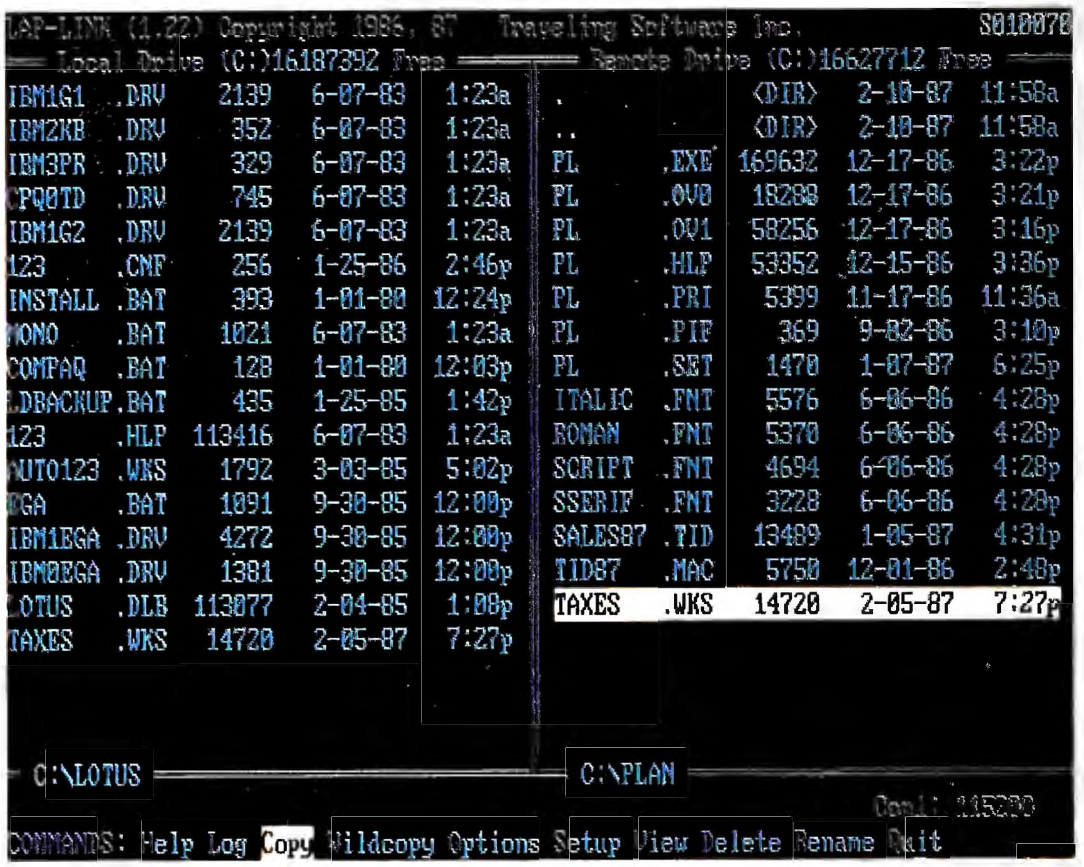


At the touch of a key, Laplink can transfer a .WKS file from a desktop PC's Lotus directory to a laptop's pfs:plan directory.

to create data bases, view and modify data, and perform queries by example. Data management and *1-2-3* functions coexist; *1-2-3* becomes a framework for data analysis, while *Datasheet* serves as the data repository.

Although *Datasheet* supports expanded memory, it's disk-based and thus can work with files larger than any worksheet can swallow. Because *Datasheet* draws on a single data base, worksheet linking is unnecessary; indeed, the program's relational powers enable you to create multiple worksheets from that data base. *Datasheet* marries *1-2-3* graphics capabilities to existing Informix applications and will operate unflinchingly on *Informix-SQL* and *Informix-4GL* files. Informix Software, 4100 Bohannon Dr., Menlo Park, CA 94125; 415/322-4100.

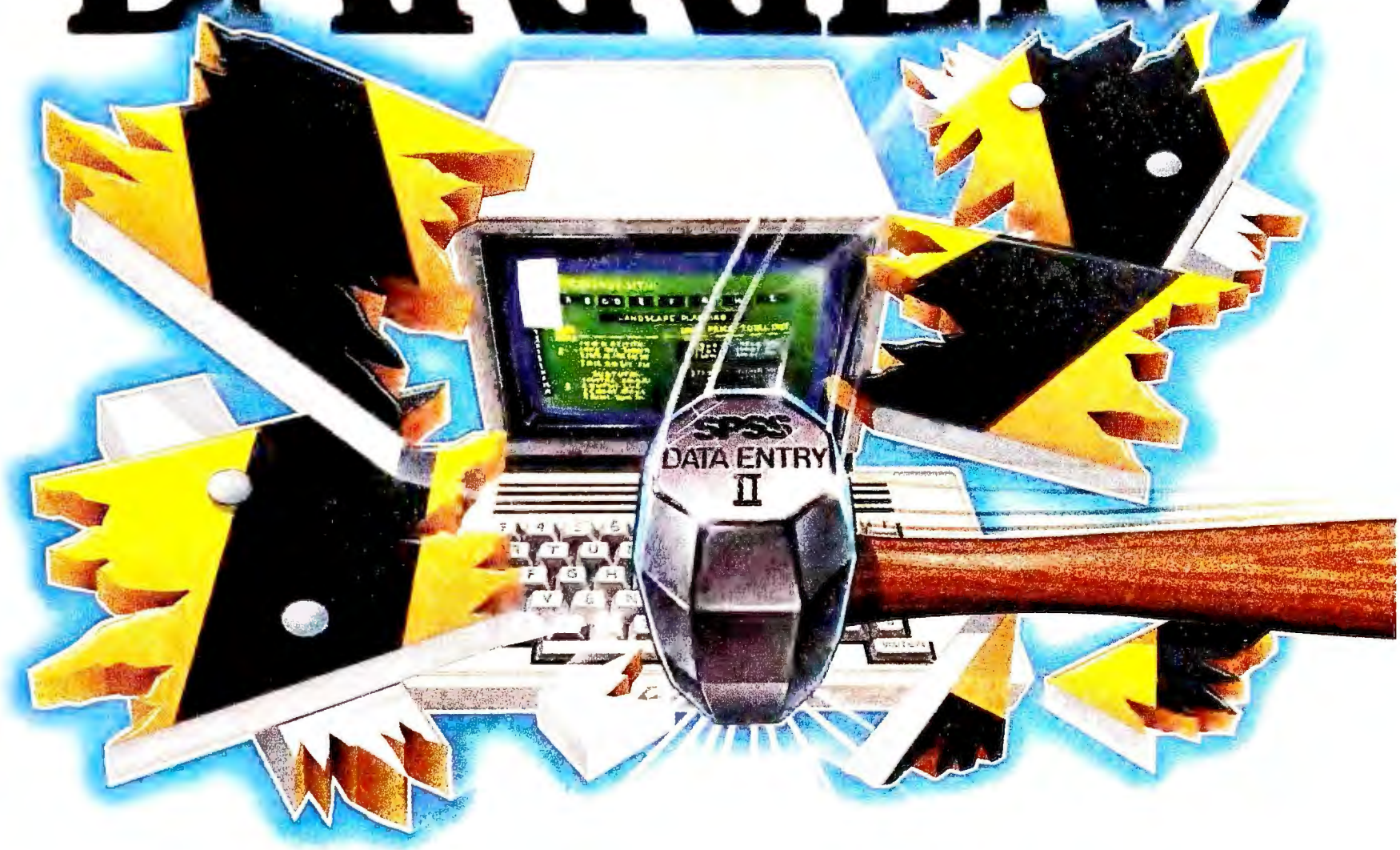
Tours of Lapland

Giving weight to the theory that the best solution is the simplest, two newcomers on the mobile computing scene may spare you a tango with an imposing assemblage of cables, drives, and communications arcana. In the process, both may reenergize life support systems for the 3½-inch floppy disk drive format—and for laptops themselves.

◆ ***The Brooklyn Bridge,*** from White Crane Systems, is a nifty $129 file-transfer utility that does with a pair of floppies and a serial cable what might otherwise send

(continues)

BREAK THE BARRIERS



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you to the store in search of an external floppy drive—or require that you mess with conventional communications software. The pylons of the *Bridge* consist of software on both 5¼-inch and 3½-inch disks, plus a 9-pin or a 25-pin serial cable.

Transferring data at 115 kilobits per second, the *Bridge* joins laptop and desktop—and anything tethered to them. The program acts as a device driver, enabling you to use DOS commands to access remote drives as though they were local. You can edit, print, and copy files of virtually any size. White Crane Systems, 6889 Peachtree Industrial Blvd. #151, Norcross, GA 30092; 404/454-7911.

Taking a slightly different tack, Traveling Software's ◆***Laplink*** comes complete with a turbo mode that zaps files from desktop to portable at 140 kilobits per second. *Laplink* is not a device driver; it enables either machine to control the other. Copying is a one-keystroke process, and you can transfer files individually or by directory, subdirectory, disk, date, or most recent modification. You can also back up data onto multiple 3½-inch floppies. *Laplink* lists for $129.95, which buys disks and a cable that features 9-pin and 25-pin connectors at both ends. Traveling Software, 19310 N. Creek Pkwy., Bothell, WA 98011; 206/483-8088.

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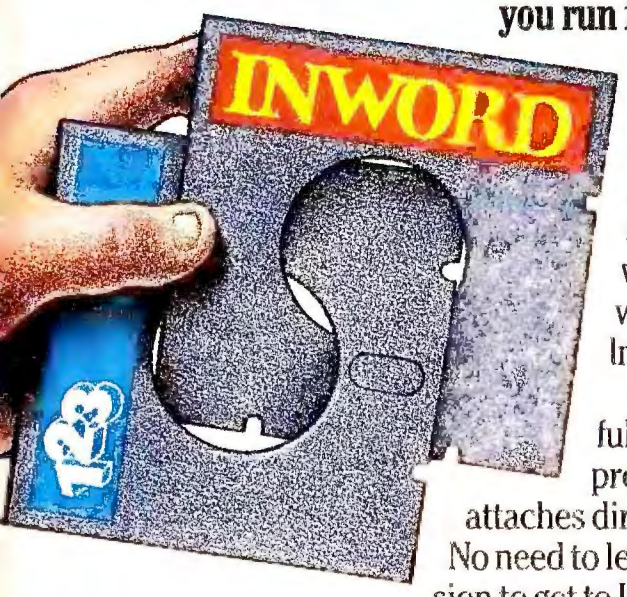

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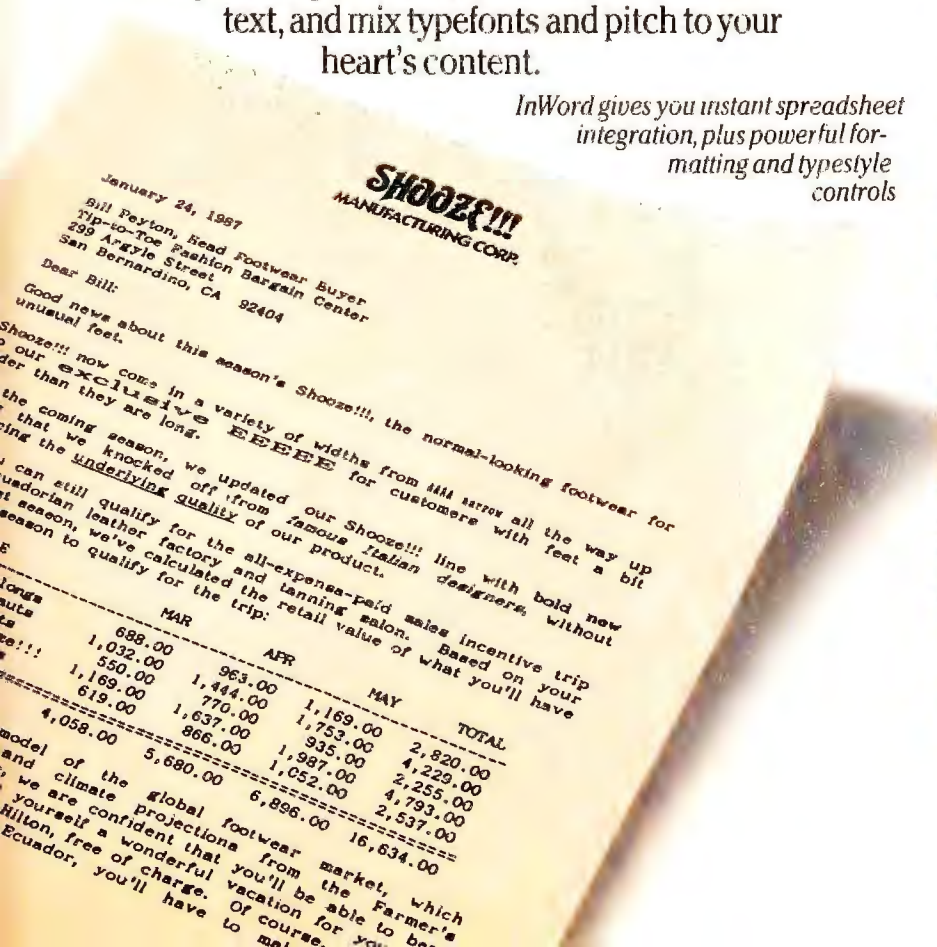


InWord gives you instant spreadsheet integration, plus powerful formatting and typestyle controls

It's great to be connected with Lotus.

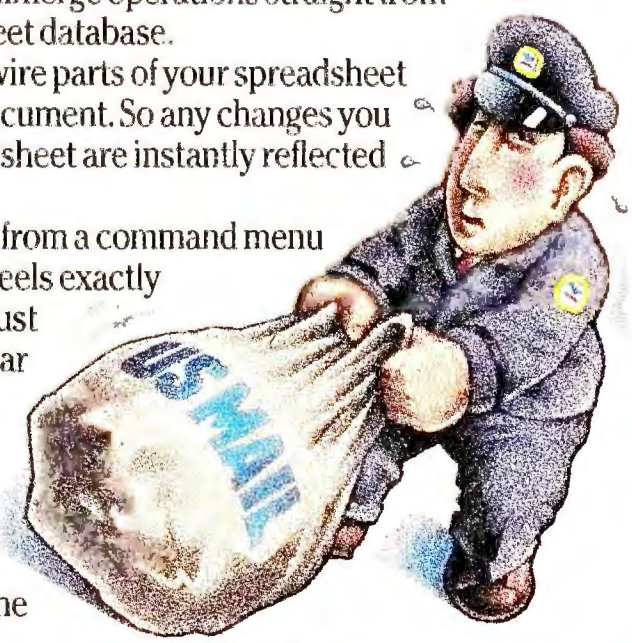
It's no coincidence that InWord gets along so beautifully with 1-2-3. In fact, InWord was developed especially for 1-2-3 Version 2 using software tools supplied by Lotus® themselves.

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

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

Plus, InWord runs from a command menu that looks, acts and feels exactly like 1-2-3 itself. You just can't get more familiar than that.

So if you've become hopelessly attached to the 1-2-3 habit, insist on the one word processor that shares your affection. InWord. It's from the makers of Sideways, the world's leading 1-2-3 spreadsheet printing software.



With InWord, automatic mailmerge is as easy as selecting a range from your 1-2-3 spreadsheet database.

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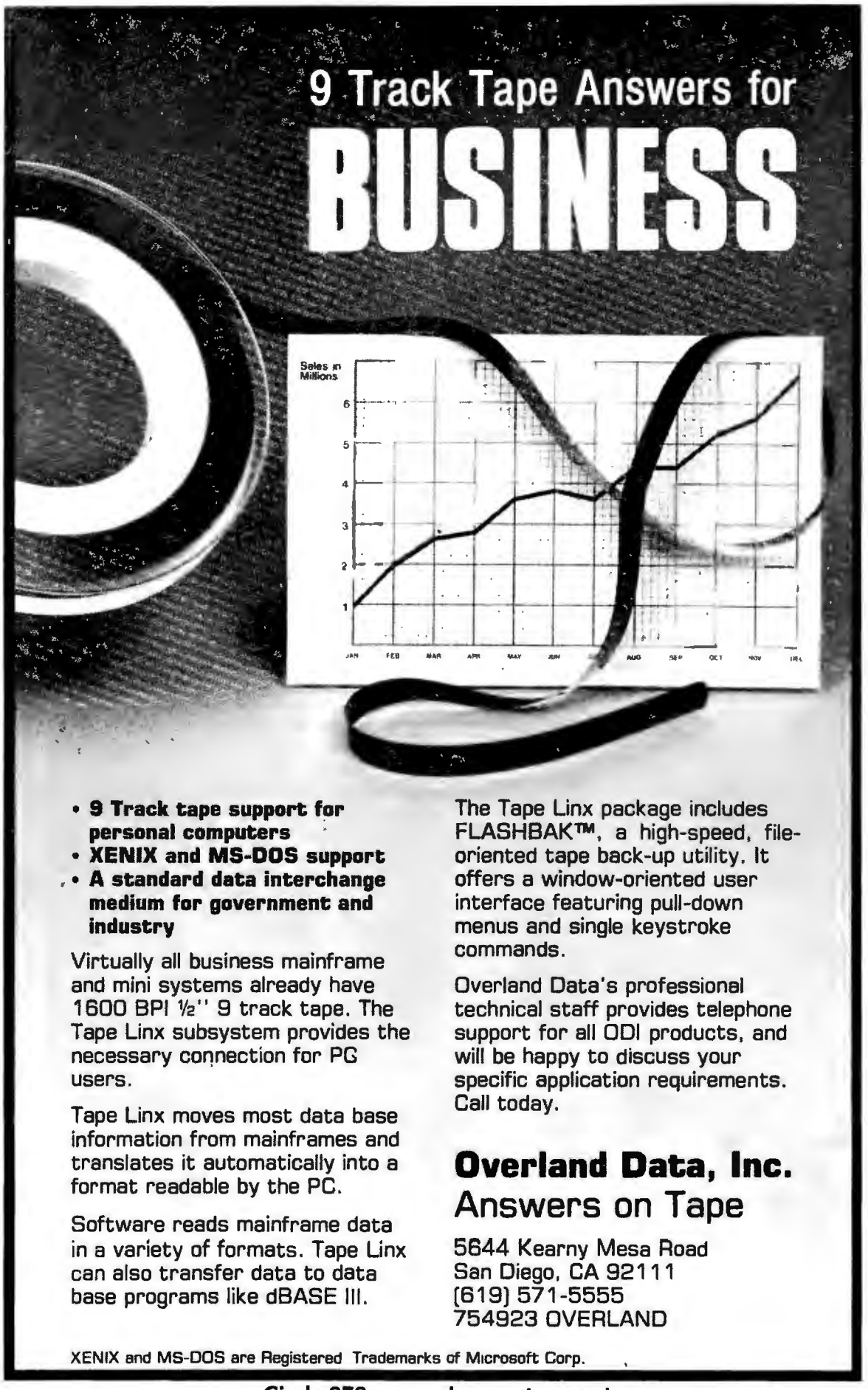

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Requires 1-2-3 Version 2 or Symphony.® Will **not** run with 1-2-3 Version 1 or 1A.

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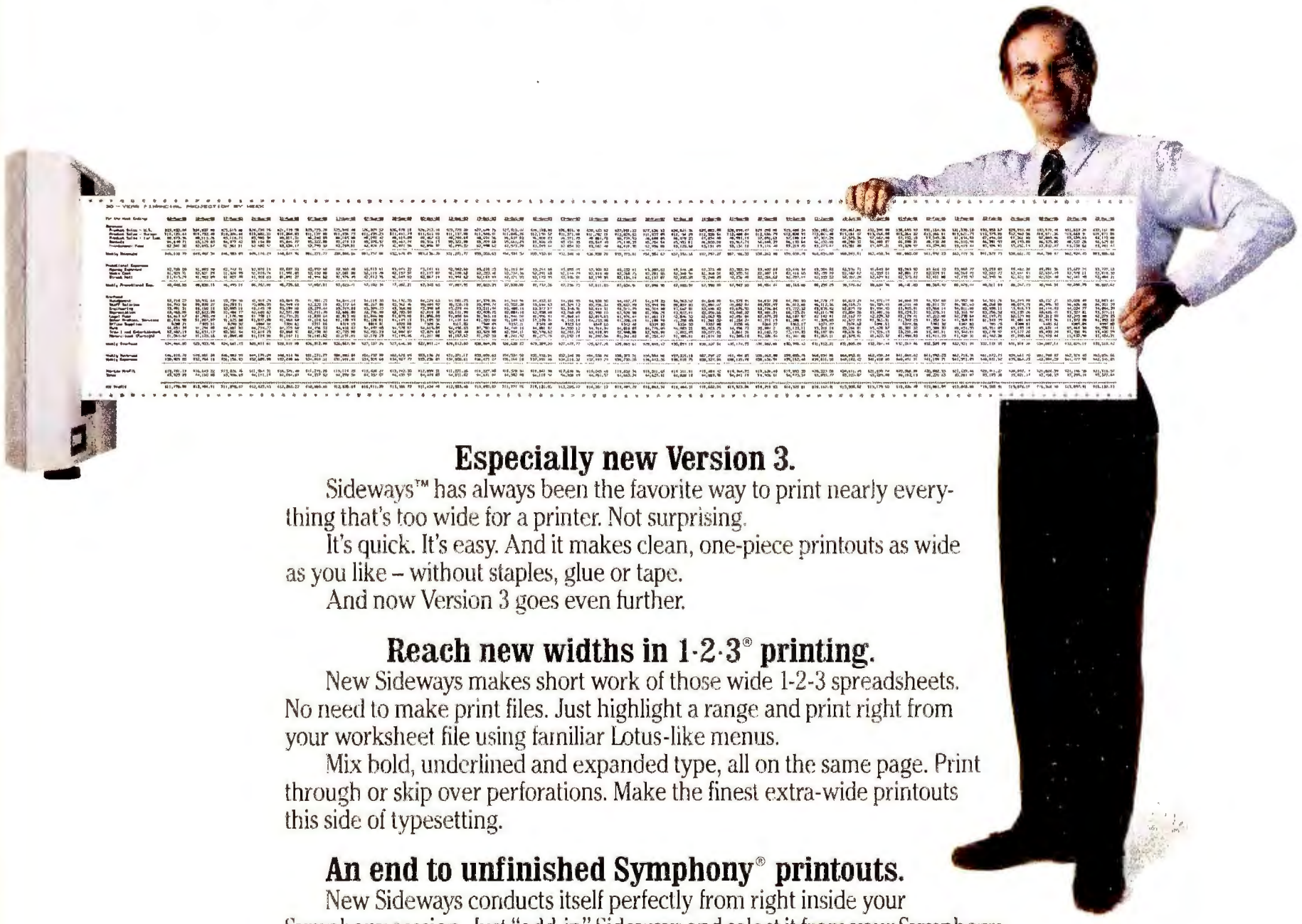

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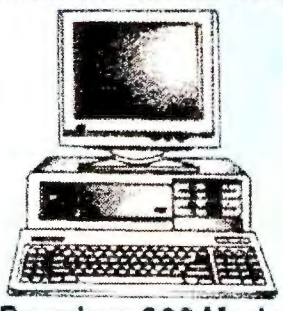

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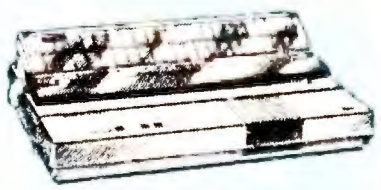

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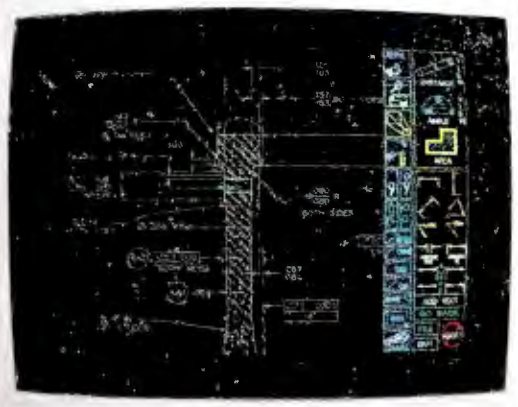

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Circle 937 on reader service card

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and most desktop publishing packages and keeps company with most laser printers. ZSoft, 1950 Spectrum Circle #A495, Marietta, GA 30067; 404/980-1950.

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No doubt you've been waiting for a major manufacturer to drive laser printer prices into your neighborhood. Wait no longer; the GQ-3500 is Epson's light touch, an economical 6-page-per-minute laser printer that borrows liberally from the best of its dot matrix cousins and emulates the LQ series. Bearing a list price of $2495, the GQ-3500 shapes up more as an office workhorse than a pint-size printing press. Its 11-function SelecType control panel lets you quickly set paper size, determine pitch, select from any of seven built-in fonts, and handle similar chores. Powering the GQ-3500 is a second-generation Ricoh engine that conserves desk space and can churn out 3000 pages a month. Equipped with 640K and a Motorola 68000 CPU, the GQ-3500 delivers half-page graphics at 300 dpi and can go to full-page with an optional 1.5MB board. The printer accepts vest-pocket-size font cards for Diablo and LaserJet emulation and supports Epson's own page-description language, built around graphics primitives rather than bit maps. Epson America, 2780 Lomita Blvd., Torrance, CA 90505; 800/421-5426.

(continues)

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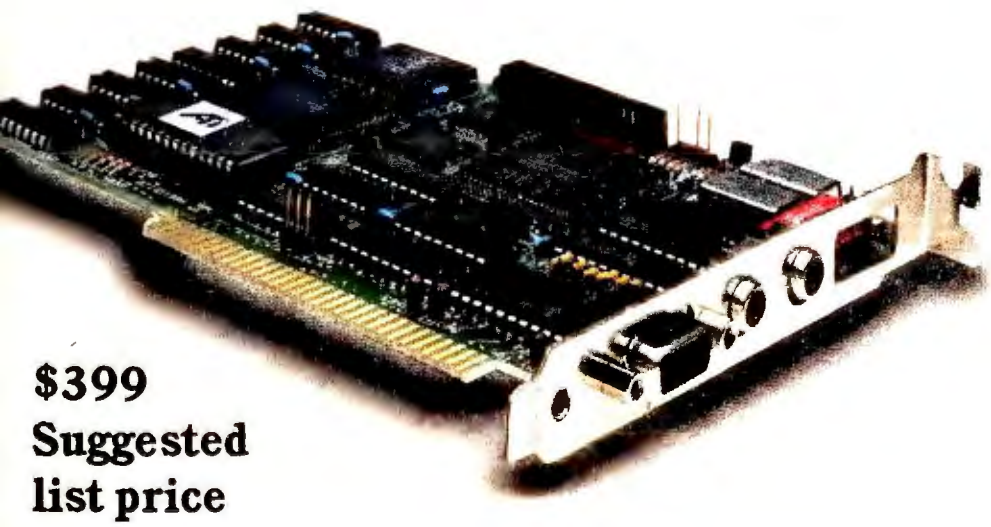

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Circle 846 on reader service card

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You need to equip your office with PCs but can't exceed your budget without biting into other critical line items—and your relationship with your boss. If nameless Far Eastern clones give you the willies, consider the warm feeling of a familiar domestic: Commodore. Leaving the parlor behind, **Commodore's PC10** family is angling for your business by offering as standard fare the graphics of pricier systems. It includes an ATI Graphics Solutions board in every box, which lets you select from among monochrome, CGA, Hercules, or Plantronics modes. The $999 PC10-1 is outfitted with a 360K floppy drive and 512K, expandable to 640K; the $1199 PC10-2 is a 640K, dual-floppy system. All systems include an 8088 running at 4.77 MHz, an XT-compatible BIOS, DOS 3.20 and GW BASIC 3.2, an XT-style keyboard, a parallel port and a serial port, five slots, and a power supply husky enough to handle two floppies and a 40MB hard drive. Commodore Computer Systems Division, 1200 Wilson Dr., West Chester, PA 19380; 215/431-9100.

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If you crave raw speed and are absolutely convinced that nothing beats a 386, you're missing at least one affordable surrogate. PC Designs has come up with a looker in its GV-286, a 12-MHz AT compatible that brakes to 6 MHz for speed-sensitive software. The company has managed to pull out all the stops—and guarantee peak zero-wait-state performance—by adding a high-speed static RAM cache circuit, just a keyboard toggle away. This is a machine with the future built in: The motherboard is socketed for 1-megabit RAM chips and tops out at 8MB. The $3799 base system includes 1MB of RAM, a 1.2MB or 360K floppy drive, two serial ports and one parallel port, a 30MB hard disk, a 60MB tape backup unit, Hercules-compatible graphics, a Princeton amber monitor, and a copy of *Desqview 1.3*. The EGA

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system—with a NEC MultiSync monitor—runs $4350. PC Designs, 19 Rector St. #2705, New York, NY 10016; 212/514-7280.

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On the other hand, if you can live without warp speed, try the latest 386. Cheetah International's **Adapter/386** is a palm-size $495 AT add-on that won't goose any of your applications. The board skips the supercharging in favor of the palpable multitasking that the 386 supports today. Coupled with control software like *Desqview 1.3*, the board lets your AT tap the 386's virtual 86 mode, and that means coexistence with a host of applications. The Adapter/386 doesn't require a slot but mounts on the motherboard directly above the 286, plugging into its socket and using the existing 16-bit bus. Cheetah International, 107 Community Blvd. #5, Longview, TX 75602; 800/243-3824.

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Architects, product designers, and garden-variety CAD users who need more than wire-frame capability may want to check out ***Dynaperspective,*** an $1850 heavyweight from Dynaware. The program is dedicated to rich, textured 2-D and 3-D solid modeling, good for both real-time analysis and presentation purposes. *Dynaperspective* supports 360-degree rotation and scaling, presents four simultaneous on-screen views, and enables you to create a wire frame and then flip to a solid model. The program comes with a parts library that can be augmented, and you can dispatch images to any 2-D drafting package. You can even string together up to 100 views for a slide show. Dynaware, 1309 114th SE #316, Bellevue, WA 98004; 206/451-0200.

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Assuming your taste in 3-D images runs to a florid conveyance of business data rather than solid modeling, you may be a candidate

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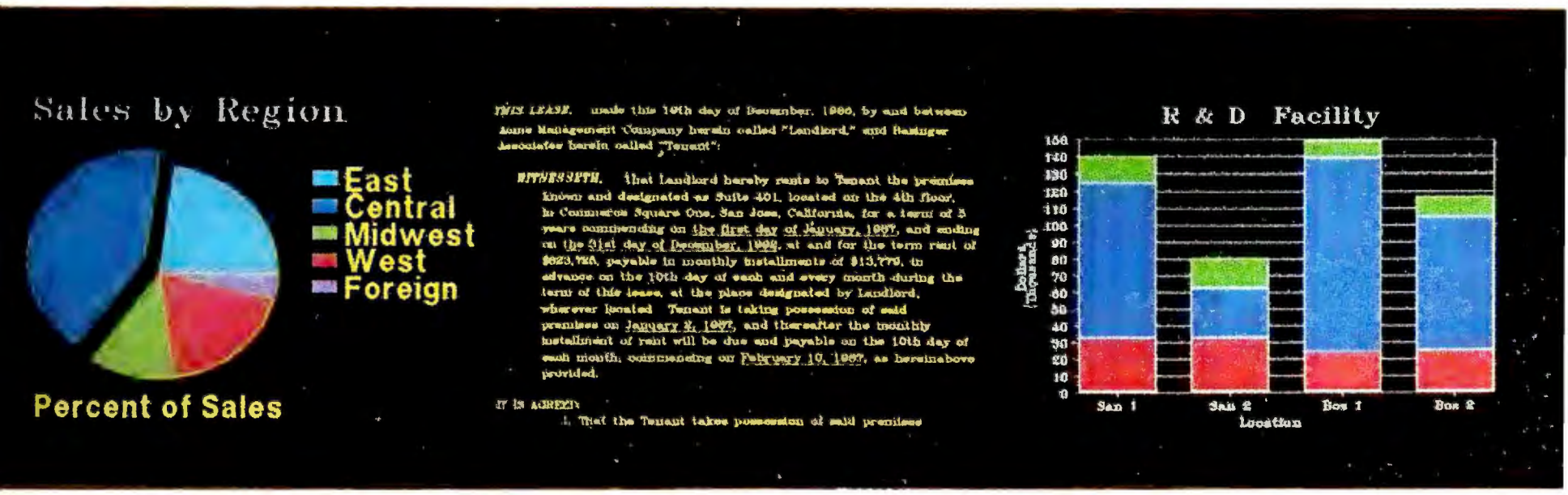

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Circle 89 on reader service card

for ***Perspective II,*** a revamped edition of Three D Graphics' charting package. At $395, *Perspective II* moves away from the strictures of monochrome and into the 16-color EGA universe. The program's image library now includes 1375 graph/angle combinations and adds a slide show capability, complete with fades and dissolves. A separate animation program, used in conjunction with an expanded memory board, enables you to add motion to your ever-rising sales curves. The program is no longer merely a passive recipient of data, thanks to added math and statistical functions. And the news for desktop publishers is good: With the program's Superprint utility, you can send those vivid images to a laser printer at 300 dpi. *Perspective*'s almost playful five-key interface remains intact. Three D Graphics, 860 Via de la Paz, Pacific Palisades, CA 90272; 213/459-8525.

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Any electronic publisher will concede that between dedicated desktop publishing programs and word processors of the old school lies a feature gap—even a chasm. Samna Corporation's ***Samna Word IV*** aims to bridge the gap, offering a brace of functions designed to make that word processor a suitable environment for polished document preparation. In the revamped program—which does not supersede *Samna Word III*—graphics and text can mingle in a single document, text can be manipulated in up to ten on-screen columns, and right-margin white space can be adjusted within a hyphenation "hot zone." You can use the program's preview mode to view a mockup of a completed page, zoom in on headers and footers, and automatically center text. *Samna Word IV* can generate output in any of 30 fonts and supports proportional printing with wide fonts; if a line can't be squeezed in, the program automatically reformats the document. The $595 package even works with full-page monitors. Samna, 2700 N.E. Expwy., Atlanta, GA 30345; 404/321-5006.

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If you've held off buying a **PC Convertible** because you think a $2000 machine should come with a screen you can read, your forbearance has been rewarded. In one fell swoop, IBM has remedied its mobile machine's three most acute ailments. The new PC Convertible features a crisp 80-by-25 supertwist liquid crystal display, an optional Hayes-compatible 300/1200-bps internal modem, and a 256K Memory Card that can bring total RAM to 640K. A higher-contrast blue-green-on-yellow display—complete with antiglare screen—replaces the LCD's gray-on-gray and ensures a wider viewing angle. No upgrade is painless, of course: The internal modem runs $450, the memory board $390, and current owners can get the new screen for $250. The Convertible's base price remains $1995. IBM Information Systems Group, 900 King St., Rye Brook, NY 10573; 914/934-4488.

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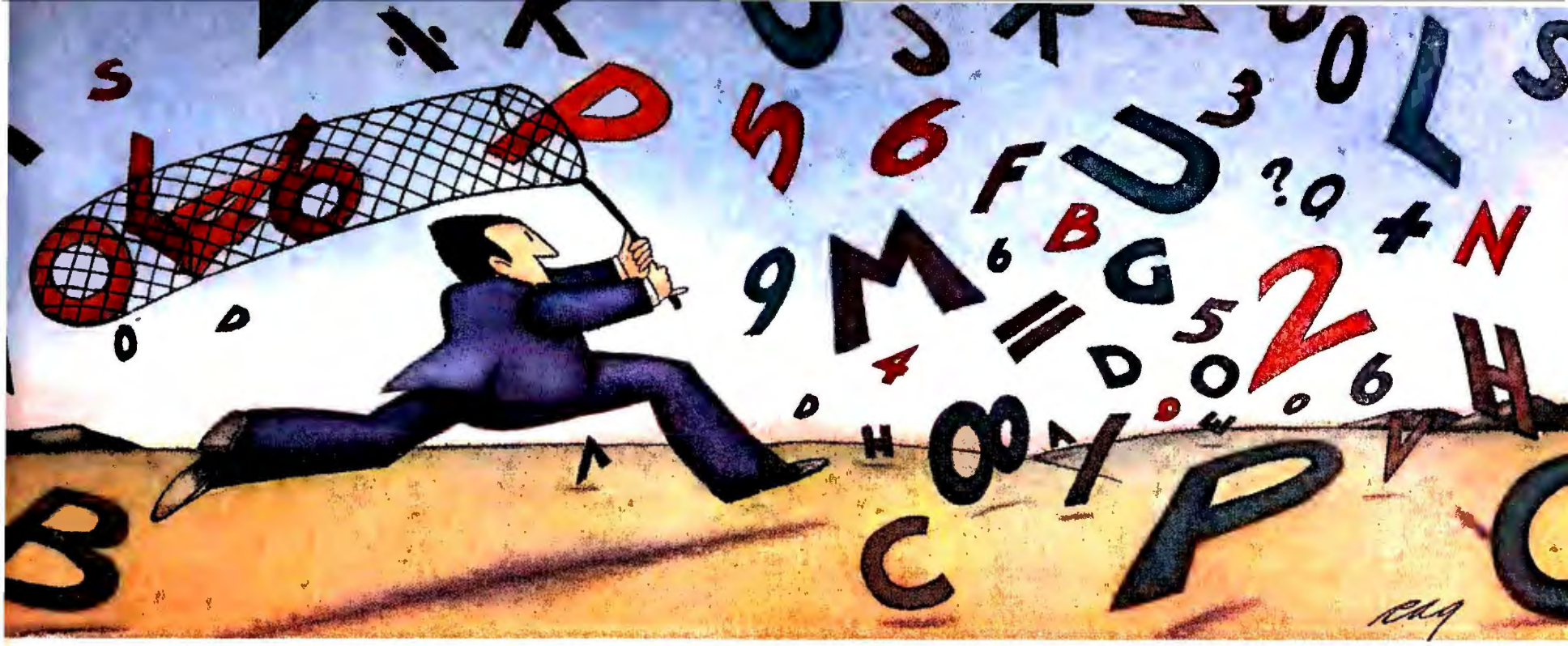

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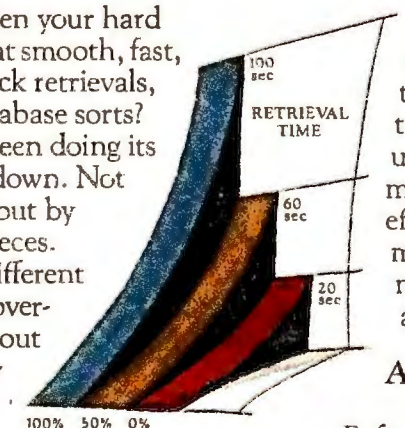
Loading is slower. Sorting is slower. Retrieving, backing-up. Everything takes longer because your disk has to work harder.

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



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

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

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

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

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

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

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

Analyze, scrutinize, optimize.

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

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

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

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

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

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

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

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

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◆◆◆◆◆

Perhaps the most daunting aspect of any project management package is feeding it data. With that in mind, Software Publishing has released ***Harvard Total Project Manager II.*** This $595 reworking of the popular program tosses a new paradigm into the mix: the Work Breakdown Structure (WBS). In *HTPM II,* WBS is an on-screen form, complementing its Gantt and PERT charts and Task List. WBS is essentially a project outliner that enables you to manipulate tasks and resources as you would words or figures. With WBS, you lay out the entire show—from inception to completion—in an on-screen organization chart; that data then automatically feeds the PERT chart. *HTPM II* also performs automatic resource leveling and resource tracking, hourly and overtime calculations, and ASAP and ALAP (as late as possible) scheduling. The program writes *1-2-3* and *dBASE* files and features 24 default report formats.

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The PC is a pretty fair student of math, but for engineers and technical pros interested in harnessing that prowess without wearing the straitjacket of electronic forms, MathSoft is offering ***MathCAD 1.1.*** Where traditional equation processors and calculation packages do their work in a black box, *MathCAD* relies on an electronic scratchpad—a vivid freeform analog to the blackboard, with guidance from pulldown menus. You can treat sections of the display as independent entities and execute "what if" scenarios. *MathCAD* handles all signs and math notation, real and complex numbers, and unit conversions. Its array of computational features includes differentiation, integration, root finding, statistics, and cubic splines. If you can't find a function within the $249 program, you're free to define your own. MathSoft, One Kendall Square, Cambridge, MA 02139; 617/577-1017.

(continues)

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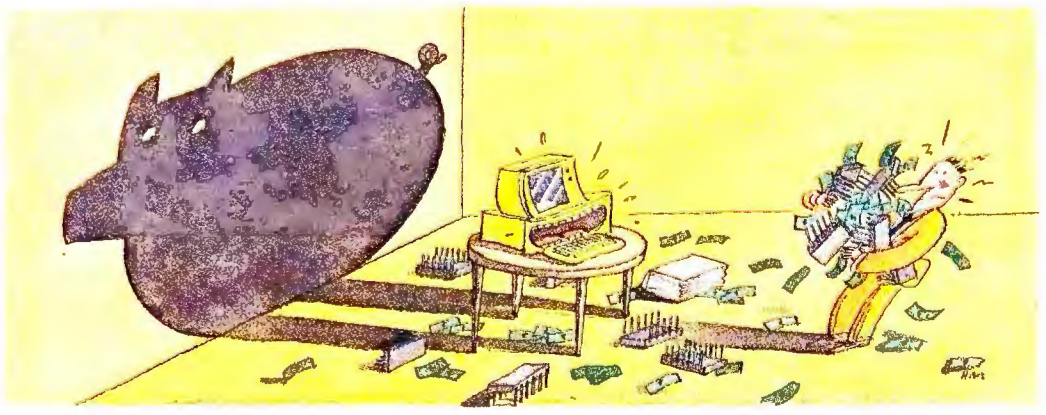

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Desk Top Publishing Wish List

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Multitech 900 10MHz **$1495**

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Seagate 4051 **$669**

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HIGH RES MONITOR
Princeton LM300 **$1049**

LASER PRINTER
HP Laser Jet Series II **$1967**

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Logitech C7 **$85**

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Fountain Valley, CA 92708

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The only compensating factor for the tedium of completing an expense report is the promise of speedy reimbursement. So imagine a semi-intelligent expense-reporting package that will advise on whether that distant hotel includes a sauna or if Hertz is currently renting RX-7s. Open your eyes and check out ***Travex***, a faithful expense reporter for employee and employer alike. The program tracks advances, reimbursements, per diem costs, and mileage rates and computes the tax consequences of travel expenditures. Tracking is further simplified thanks to a well-stocked library of hotels, airlines, and rental car agencies. *Travex* files on 2000 rental car outfits and 4000 hotels—including just about every Hilton, Holiday Inn, Hyatt, Marriott, and Sheraton—are updated semiannually. Reports can be generated horizontally or vertically to fit most company forms, and management reports on travel outlays can be had for the asking. The $89.95 program is available on 3½-inch disks for those on the go. Companion Data, P.O. Box 3171, Laguna Hills, CA 92654; 714/855-7254.

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For the record, the March *Product Outlook* trumpeted *Sprint: the Word Processor* "at the traditional Borland price." The actual retail price of the program is $195, not $99.95 as stated in the column. The correct Borland phone number is 408/438-8400. *PC World* regrets the errors.

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Product Blitzes

Hardware

Computers

IBM
XT 256K 1 DR *$1072
AT 256K 1 DR *$2475

Multitech
1100 **********$3399
Intel 80386, 16MHz;
40 MB up to 2MB Ram
Accel 900 ****$1495
IBM AT Comp. Computer
The ***Accel 900*** comes with Intel 80286 chip operating at 10 MHz, eight expansion slots, Hard Disk Drive/Floppy Disk adapter 512K RAM, expandable to 1MB, one 1.2 floppy, and MS DOS 3.2. The system works with Concurrent Dos, Xenix, and Unix. Hard disk drives, additional floppies, and expansion cards available. It comes with a one year warranty from TRW to give you dedicated service and support at an economical price.

Compaq
Deskpro 386
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70 MB, 16MHz *$5700
130MB, 16MHz *$7475
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2DR 256K *****$2640
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640K 20MB
Model 40 ****$4950
640K 40 MB
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PCAM
8 MHz Turbo System
IBM XT Compatible Computer
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30MB, 8MHz ****$955
Two floppies ****$555
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1.2 MB *********$129

Toshiba
ND040 360K ****$99
3.5" 720K ******$129

Fujitsu *360K*** *$79

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Toshiba
T 1100+ ******$1555
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30MB *ST238 KIT* $459
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60 MB Internal **$695
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Everex
Excel 20MB INT *$629
Excel 60MB INT *$789
Excel 60MB EXT *$875
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Graphics Board Monochrome

Hercules
Graphics + *** $194
Clone
Mono Graphics $89

Mono/Color Graphics Board

Everex *Edge* * $239

STB
Chauffer HT **$199

Monochrome Monitor

Samsung
SM12SSA TTL * $79

Multitech
14" Reversible, BK/W $149

Princeton
MAX 12 *******$154

Amdek
310A Amber TTL $149
410W 132 Col * $165
1280 1280 x 800 15" $778

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Quadram
Prosync ***** $329
(CGA, EGA, Auto Switch)

NEC
GB-1 ******** $359
Multisync Graphics. 640x840 132 Col., Hercules/CGA/EGA 16 Colors

Paradise
Auto EGA 480 $394

STB
EGA + CGA/EGA $299

Video 7
Vega Deluxe * $333
Auto switchable

Tseng
EVA 480 ***** $379

Color Monitor

CTX
14" RGB *******$269
640 x 200 (same as Multitech)

Princeton
PL 14" ********$478
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Multitech
Color 14" *****$329
640 x 200 + Switch

EGA Monitor

NEC *Multisync* $559
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Sony *Multiscan* $599
Autoswitchable, 900x560, Dot Pitch .26

Mitsubishi
Diamond Scan $569

JVC
GD-H3214 ****$569

Thompson
Ultra Scan **** 688
Monochrome, Hercules, CGA, PGC, 800 x 500 pixels, 45 to 75 Hertz.

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7475A ****** $1599
7550 ******* $3329

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DMP 42 ***** $2539
DMP 52 ***** $3847

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Princeton
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Citizen
120D ******** $190
80 col/120 CPS

Toshiba *24 WIRE*
P321 ********* $434
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P341 ********* $699
132 col/216/72CPS
351C Model 2 $1224
132 col/300/100/132 CPS
P351 **********$949
132 col/300/250/100CPS

Panasonic
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1091I 160CPS **$281
1592 180/38CPS *$439
1092I 240CPS **$355

Epson
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FX 286E ***** $624
EX 800 ****** $499
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Multifunction
P/S/C/G/OK ***** $89

AST
Sixpac Premium *****$308
Sixpac+ (384K) $227
Rampage PC * $234
256K + Deskview
Rampage AT **$445
512K + Deskview

Everex
2 MB EMS *** $129

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Courier HST 9600 Baud ****$699
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PCMouse *****$126
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CH Products
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150 Watt ***** $79

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RapidFile ***** $18
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Dac Easy Accounting $45

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It all added up to a pretty long list. Which made for a short answer. Microsoft Word.

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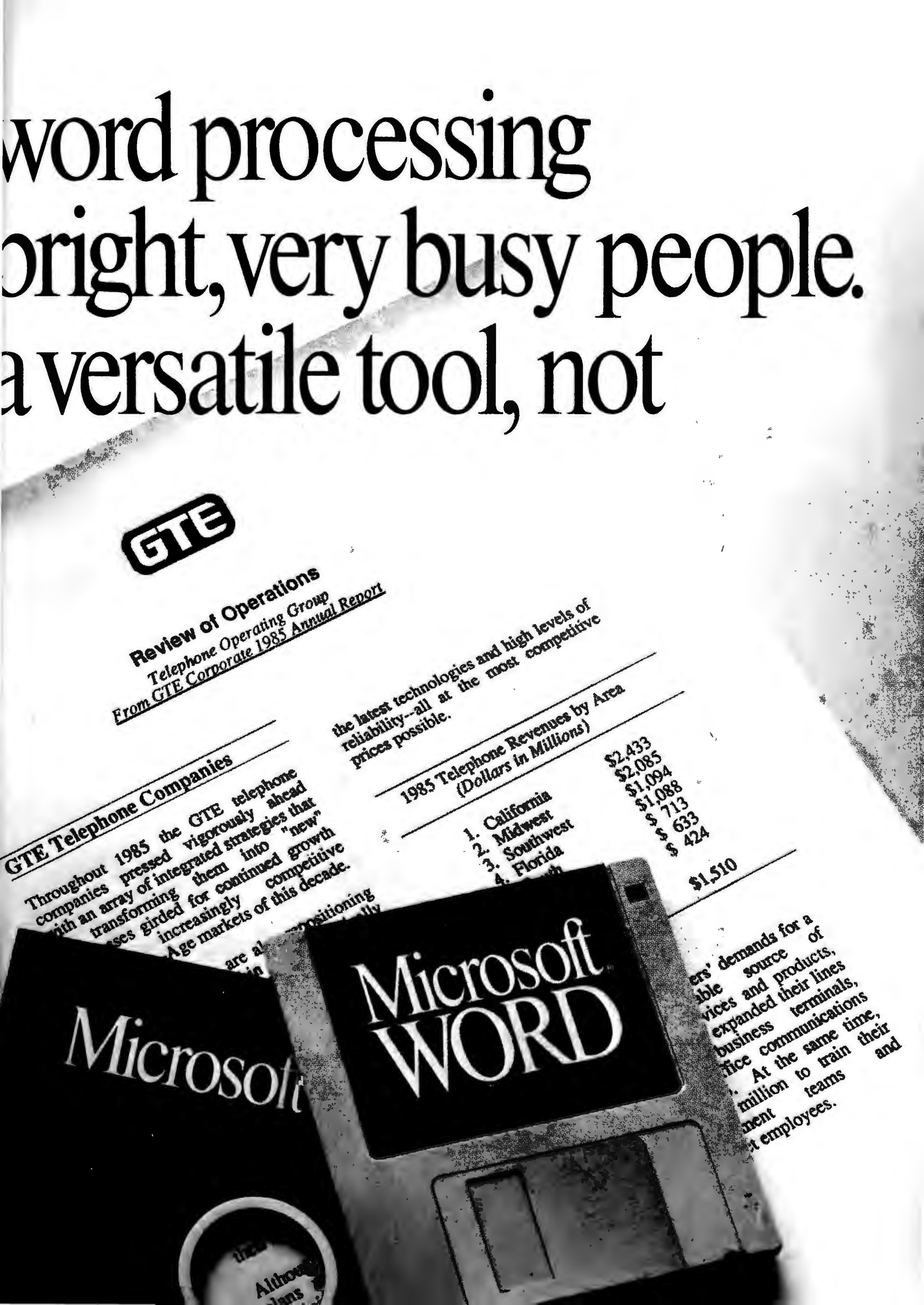

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From the Software Shelf

PC World offers first impressions of recent software releases

This month: A not-so-easy Dac-Easy Base, two top-notch hard disk managers, a communications program that really puts Windows on the phone, 10,000 programs on a single disk, and starflights of fancy

Edited by William Rodarmor

Dac-Easy Base

Relational data base manager

Pros: *Inexpensive*
Cons: *Cluttered and confusing interface, poor reporting functions, inadequate documentation*

Version 1.0
Dac Software, Inc.
4801 Spring Valley Rd. #110B
Dallas, TX 75244
214/458-0038

List price: $49.95
Requirements: 256K, two disk drives, DOS 2.00 or later version
Not copy protected

Every bargain has its price, and Dac Software has proved this maxim once again. Dac earned its reputation by selling inexpensive generic software, notably the nifty *Dac-Easy Accounting*. The company's latest addition to its line is *Dac-Easy Base,* a relational data manager that lists for a rock-bottom $49.95. Although advertised as suitable for both beginners and veterans, *Dac-Easy Base* is a quirky *dBASE II* spin-off that won't suit either.

Dac-Easy Base is essentially an unchanged, repackaged version of PractiCorp's *PractiBase,* which was developed when *dBASE II* was still the data management standard. *Dac-Easy Base* can be run from menus, but its true (if limited) powers are tapped only with commands issued at the program's dot prompt. An ersatz *dBASE*-like command language and a pocket-money price tag, however, aren't enough to overcome the program's serious shortcomings.

At first glance *Dac-Easy Base*'s opening Partial menu of 18 commands isn't overwhelming. But display the program's Whole menu, and the screen fills with a gaggle of illogically grouped commands that would mystify novices and experienced users alike.

Fortunately, *Dac-Easy Base* isn't totally opaque. When you highlight a menu option, an explanation of the function appears at the bottom of the screen. When you move the cursor to Create to create a file, for example, a series of prompts guides you through the process of naming fields, specifying the field length, and choosing the field type (alphanumeric, numeric, logical, or date).

This may sound like an ideal prompt-and-response system for novices, but it assumes that they are already familiar with data management terminology. Not everybody who buys *Dac-Easy Base* to track a stamp collection (an application mentioned in the company's ads) can define a Date-Update field without some help.

Dac-Easy Base seems well intentioned but incomplete. It includes a set of informative, context-sensitive help screens but buries error messages at the bottom of a cluttered screen. Although the manual tells you how to append records and print reports, it fails to provide concrete

examples. Worst of all, *Dac-Easy Base* is unforgiving: I twice found myself dumped out of the program after mistyping commands.

Dac-Easy Base's report generator is similarly slipshod, though the manual walks you through the process of creating a simple tabular report (one record to a line) or page report (one record per page). For all the promotional huzzah about *Dac-Easy Base*'s relational capabilities, the program can draw from only a single data base when generating a report. A report definition can be applied to other data bases only if they share the same structure and field names.

Limited formatting commands make printing a report a frustrating affair. Page-layout controls are skimpy—you have some control over title, page number, and date placement, but you can't create your own headers or footers. Even the most basic task—printing mailing labels—is circumscribed because you can't specify top and bottom margins or character spacing.

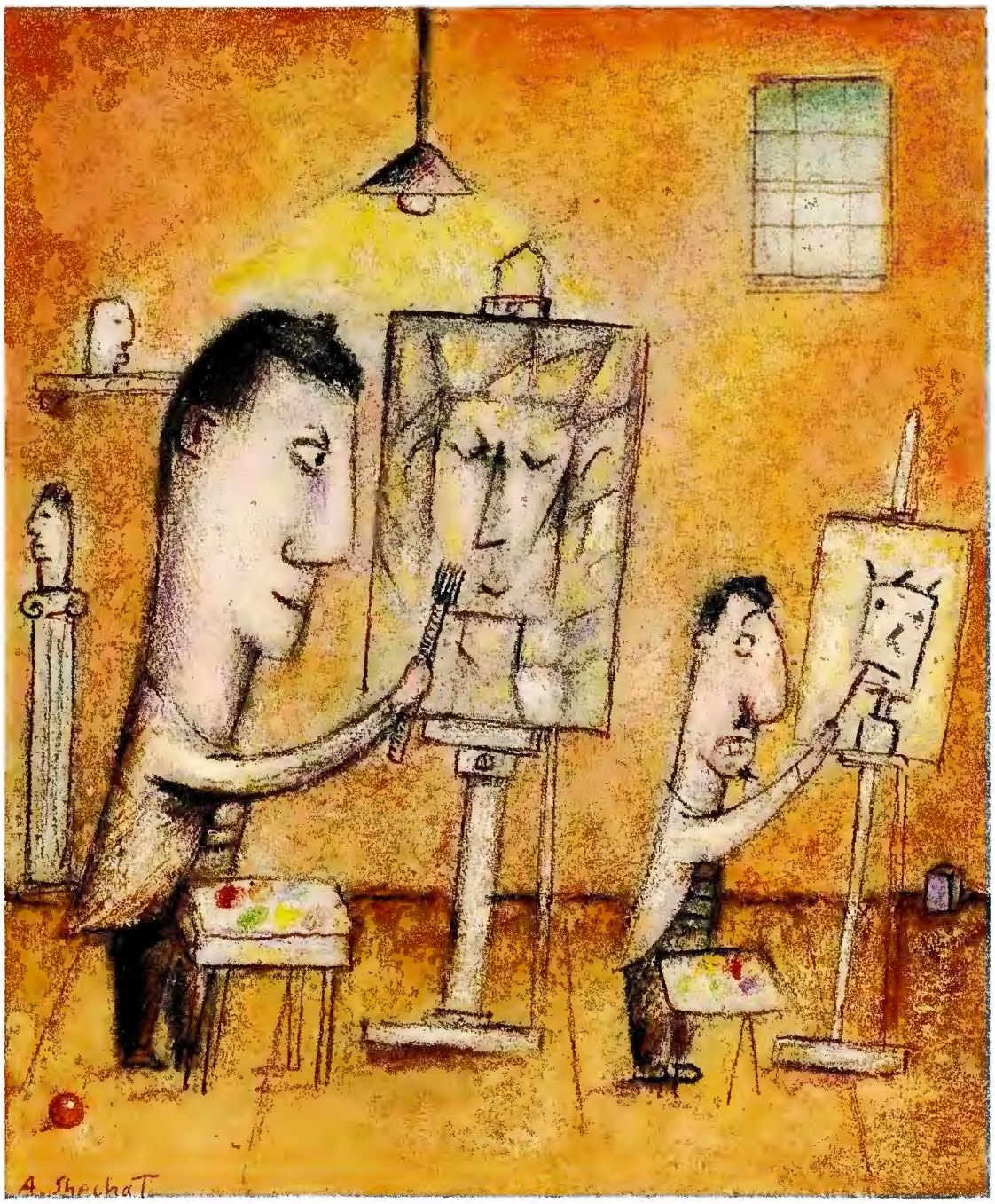
Dac-Easy Base can import *dBASE II,* ASCII-delimited, and ASCII fixed-length files, but this is no job for the uninitiated. Even if you do it by the book, you may spend a lot of time coaxing a *dBASE II* file into *Dac-Easy Base,* only to have the program skew or truncate the data.

Dac-Easy Base is not completely without virtues. It can link more than one file at a time, a relational feature usually found only in more expensive data management programs. Entering and editing records is straightforward, and the program's default data-entry screens are well designed.

Alas, just as you sit back to view the records in a file, they come at you like a runaway train. Once the records start cascading down the screen, there's no way to stop them. I once thoughtlessly issued the List command on a 1700-record file and had to cool my heels for several minutes until the report finished rolling by.

Dac-Easy Base is trying to please first-time buyers who need a simple file manager and experienced users looking for a bargain-basement relational data manager. Even at $49.95, however, the program is likely to disappoint both groups. *—Ken Smith*

(continues)



Andrew Shachat

Snap

DOS shell and hard disk manager

Pros: *Fast, menu-driven interface; moves and deletes files; retrieves lost files; protects data; edits and prints ASCII files*
Cons: *Requires basic knowledge of DOS*

Version 2.2
The Mt. Whitney Group
11612 Knott Ave. #G-19
Garden Grove, CA 92641
800/992-4992, 800/624-7355 in California

List price: $99.95
Requirements: 256K, hard disk, DOS 2.11 or later version
Not copy protected

I used to think that DOS shells and hard disk managers were for rookies. When I was a buck private in the computing army, I slogged it out the hard way, learning one murderous DOS command after another.

Still, when I found myself retyping a lengthy DOS path that I'd just botched, I'd wonder if it was worth it. But reading the ads for those easy, menu-driven interfaces only stiffened my resolve to tackle yet another MODE command. After all, what's the point of performing half your file management chores via a menu, only to have to return to DOS and a collection of batch files to handle the tricky stuff?

If, like me, you've turned up your nose at hard disk managers, you might be surprised by *Snap,* from The Mt. Whitney Group. It offers speedy menu-driven access to the full range of DOS commands, plus utilities for regaining lost files, protecting privacy with passwords and data encryption, and editing and printing ASCII files. You could assemble a reasonable facsimile of *Snap* by downloading utilities from bulletin boards and buying a few adjunct programs, but why not gather them all in one package, with all the utilities easily accessible? Even at $99.95, *Snap* makes sense.

Snap enables novices to tap a PC's full power from a menu without fully understanding DOS, batch files, or the rest of the PC's arcana. Veterans can use it to set up sophisticated turnkey systems for others.

One warning: Be sure to pick up the latest release of *Snap.* The documentation with version 1.9 was so atrocious, I had to call the Mt. Whitney group just to find out how to load the program. The new documentation is vastly improved.

The program is indeed a snap once set up, and it assumes a low profile when not in use. *Snap* uses about 150K when active, but shrinks to less than 300 bytes when you're running an application. It gets along swimmingly with other memory-resident programs, although *SideKick* won't always leave *Snap*'s cursor where it found it.

Snap is much more than a simple DOS shell. It can be used to create divisions and subdivisions that DOS's designers never imagined. For example, when I select Word Processing from my *Snap* menu, it calls forth a submenu that lists *Volkswriter, Lotus Manuscript,* and *IBM WordProof.* Real beginners could as easily set up menus with descriptive names such as Letters With Thesaurus, or Memos and Spelling Checker (see Screen 1).

Snap can be configured to return to a specific menu or load a designated program every time you exit an application. This is particularly useful if you repeatedly run several programs in a given sequence. A word processor might exit into a spelling checker, which then exits back to the word processor for printing, and finally moves to a spreadsheet where time and billing information is recorded.

Snap's system utilities, available on every menu, perform a host of DOS functions and PC-management tasks, from recovering deleted files and moving files using wildcard commands to editing documents and displaying a graphic representation of the directory tree. A display window also details the status of current ports, video modes, and buffers.

As if this weren't enough, *Snap* is also adept at securing your data. You can assign passwords to individual programs, submenus, and even DOS itself. The password system isn't foolproof; nothing can prevent a savvy operator from rebooting with a DOS floppy disk

(continues)

Extraordinary new Printer Mufflers. Peace and quiet for as little as $59.95

New from Kensington, the Printer Muffler™ 80 (only $59.95) and the Printer Muffler™ 132 (only $79.95) are the perfect solutions to noisy printers.

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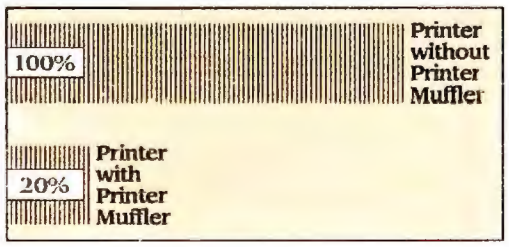

The Printer Mufflers' sturdy lids not only keep noise in, they keep dust out. And they're transparent, too. After all, printers should be seen, even when they're not heard.

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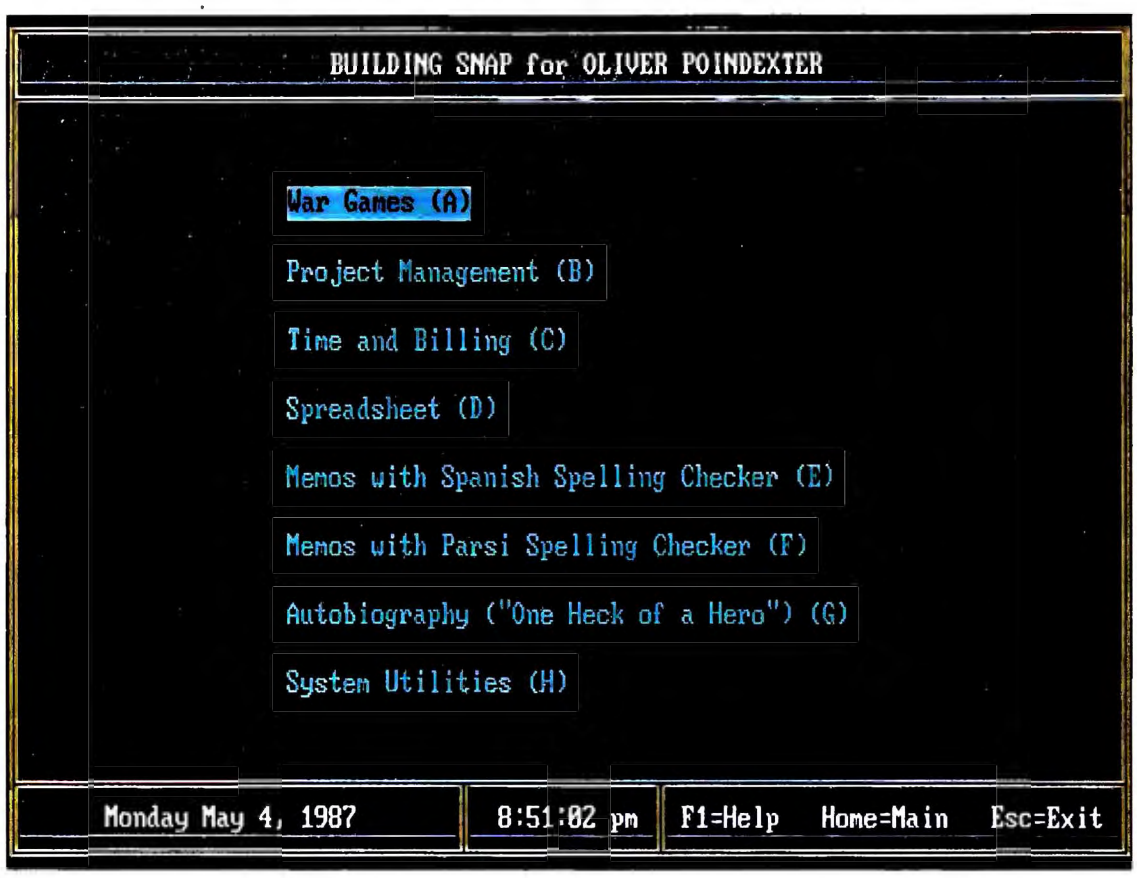

Screen 1: For the person on the move in a fast-changing situation, Snap zips to the needed information. A single keystroke opens up areas that are hard to look into with DOS. The program's encryption powers are useful too; whether your records concern international travel or foreign exchange, they are safe from probers.

and bypassing *Snap*. If you're really concerned about securing data, turn to *Snap*'s encryption utility, which transforms a file into balderdash until you supply the right password.

For someone just starting out with a PC, there are simpler and cheaper programs to help with basic DOS functions (see the review of *WindowDOS* in this column). But if the system is already set up, *Snap* can be very helpful. It should prove especially valuable to office PC wizards who want to create turnkey systems for novices. After they scan *Snap*'s wealth of features (and swallow their pride), the wizards may even end up using it themselves. *—Donald B. Trivette*

InTalk

Communications program

Pros: *Works with Microsoft Windows, swaps data with compatible applications*

Cons: *Requires too much memory, slow when other programs are loaded, can display color only on EGA-equipped systems*

Version 1.02
Palantir Software
12777 Jones Rd. #100
Houston, TX 77070
800/368-3797

List price: $150
Requirements: 512K, hard disk, graphics adapter, DOS 2.00 or later version

Palantir Software's *InTalk* is the first full-featured communications program to take advantage of the *Microsoft Windows* environment. Not only can you cut and paste data between *InTalk* and other *Windows* applications, but you can also use a second application while *InTalk* runs a communications session in an on-screen window. Unfortunately, the program is also a memory hog and picky about the company it keeps in RAM.

InTalk has gone through several incarnations in its brief life. It started out as a PC and Macintosh program called *InTouch*, but it was as buggy as a hot June afternoon and demanded absurd amounts of memory. Version 1.02 addresses most of the earlier problems but nonetheless has some daunting requirements: 512K of RAM, a graphics adapter and display, and a hard disk.

You don't need a mouse or the full-blown version of *Windows* to run *InTalk* (a run-time version of *Windows* is included), but without them the program doesn't live up to its potential. Thankfully, *InTalk*'s documentation is clear and concise concerning both telecommunications theory and *InTalk* practice.

If you've used *Windows* you'll feel right at home; *InTalk* adheres to the *Windows* standard interface. You can select functions by

(continues)

When you're ready to get serious about surge suppression.

Here's important advice for PC users. With test after test proving that 70-90% of all PC malfunctions can be traced to disturbances in the power supply, a surge suppressor is the first accessory you should buy for your PC.

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	Master Piece and Master Piece Plus
Meets IEEE 587-1980 Category A	✓
Meets IEEE 587-1980 Category B	✓
UL Listed	✓

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The circuitry in both Master Piece and Master Piece Plus is designed to exceed Category A of IEEE* specification 587-1980, as well as those established by UL†.

Sound good? Keep reading, it gets even better. Our circuitry also exceeds Category B of IEEE specification 587-1980. Under this category, created to guard against the severe spikes near the main power distribution panel of a building, Master Piece will even protect your PC from a simulated 6,000 volt lightning strike with a 3,000 amp follow-on current.

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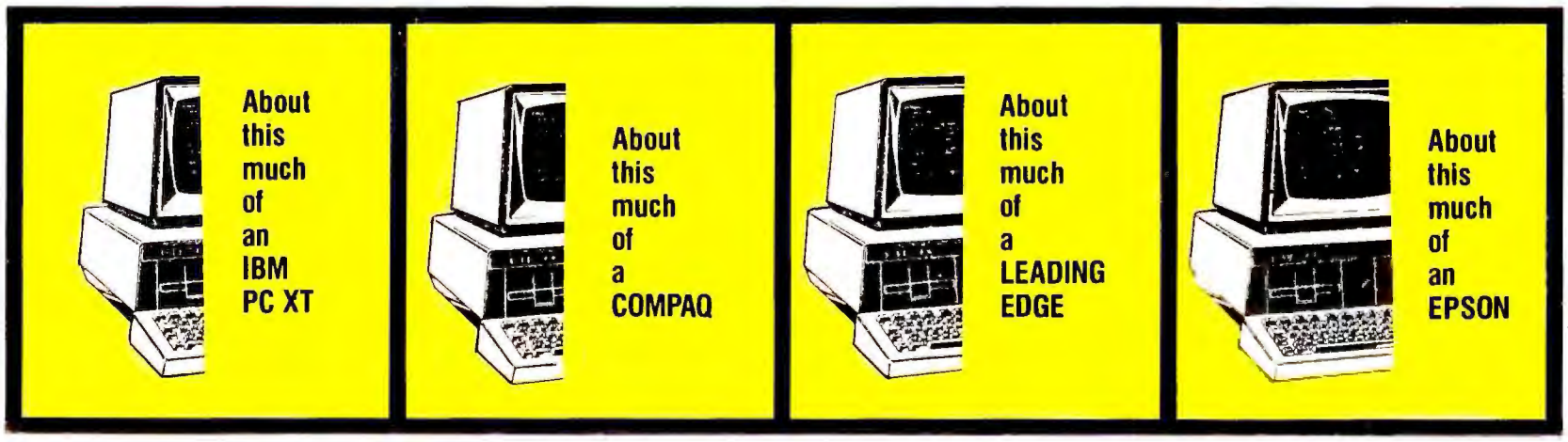
How much computer will $799 buy?



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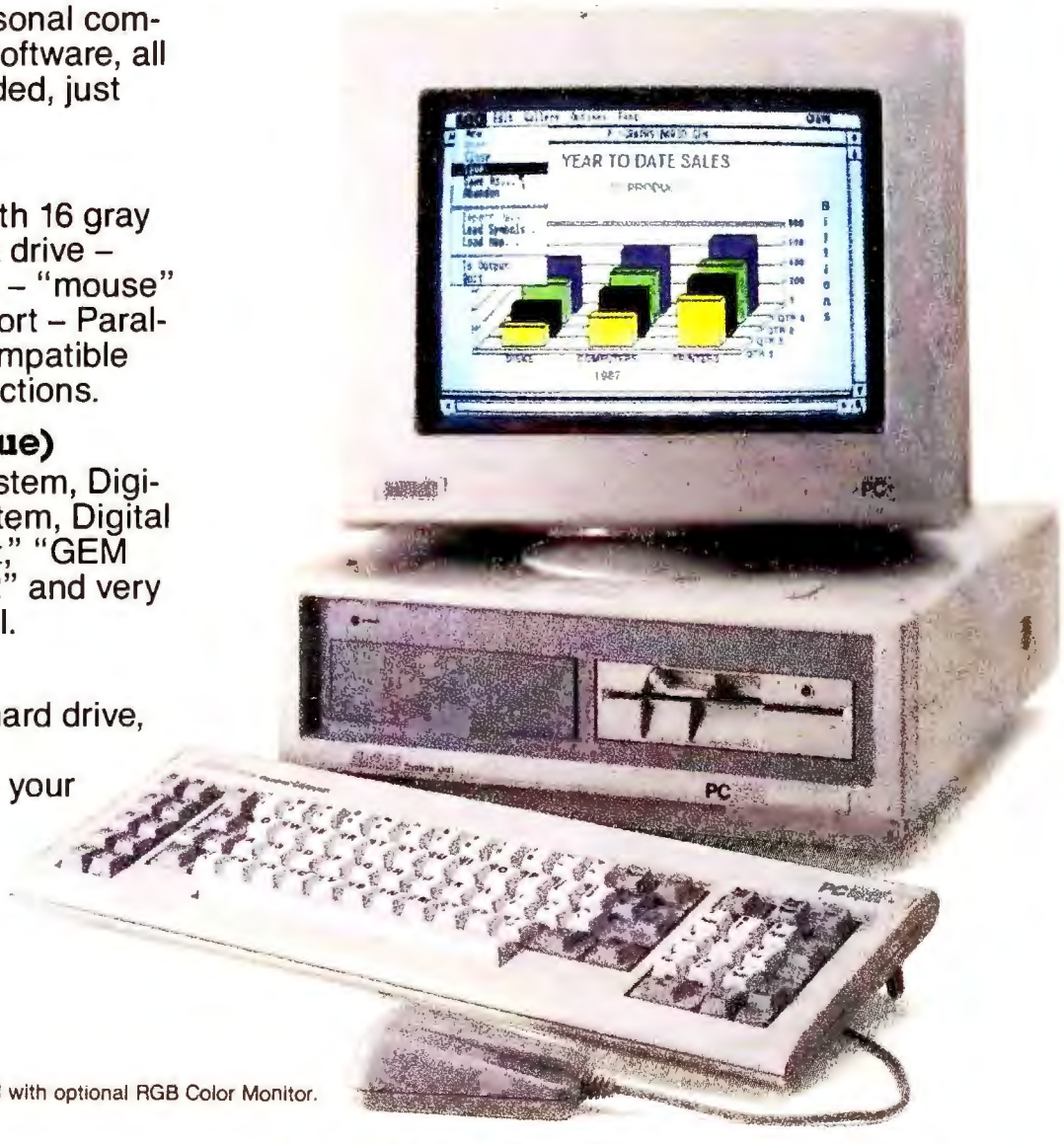

Unit pictured with optional RGB Color Monitor.

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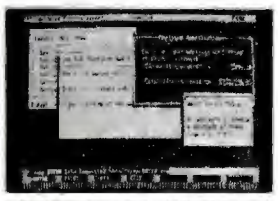

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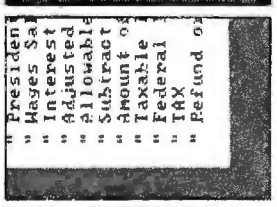

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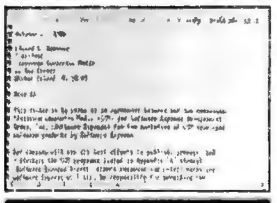

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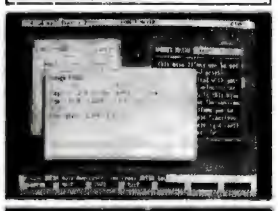

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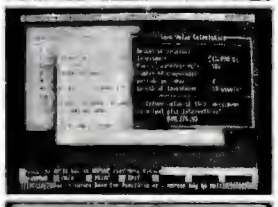

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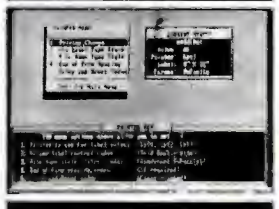

☐**DISK FILER Organize Your Disks With Neat, Printed Labels** Great get- organized program prints the filename contents of your disks in reduced-size type on commonly available self-stick disk labels, on your dot-matrix printer.

☐**TUT BUSTERS Fast-Paced Pyramid Action** Help Bold Adventurer Buster Cheops reach the jewel-encrusted urn at the top of Tut's Pyramid. Fun, fast, and very sneaky! (Color/Graphics req'd.)

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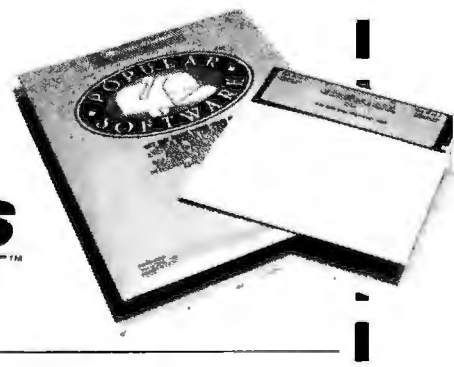

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____ PHONE _____

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ORDER TOTAL: $_____(Orders under $15.00, please add $1.50 shipping and handling).

METHOD OF PAYMENT: ☐Check enclosed ☐VISA ☐MASTERCARD Enter credit card number below:

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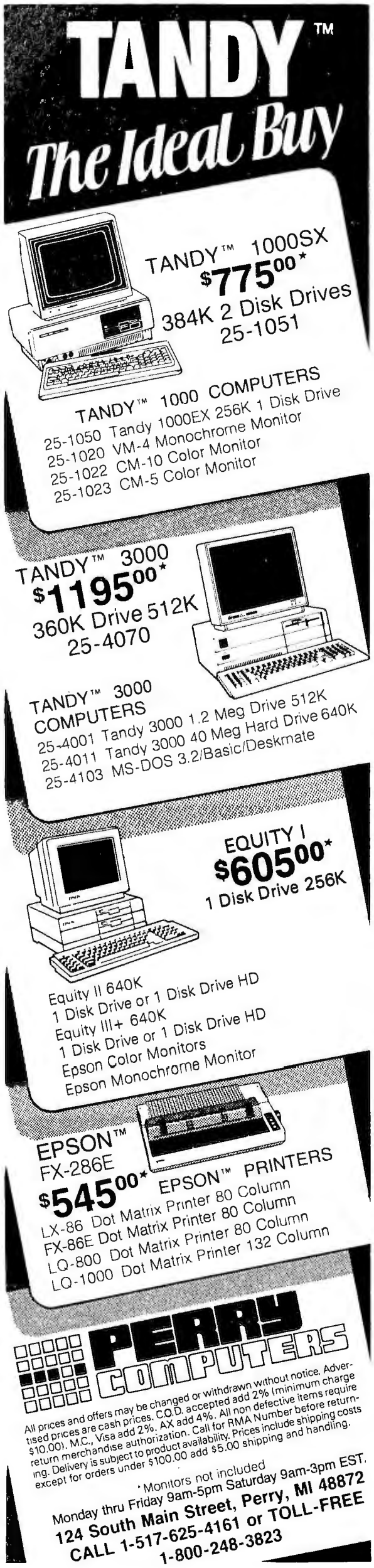

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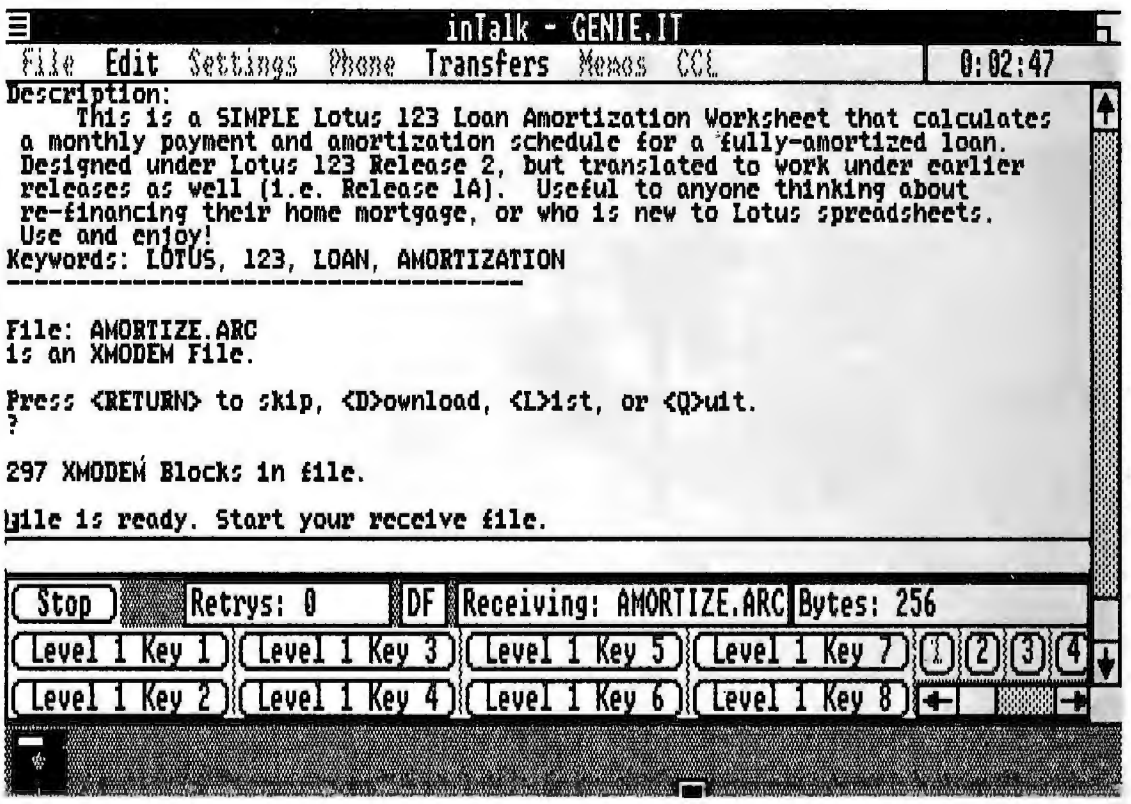

Screen 2: With InTalk on line, the program displays a clean, readable interface—in this case, data on a 1-2-3 utility to be downloaded.

placing the mouse pointer on a command and clicking or by pressing either a mnemonic <Alt>-*key* combination or a command's first letter.

Better still, *InTalk*'s sophisticated script language, called Communications Command Language, or CCL, automates virtually all communications functions. Yet CCL scripts can be quite simple: An eight-line script can dial up a CompuServe EMAIL network and log on to a restricted area.

You can create more complex scripts to ride herd on unattended communications sessions and define timing operations that can, for example, instruct a modem to hang up after so many minutes of system inactivity. As with *Microsoft Access*, *InTalk* scripts can be chained together to access a number of services while you snooze. *InTalk* also emulates VT 52, VT 100, Vidtex, TeleVideo, and other popular terminals and supports XMODEM, CompuServe B, *Crosstalk* binary, and PC-to-Macintosh error-checking protocols. Kermit isn't on the list, although it should be.

File transfers with any of those protocols run smoothly, and *InTalk*'s animated bar graph that marks transfer time is particularly helpful when you're managing a session and working with another application (see Screen 2). But *InTalk* is positively obstinate when running with anything save *Windows* applications. The program is quick to seize the lion's share of RAM, and often refuses to yield memory when full-screen, standalone programs such as *Microsoft Word* and *1-2-3* venture onto the scene.

(continues)

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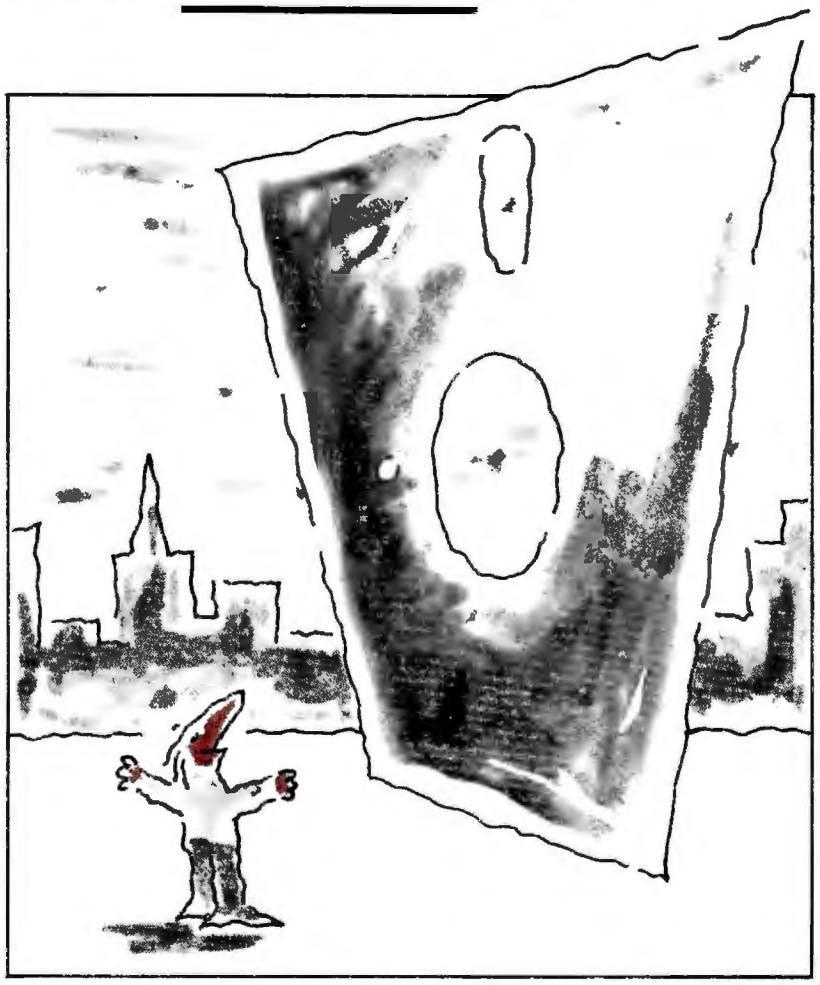

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InTalk's foot-dragging performance also merits a rap on the knuckles. With just *InTalk* and *Windows* loaded, it took about 45 seconds to log on to CompuServe. When I finally got both *Word* and *InTalk* to sit still and behave, I discovered the same task took nearly 2 minutes. Once I was hooked up to CompuServe, the delays were noticeable enough that I started fretting about my phone bill.

InTalk is an exceptional program, but it has trouble fitting in with its peers. Until *Windows* truly supports extended memory boards—and *InTalk*'s designer curbs its grabby habits—*InTalk* will fail to live up to its potential for linking applications.
—Mark A. Kellner

PC-SIG Library on CD ROM

CD ROM library of shareware products

Pros: *Holds thousands of programs*
Cons: *Requires a CD ROM player*

Version 3
PC-SIG, Inc.
1030D E. Duane Ave.
Sunnyvale, CA 94086
408/730-9291

List price: $195
Requirements: Sony, Philips, or Hitachi CD drive; 128K; one disk drive; DOS 3.10 or later version
Not copy protected

If you have a CD ROM player but think "shareware" is discounted Esprit mufti, think again. A maverick California company called PC-SIG is selling a collection of some 17,000 programs and data files, ranging from data bases to calorie counters, for a mere $195.

Based in Sunnyvale, California, PC-SIG tests, catalogs, and distributes public-domain software. Most of the programs are written by people committed to the free-software concept or by professional programmers avoiding the high cost of commercial marketing and distribution. PC-SIG sells most programs at bargain prices, typically $6 per disk. With a few programs, you're expected to send the author a small donation if you like what you get. That's the concept behind shareware.

In this unorthodox business, PC-SIG is a roaring success, and many of its programs can go toe-to-toe with their commercial equivalents. Jim Button's data base manager, *PC-File,* is part of the PC-SIG clan, as are *PC-Outline, PC-Write,* and the ever-popular *PC-Talk*. The company also brings home the bacon for its contributors. A word processing program called *New York Word* earned author Marc Adler $20,000 within six months after he switched from a traditional software distributor to PC-SIG. Roger Petersen, who founded PC-SIG, says some authors earn $500,000 a year.

While it does very nicely selling floppy disks, PC-SIG has now planted both feet in the future by offering its entire software library on a single CD ROM for Sony, Philips, and Hitachi CD ROM players. PC-SIG also supplies software it developed that enables the CD ROM to be accessed as another logical device, for example, drive D:.

The Library is divided into seven directories that hold the equivalent of 100 360K floppy disks. Those seven are further divided so that each disk is allotted its own subdirectory. You reach disk #310 (*QModem*) by typing CD\301-400\DISK310 at the DOS prompt. DOS commands such as DIR, TYPE, and COPY work on the CD, although CHKDSK and DISKCOPY don't. The FIND command will locate a particular program, which can then be run directly from the CD player.

At press time, PC-SIG's latest version of the Library contained 16,784 files. Of these, nearly 10,000 are separate programs; the rest are text, template, and miscellaneous data files. Since even this cornucopia occupies only 40 percent of the CD, the company has thrown in the King James Version of the Bible.

PC-SIG strives for high standards, and it delivers. At one point I was looking for a software restart program and found three. The first program wouldn't work on my hard disk system, but the second one worked so well that I never looked for the third.
—Donald B. Trivette

(continues)

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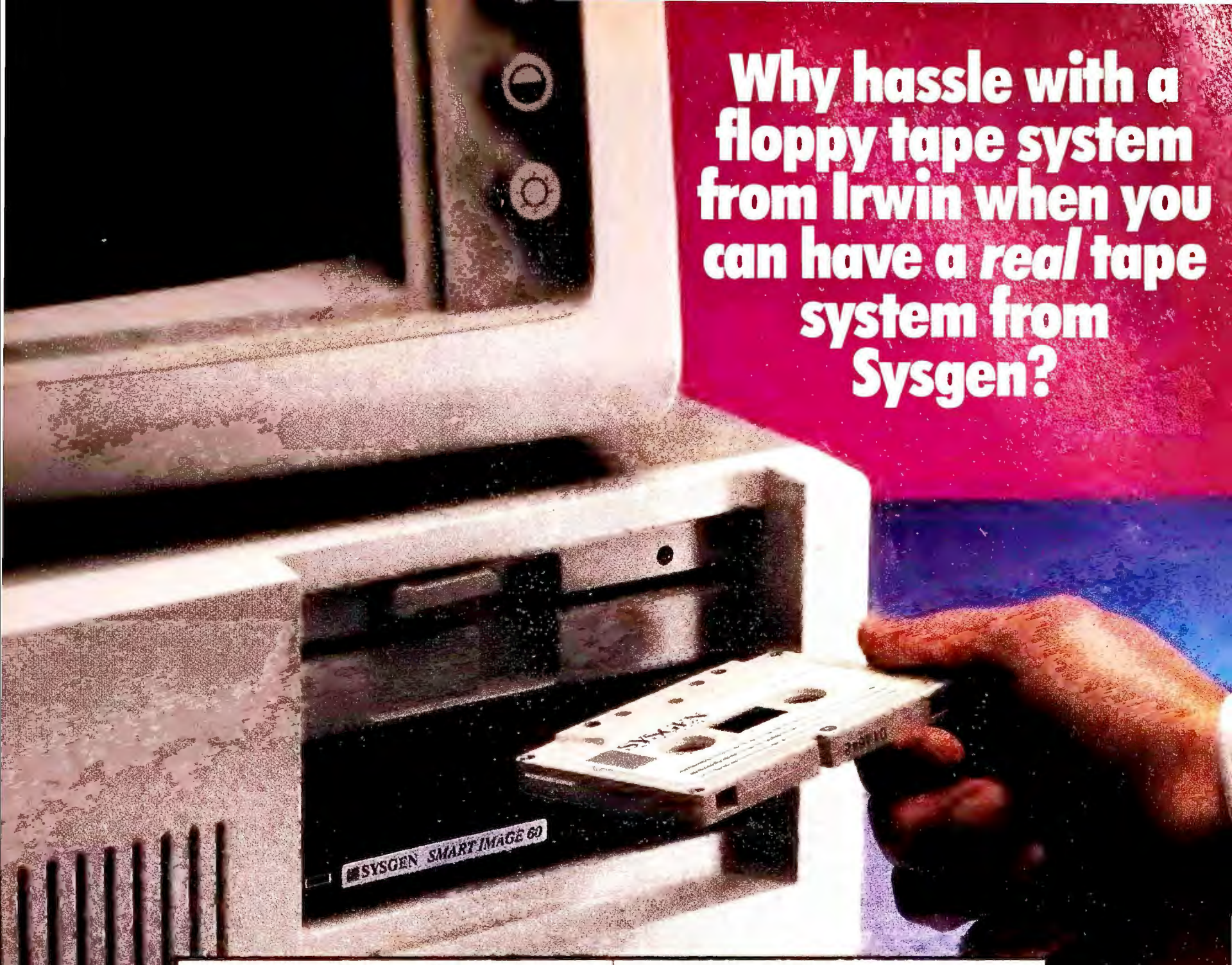

The floppy facts Irwin® floppy systems	*The real facts* Sysgen™ Smarter Image™
Single read/write head: Cannot verify data	Dual read/write head: Verifies as it backs up
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20–40 Mbytes per cartridge	60 Mbytes per cartridge
Back-up slow: Dependent on floppy controller	Back-up speed up to 3 times faster: Has dedicated controller
Optional adaptor required for use with both PC/XT™ and PC-AT™	Compatible with PC, PC/XT and PC-AT

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WindowDOS

RAM-resident hard disk manager

Pros: Instant directory display, fast file handling, can show current RAM-resident programs
Cons: Some text files hard to read

Version 2.0
WindowDOS Associates
Box 300488
Arlington, TX 76010
817/467-4103

List price: $49.95
Requirements: 40K, one disk drive, DOS 2.00 or later version
Not copy protected

When Baba Ram Dass said "Be here now, remember," designers of hard disk utilities should have paid heed. A powerful manager like *XTree* can track files and subdirectories and execute DOS commands, but it isn't memory resident. Handy pop-up DOS commanders like *PopDOS* may be here now, but they lack the power of a full-fledged disk manager. After much meditation, the developers of *WindowDOS 2.0* have come up with the best answer yet to the guru's paradox.

Until now, the closest thing to a real RAM-resident disk manager was version 1.0 of *WindowDOS.* It offered a full-screen pop-up menu and could rename, copy, and delete files. But it couldn't move files, format disks, or rename subdirectories—which *XTree* can. Now version 2.0 is here, and it's a winner. It's RAM resident (using less than 50K) but offers all the power of a nonresident disk manager.

(continues)

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- Add finance charges at the rate you choose to accounts you wish to charge.
- Prints the open item and aged receivables reports.
- Prints customer statements.
- Supports Partial Payments.
- Prints Invoice, Payment and Credit Memo Registers.

Accounts Payable

- Now prints mailing labels and rolodex cards.
- Sorts and prints vendor list by vendor name, number or zip code.
- Prints reports to screen as well as to printer.
- Vendors may be added to system during data entry.
- Prints the open item & cash requirements reports.
- Prints A/P checks.
- Prints Check register.

Inventory
With Purchase Orders

- Sort and prints inventory listing by description, part number or location.
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- Uses average cost.
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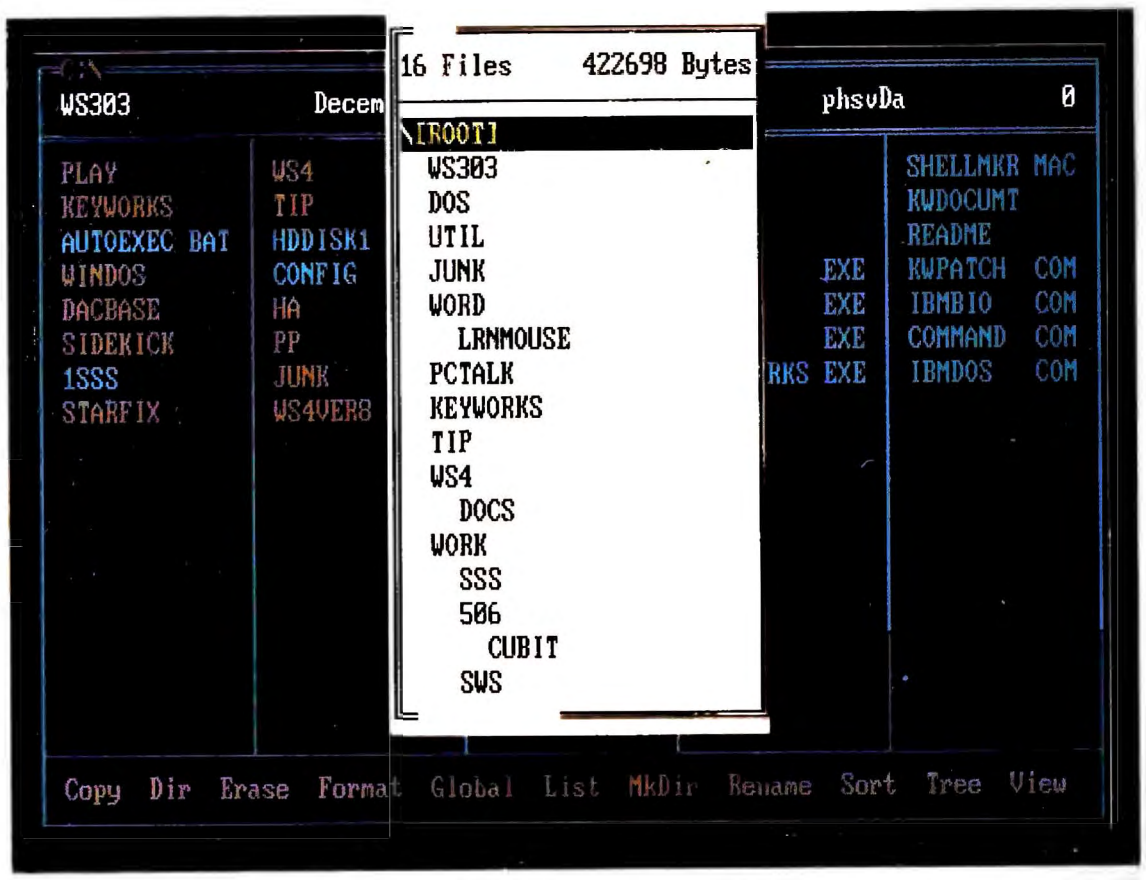
To keep *WindowDOS* from conflicting with other RAM-resident programs, load *WindowDOS* first. Take a moment to tailor the program to your needs. By choosing from among 11 "command switches," you can determine *WindowDOS*'s speed, whether you want it to sort your files and in what order, and other options. Typing WD2 T, for example, activates an automatic screen-blanking feature.

Once in memory, *WindowDOS 2.0* is a pleasure to use. Pressing <Ctrl>-<Ins> flashes a full-page directory on the screen. Files are listed in columns; when you move the cursor to a file name, details such as date, time, and size appear on a line across the top of the screen. *WindowDOS* commands appear in a menu bar along the bottom.



Screen 3: In WindowDOS, files can be sorted in any order the user chooses, whether in the main directory or the tree directory, as shown here.

With *WindowDOS,* you can change the default drive or directory and check the amount of free space on any drive. The program will format floppies, move files from one directory to another, and print a file without forcing you to exit the application you are working with. Like *XTree, WindowDOS* fills one of DOS's most annoying gaps, enabling you to rename subdirectories.

A new Backup command permits users to copy groups of files that are too big to fit on one disk; when one disk is full, just insert another, and the program continues copying. It also shows a running total of disk space occupied by the copied files.

For those who care to plumb their system's deeper mysteries, pressing <Ctrl>-E displays the DOS version, the date of the BIOS ROM chip, total system memory, and remaining memory. Like a scaled-down *Referee, WindowDOS* will even list memory-resident programs, the memory allocated to each, and respective memory addresses. One handy feature will appeal to programmers and people who patch their programs: Choose List from the menu, and the file is displayed in either ASCII/hex format or in full-screen ASCII.

WindowDOS is such an exemplary program, it seems churlish to find fault with it. But its tree-style directory (see Screen 3) and text-file display can't match *XTree*'s.

When I first used *WindowDOS,* I was unhappy that it defaulted to the current directory instead of the root directory. This is a matter of individual taste, but since my current directory usually shelters an application such as *Word* or *1-2-3,* it seldom needs housecleaning.

Luckily, the next best thing to having the perfect program is having a software company that's responsive to constructive criticism. I mentioned the latter problem to the people at WindowDOS Associates. A few days later, I received a program update with a command key that can be used to set the default my way.

WindowDOS 2.0 is one of the easiest-to-use hard disk managers available. And having all that power squeezed into a RAM-resident package makes the program truly enlightened. Remember it.
–Patrick Marshall

(continues)

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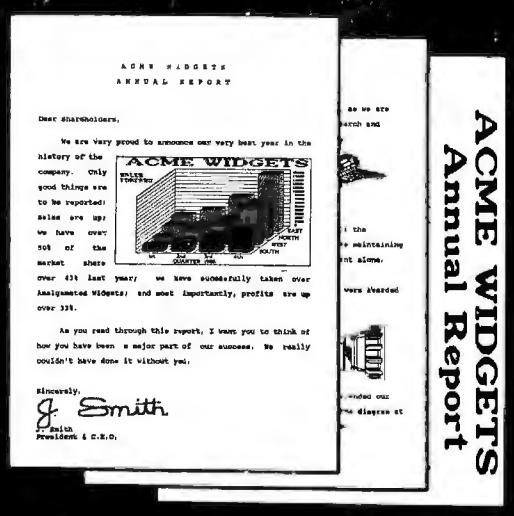

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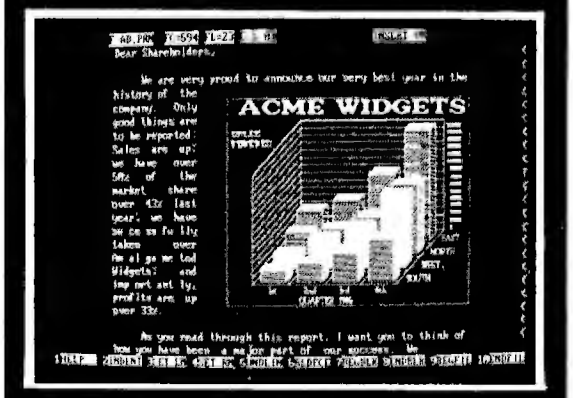

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Fantasy adventure game

Pros: *Imaginative, engrossing, good graphics*
Cons: *Sluggish keyboard response*

Electronic Arts
1820 Gateway Dr.
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800/245-4525, 800/562-1112 in California, 415/572-2787

List price: $49.95, Starflight clue book $12.95
Requirements: 256K, two disk drives (hard disk recommended), DOS 2.00 or later version, Hercules Graphics Card or Color/Graphics Adapter with RGB or composite monitor
Not copy protected

You're still a mile from your crippled ship, the desert sand is scorching your soles, and the insectlike navigation officer is looking at you with mutiny in its compound eyes. How did I ever get us into this mess? you wonder. Maybe it's time to sit back and take stock. After all, it's just a game . . . or is it?

Welcome to *Starflight* from Electronic Arts, not only the best space game available for the PC but one of the best adventure games on the market. It's an absorbing, superbly animated piece of software that challenges players with everything from the drudgery of space mining to the mysteries of the universe.

The *Starflight* universe is an intricate one indeed: 270 star systems, 800 planets, seven spacefaring peoples and their spacecraft, and a host of lesser life-forms. Because of the game's immensity, most planets' ecosystems were generated using fractal mathematics. Even with the help of graphics generators, it took years to develop the game.

The *Starflight* package includes a star map, a manual, and a security decoder wheel that acts as a simple form of copy protection during launch sequences. The game can be loaded onto a hard disk, and games can be saved and reloaded even if players are destroyed—which they are sure to be.

You start off as the commander of a starship based on the planet

(continues)

There may be light-years between your two ships, but it's eyeball to eyeball when you deal with aliens like this Veloxi. They tend to shoot first and answer questions later.

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Stan Miastkowski, BYTE, March 1987

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Circle 983 on reader service card

PC World Creates a Long Buy-Line for You

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Arth. Scientists have just discovered ancient ruins that prove that the Arthian civilization was descended from the Old Empire that arose from a distant, unmapped planet called Earth. When the scientists also discovered "endurium," a fuel that powers interstellar ships, the Interstel Corporation was set up to oversee space exploration.

Starflight has enough goals to keep anybody busy, and they tend to get more engrossing the longer you play. At first, you merely equip a ship and crew to mine for ore, contact and capture alien lifeforms, and search for planets suitable for colonization; Interstel underwrites the work. Later in the game, you move on to larger issues: Where is Earth? Who or what destroyed the Old Empire? And finally, how can Arth avoid meeting a similar fate?

But before you launch into hyperspace to chat with aliens and ferret out the mysteries of the universe, you need to make money by mining nearby planets. Each time you return to Starbase, Interstel pays for your haul, and you continue training your crew and enhancing your ship with shields and weaponry.

Chasing and bagging wild game is more fun than mining, but not as profitable. Fanciful text descriptions accompany the animated icon graphics. The trick is to stun the beast and then trap it before it wakes up to attack your crew.

Once suitably equipped, you can take your chances out in hyperspace, following your star map to distant star systems. If you're lucky, you might chance across

(continues)

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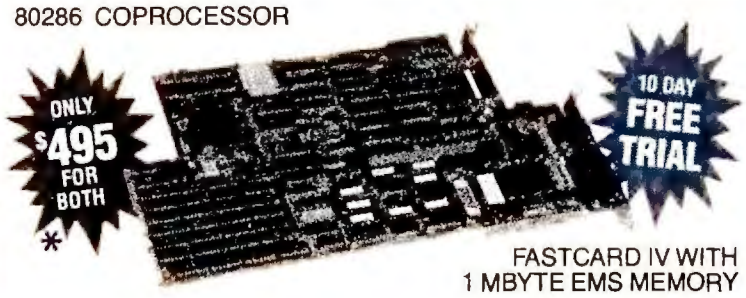
80286 COPROCESSOR



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LOTUS EMS COMPATIBLE

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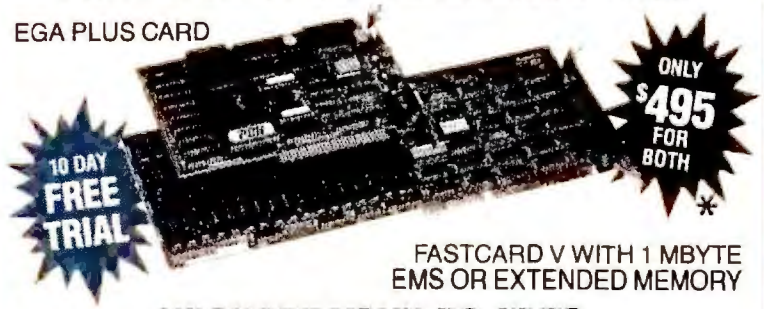

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Circle 960 on reader service card

"continuum fluxes," which hopscotch your ship over great distances without using any fuel.

In a typical planetfall, you first orbit a planet and order your science officer to run sensor checks for minerals, atmospheric conditions, or signs of life. Crushing gravity or bad weather puts most planets off limits, and very few others contain life. If you find one of those extremely rare planets that provide optimal conditions for human life, you can log a colonization recommendation and look forward to a handsome reward when you return to Starbase.

Right now, though, it's time to take a closer look at the new planet. You drop down to the planet's surface, rove around an animated landscape in a terrain vehicle, and pick up ore. You might also encounter ruins of the Old Empire that contain endurium, alien artifacts, or cryptic messages. But it isn't all fun and games: If you run out of gas before returning to the main ship, you'll have to hotfoot it back to the ship, risking electrical storms, monsoons, and attacks by unfriendly fauna. Fortunately, your crew includes a doctor as well as engineering, communications, science, and navigation officers.

Like life, *Starflight* requires patience. After visiting several hundred planets, I have yet to find any sentient life-forms; all communication with aliens seems to occur in space. Encountering aliens is the most difficult part of the game, yet it is also the key to winning. As every Trekkie knows, the usual procedure is to scan the alien ship, establish communications, and, if

(continues)

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Boeing Calc is the next logical step in spreadsheet evolution. It's a unique program that lets you build related spreadsheets as separate pages within a single file.

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The multi-user version supports Local Area Networks. As many as 32 users can access the same spreadsheet at the same time, with separate security levels for each. Right down to the cell. The system administrator has full control and can match task and security requirements to each user.

You can automatically import 1-2-3® and Symphony® files directly — formulas, macros and all. Boeing Calc's command structure works like Lotus® and permits you to move quickly to its more efficient command option.

For a demo diskette and the nearest dealer, call 1-800-551-0800, Ext. 12. Or write Boeing Computer Services, P.O. Box 24346, M/S 7W-05, Seattle, WA 98124-0346.

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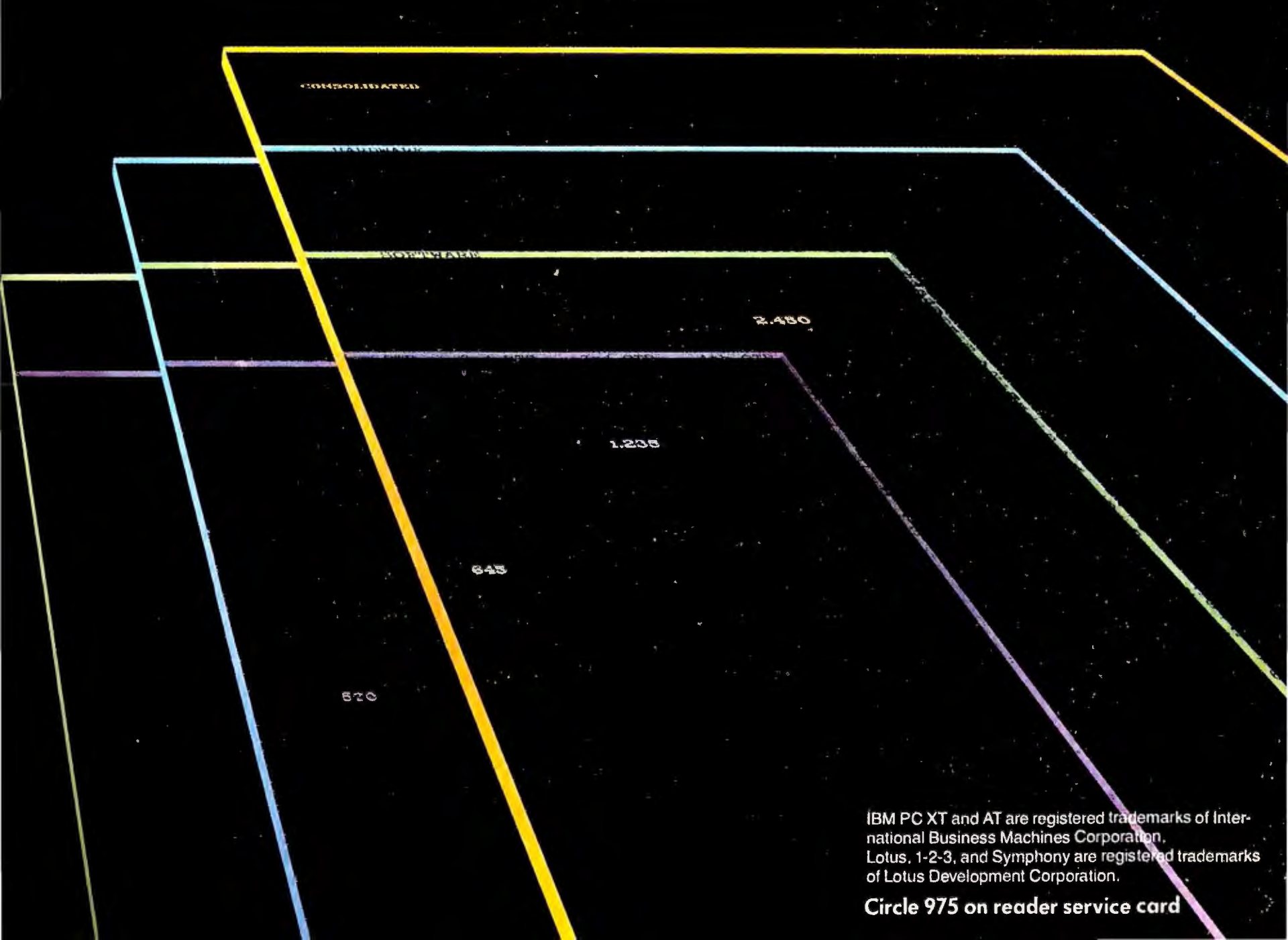

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Circle 61 on reader service card

PC World Creates a Long Buy-Line for You

Queue up! *PC World* readers mean big business—for you. Call your Account Manager to reserve your advertising space today—please see page 4 for phone numbers.

all else fails, raise your shields and start firing. Communicating with aliens can prove frustrating; instead of speaking your mind, you must choose from available question-and-response postures.

Most aliens tend to shoot first and ask questions later. The animated combat sequences aren't as sophisticated as those you may find in video games, but they require a bit of skill and keyboard dexterity. Unfortunately, this is just when you encounter *Starflight*'s occasional keyboard lag.

What makes *Starflight* so fascinating is that you're forced to be a businessperson as well as a warrior, diplomat, and scientist. And while parts of the game, like the endless mining runs, can be tedious, even they hold a strange attraction. Perhaps the bounty of unknown planets and aliens urges you on, or maybe it's the very multiplicity and ambiguity of the game's goals. Whatever the appeal, over the last months I've wasted countless hours exploring *Starflight*'s universe on my PC. I haven't discovered the mysteries of the universe yet, but I just met my first friendly alien. —*Eric Brown*

Ken Smith is a technical support supervisor at a large software company in San Rafael, California. Donald B. Trivette is a freelance writer and consultant in Wrightsville Beach, North Carolina. Mark A. Kellner is the data processing coordinator for the Salvation Army in Washington, D.C. Patrick Marshall edits the Commentary Page of the Oakland Tribune. *Eric Brown is a* PC World *Contributing Editor.*

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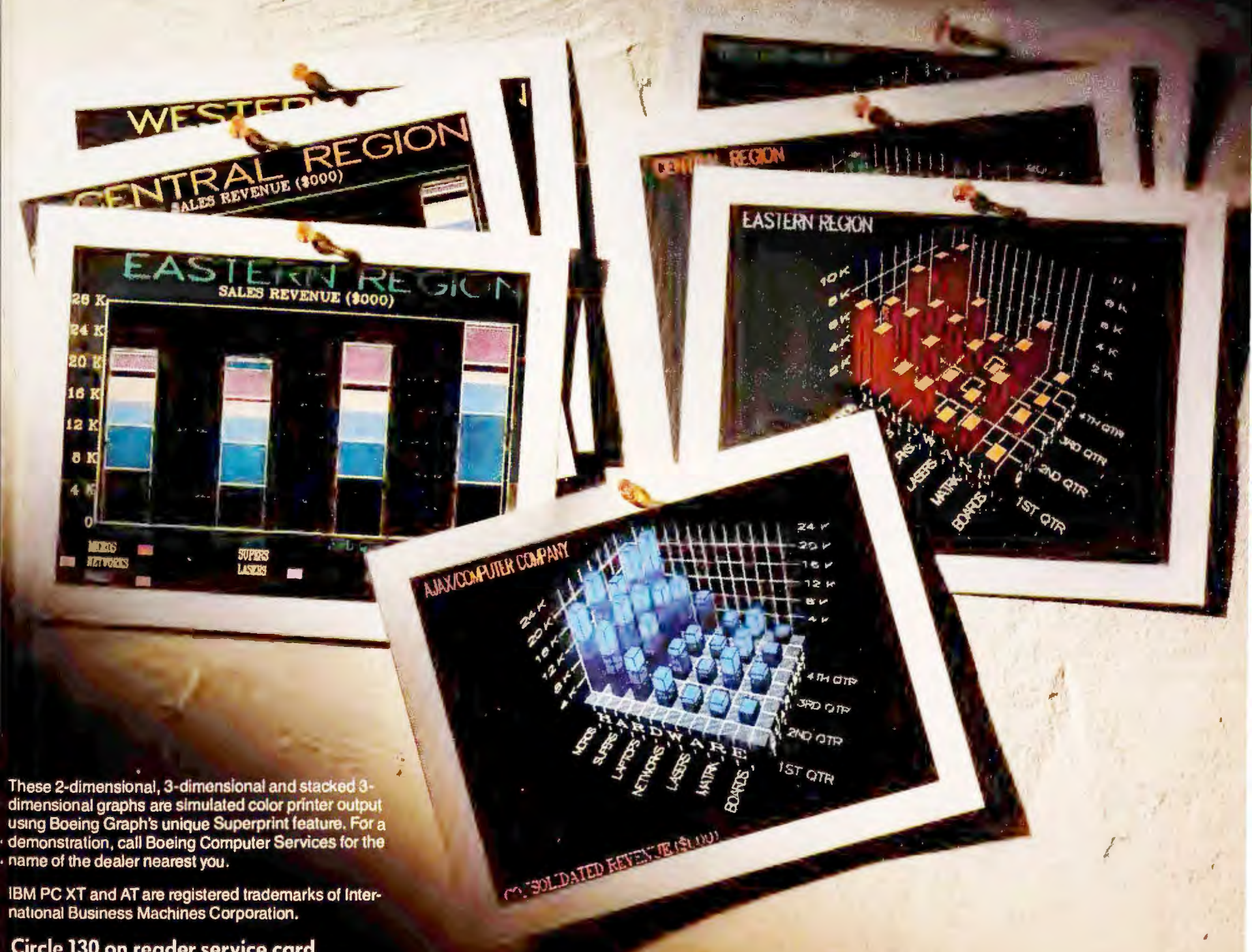

These 2-dimensional, 3-dimensional and stacked 3-dimensional graphs are simulated color printer output using Boeing Graph's unique Superprint feature. For a demonstration, call Boeing Computer Services for the name of the dealer nearest you.

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Circle 130 on reader service card

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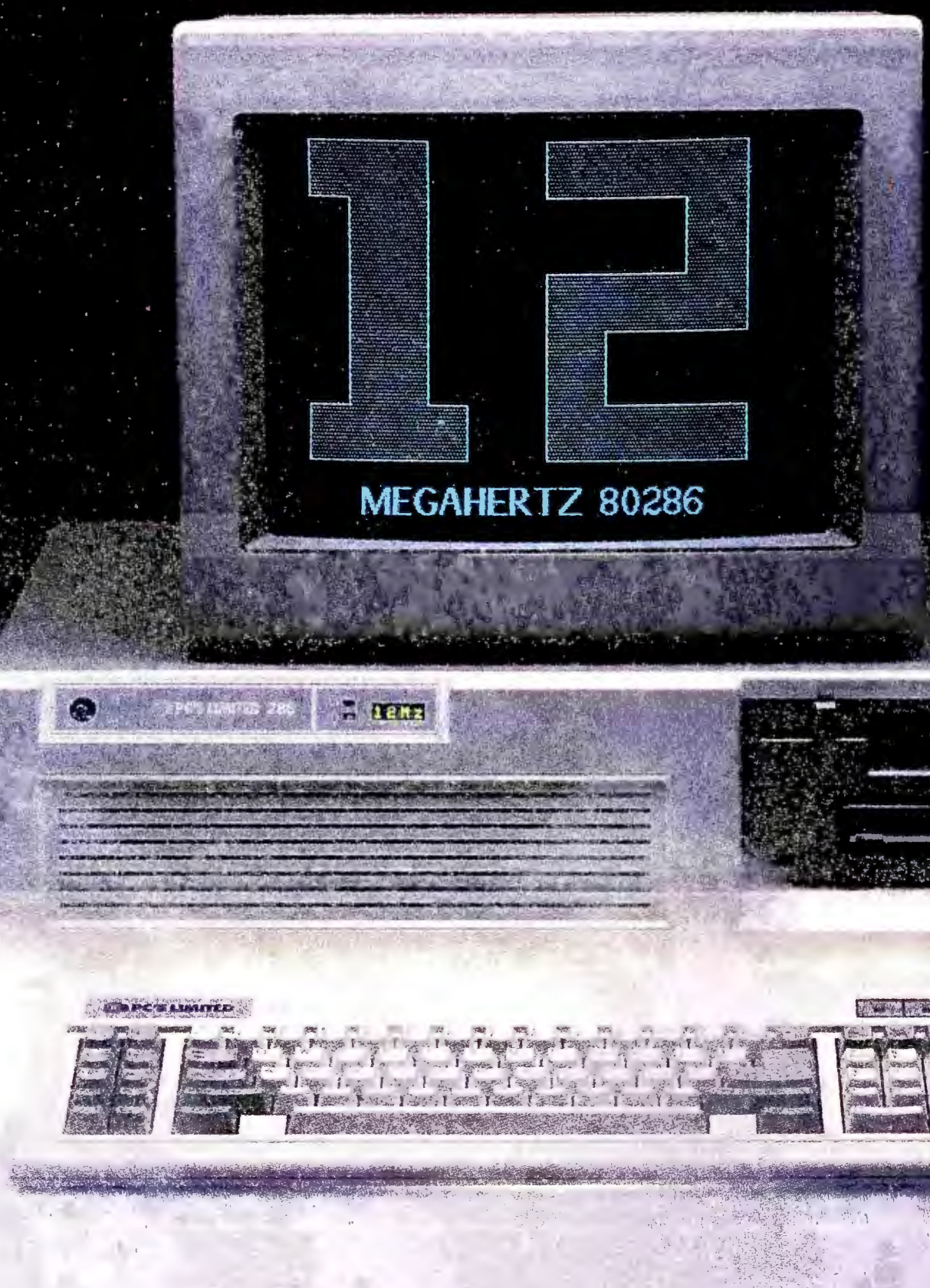

The 12-megahertz 286[12] and 8-megahertz 286[8] come complete with a 1.2 megabyte floppy disk drive, 1,024K of high-speed RAM, 200-watt power supply and an AT-style keyboard.

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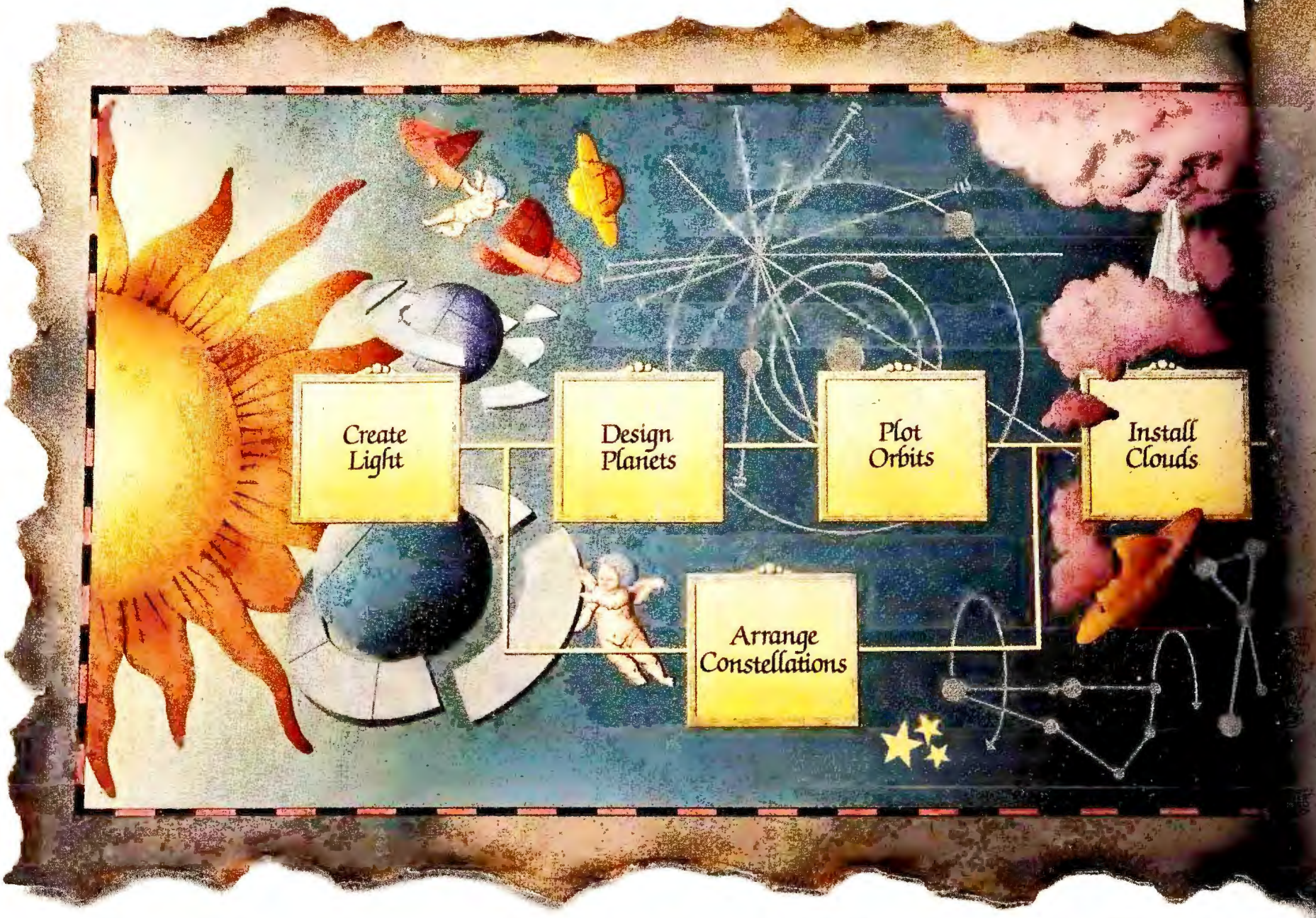

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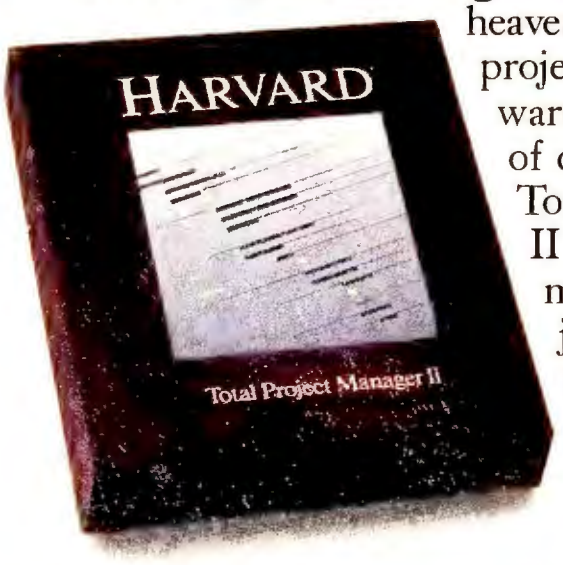

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From the Hardware Shelf

PC World offers first impressions of recent hardware releases

A rough-cut 80386 computer, a scaled-down Tandy 80286, an EGA board with improbable ambitions, and a dependable printer buffer form this month's hardware omnibus.

Edited by Eric Knorr

Advanced Logic Research Access 386

80386-based computer

Pros: *16-MHz 80386 CPU, two 32-bit slots, low price*

Cons: *2MB 32-bit RAM limit, jumpers used in place of DIP switches, poor documentation*

Advanced Logic Research, Inc.
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Irvine, CA 92718
714/581-6770

List price: with 32-bit 512K RAM, 1.2MB floppy disk drive, original AT-style keyboard $3990; with 512K 32-bit RAM, 512K 16-bit RAM, 40MB hard disk, EGA-compatible display board and monitor $6949; 10-MHz 80287 coprocessor with adapter $650; 2MB 32-bit memory expansion board $975

With Intel's 80386 waiting for someone to build a box around it—and IBM apparently in limbo—the market was wide open for an 80386 computer. And so the Compaq Deskpro 386 was born . . . several weeks *after* Advanced Logic Research (ALR) announced its Access 386.

Once a relatively obscure clone maker, ALR now enjoys the celebrity of being the first company with an 80386-based PC. The company's Access 386 is a no-frills powerhouse that lacks the polish of Compaq's Deskpro 386, but it also delivers the goods for about 12 percent less. An Access 386 with 512K of 32-bit RAM, a

(continues)

John Greenleigh

A budget-priced 16-MHz screamer, ALR's Access 386 was the first 80386-based PC on the market.

Two Clones Stack Up Against Industry Benchmarks

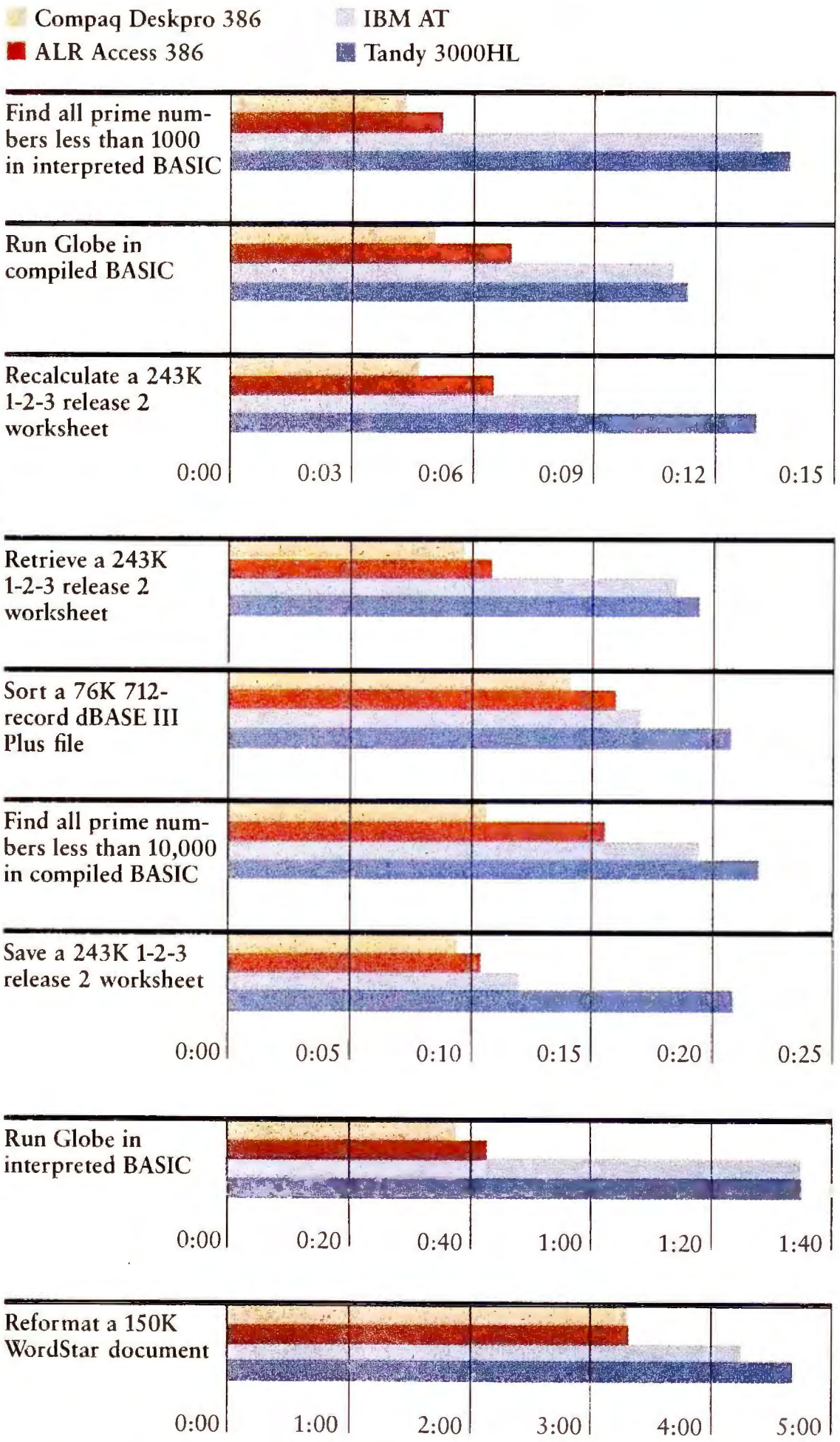

Figure 1: The new speed universe—and where the Access 386 and Tandy 3000HL fit in. Times in minutes:seconds.

40MB hard disk, and a 1.2MB floppy drive sells for $5699–$800 below the price of a similarly configured Deskpro 386. With a board and monitor compatible with IBM's Enhanced Graphics Adapter (EGA), the Access 386 sells for $6949, in contrast to the Deskpro's $7897 price tag.

As with the Deskpro 386, Access's CPU streaks through computing chores at 16 MHz using a 32-bit memory-addressing scheme (see Figure 1). The approach to memory access is different from Compaq's, however, and reflects ALR's low-budget style. Compaq uses fast but expensive static-column RAM chips, while ALR uses standard RAM with a special memory-interleaving technique (see the sidebar "Star Memories" in "The Soul of the 386," *PCW*, March 1987). Basically, the Access 386 alternates between banks of memory as it reads and writes data, giving the inexpensive standard RAM chips time to catch up to the speedy processor.

Externally, the Access 386 presents an AT-size footprint and space for three externally accessible half-height devices. Crisp resolution, side-mounted controls, and a tilt-and-swivel base distinguish the EGA-compatible monitor. The standard keyboard is a clone of the original AT's, offering fast action and quiet operation; a clone of the new, 101-key AT keyboard is also available.

(continues)

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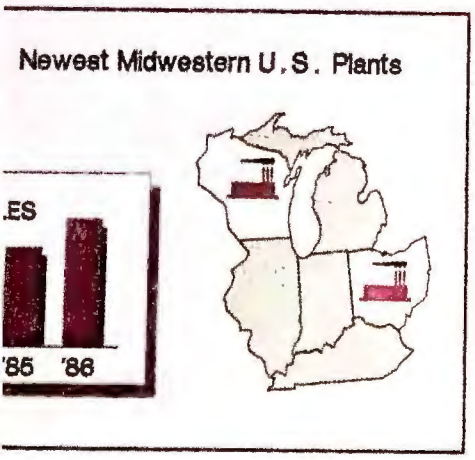

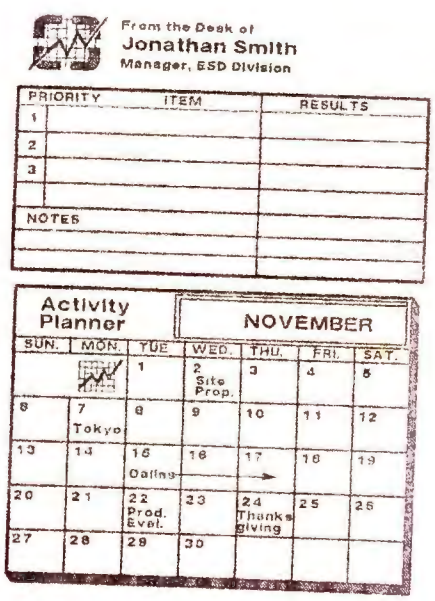

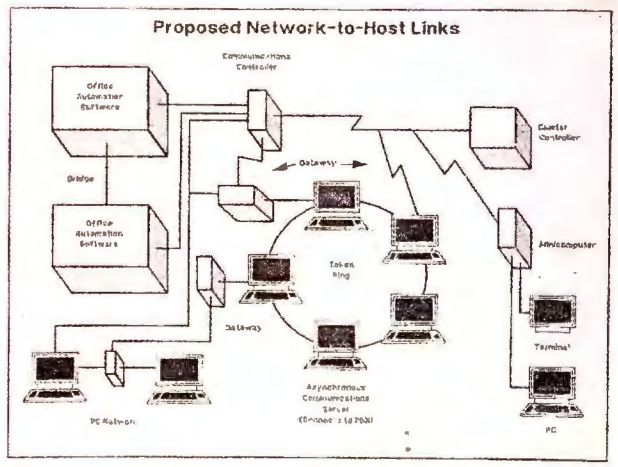

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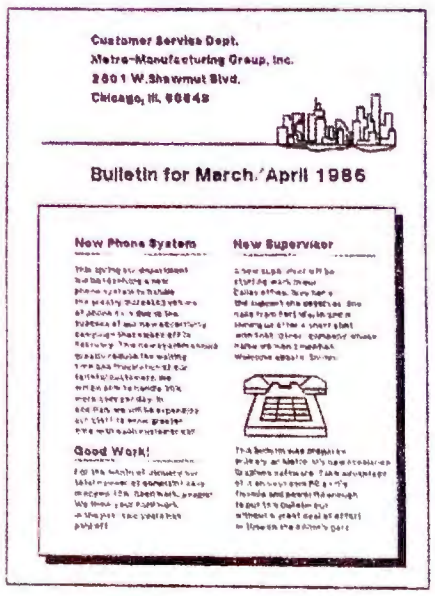
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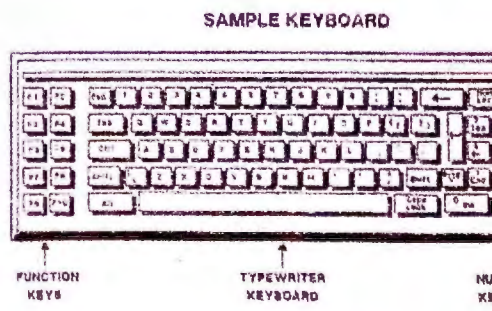

TRAINING GUIDE, Figure 2

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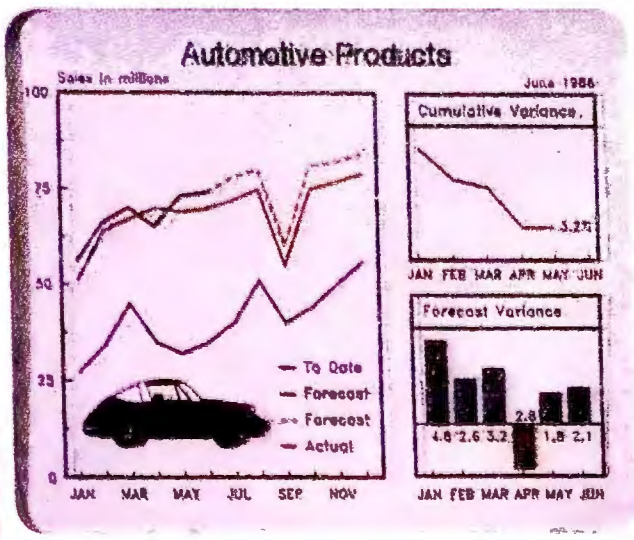

Thoroughly expandable, the Access 386 has one serial and one parallel port built in and two 8-bit, four 16-bit, and two 32-bit slots. (Bays are provided for two internal half-height storage devices.) With support for two floppy and two hard drives, the disk controller claims one 16-bit slot. The multifunction board, which has the same port distribution as the motherboard, takes up another. One of the 8-bit slots holds the video board, which contains the third parallel port, bringing the port total to DOS's maximum. For mounting connectors, the back panel features three 25-pin and two 9-pin knockouts.

Both proprietary 32-bit expansion slots on the Access 386 are empty. To fill them, ALR offers 32-bit boards with 2MB of RAM for an additional $975 each. By contrast, the Deskpro includes only one 32-bit slot, but the memory board designed for it can be expanded to up to 10MB. A 32-bit memory ceiling—6MB lower than Compaq's entry—may dissuade you if you need an 80386 for high-end, memory-intensive applications.

In one respect the Access 386 has more potential than its counterpart. Compaq provides an easily accessible socket and an 8-MHz 80287 math coprocessor for $349. ALR's coprocessor socket fits the (as yet) unreleased 80387 chip, but in the meantime you can purchase a 10-MHz 80287 with a special adapter for $650. Ultimately, support for the 80387 will give the Access 386 greater number-crunching muscle.

Thanks to the proven Phoenix BIOS, the Access 386 whizzed through its compatibility tests without incident. *1-2-3* releases 1A and 2 ran smoothly, as did *dBASE II* and *dBASE III*. Other popular packages, including *TenKey, Turbo Lightning, WordPerfect, Microsoft Word, Flight Simulator,* and *Jet* seemed right at home.

To manage the applications of your choice, the Access 386 comes with version 1.3 of Quarterdeck's *Desqview,* a popular windowing environment that takes advantage of the Lotus/Intel/Microsoft Expanded Memory Specification. Also bundled with the machine is a setup disk that includes Quarterdeck's *QEMM,* an expanded-memory manager designed for network file servers. In addition, ALR throws in Teleware West's *Above Disc,* which uses a disk or extended RAM to simulate expanded memory.

The documentation for the Access 386 consists of a slim, poorly produced manual that leaves a host of questions unanswered. And although ALR offers a one-year warranty on the machine, ALR's 24-hour customer support line was "not in place" at this writing. Both these shortcomings are signs of a company in a hurry to move hardware—with or without adequate user support.

There are other indications of cost-cutting and haste. On the motherboard, jumpers do the work of switches. Worse, the Access 386 couldn't pass muster for a Class B FCC license, which means that the machine may interfere with radio and television reception. Perhaps most disconcerting, however, are the blue patch wires that thread through the motherboard and EGA board. Though not always symptomatic of weak spots in hardware, patches can indicate flaws in the design process. Compaq's sleek innards betray no such indiscretion.

Blue wires and weak documentation don't exactly reassure a new user, but they don't compromise performance either—the Access 386's limits on 32-bit RAM expandability are more likely to do that. Hopefully, ALR will polish the rough edges and offer more 32-bit expansion options, easier configuration, and a cleaner motherboard. The Access 386 beat the Deskpro 386's price and release date, but it can't match its rival's classy design. *—Marlene Nesary and Karl Koessel*

Tandy 3000HL

80286-based computer

Pros: *Low cost, high performance, small footprint*
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John Greenleigh

Yet another 80286 machine shrinks and calls itself an XT compatible. The base price for the 3000HL (without display) is $1699.

$1699, same configuration with 20MB hard disk and controller $2599; 128K memory upgrade $100; 1.2MB floppy drive $300; additional 360K floppy drive $200; 20MB hard disk $799; 40MB hard disk $1799; Western Digital hard disk controller $400; color/monochrome display adapter $400; monochrome monitor $200; color monitor $530; enhanced color display adapter $350; enhanced color monitor $700; serial/parallel expansion board $170; internal 20MB Bernoulli drive $1800

You thought that a computer with an 80286 CPU qualified as an AT compatible. But now that several companies (including IBM) have released 80286-based XT compatibles, who knows what to believe? The marketing strategy seems to be that if you enter a stock car in a footrace, you can expect an impressive showing.

Tandy's 3000HL, a scaled-down version of the Tandy 3000 AT compatible, is only a tad slower than an 8-MHz AT (see Figure 1). At 17 by 15 inches, the machine is 2 inches wider than Sperry's diminutive Micro/IT (see *From the Hardware Shelf, PCW,* March

(continues)

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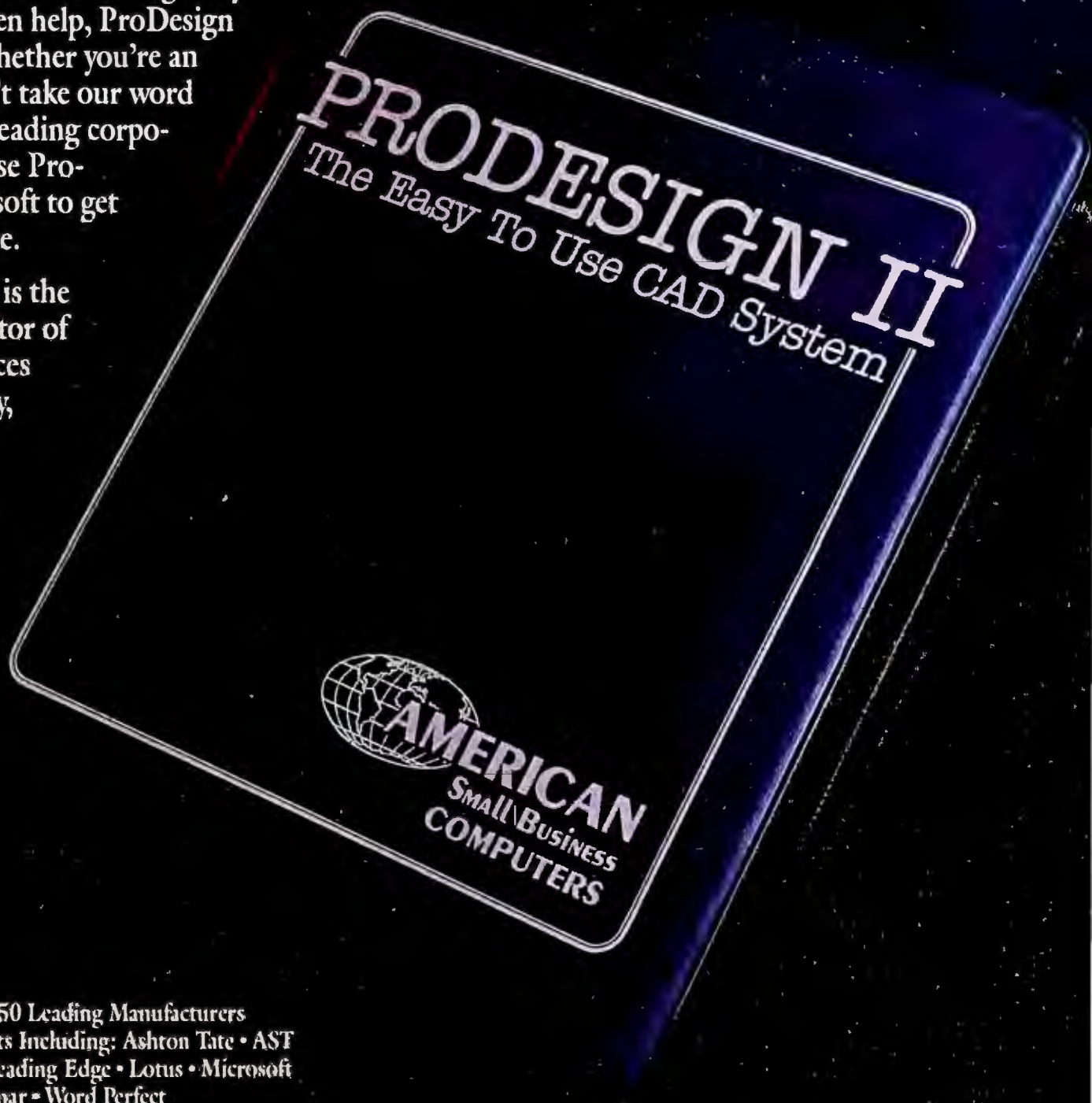

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NEIL J. RUBENKING
PIANOMAN, NAMEGRAM

Author Rubenking's goals are straightforward: to have fun with computers and get paid for it. So far he is batting 1000. Along with his technical support position he also edits a column in PC Magazine titled 'Turbo Power User'. His PIANOMAN and NAMEGRAM programs evolved while he was teaching himself Turbo Pascal programming. Finding basic computer tunes "offensive" his PIANOMAN used his musical background as a source to create music on a PC (within the limits of its 2" speaker).

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NAMEGRAM is wild, wacky and is a must for anagram (the ability to make a word or phrase from another word or phrase) freaks. After experimenting with algorithms, author Rubenking came up with a program that would handle any size of input and any size of dictionary.

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1986), but with three 16-bit and four 8-bit slots, it also offers more expandability. And unlike the slots in IBM's XT-286, the 3000HL's 8/16-bit slots easily accommodate AT-sized boards.

A bargain in the Tandy tradition, the basic 3000HL—without a monitor and housing one 360K disk drive and 512K RAM—runs a mere $1699. The configuration reviewed here includes a color monitor and adapter, plus an extremely quiet 40MB Seagate hard disk with a speedy 28-millisecond average access time and a price tag $100 higher than the machine itself. The hard disk uses a reliable Western Digital controller, but at $400, the cost for the board is also pretty steep. You'll get a far better deal ($2599 total) by ordering a machine with a 20MB hard disk and a controller already installed.

The plastic face of the system unit has a recessed reset button but lacks the conventional AT keylock. The metal casing slips off easily to reveal a cleanly designed motherboard punctuated with a Chips and Technologies AT chip set. Also on the motherboard are a battery-powered clock/calendar, a parallel port, and sockets for an 80287 math coprocessor and an additional 128K RAM. The connector for the parallel port is built into the back of the chassis.

Setting up the 3000HL for different memory configurations, displays, storage devices, and so on is accomplished with software rather than the DIP-switch method. You can cram three devices into half-height bays, all of which are accessible from the front of the machine. Although the price is high ($1800), you may want to consider filling one of these bays with the new 5½-inch Bernoulli drive, which uses 20MB cartridges. Currently, Tandy is the exclusive distributor of this costly peripheral.

The color monitor and display board are designed to be compatible with IBM's Color/Graphics Adapter (CGA), but at 400 lines, the resolution is double that of the CGA standard. This enables the display to produce text as sharp as that of IBM's monochrome display, but the graphics resolution is still lackluster CGA quality. For $120 more than this $930 color configuration, you can upgrade your graphics by purchasing a board and monitor that emulate IBM's EGA.

The keyboard is nearly identical to the one included with the original AT, except that indicator lights are built into the <NumLock>, <ScrollLock>, and <CapsLock> keys. The touch is snappy and produces a click reminiscent of IBM's keyboards. The only annoyance is a wrist rest, about 1½ inches wide, that runs along the keyboard's front edge. Most typists will find this a barrier rather than a convenience.

Tandy machines have a history of minor compatibility problems, but none of these difficulties seem to have migrated to the 3000HL. *1-2-3* releases 1A and 2 ran as if Lotus had Tandy in mind, and *SuperKey, TenKey,* and *SideKick* wreaked no RAM-resident havoc

(continues)

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on the machine. *WordPerfect, Manuscript, Q&A,* and *Jet* also performed like champs.

The 3000HL is complemented by clear, pleasantly written documentation. No operating system comes with the computer, however; DOS 3.20 and Tandy BASIC are sold separately for $100. Along with this pairing, you get a rudimentary integrated package called *DeskMate II* that includes a primitive word processor, spreadsheet, file manager, communications program, and calendar. All you can say about these applications is that they may intrigue beginning users into checking out the real thing.

Whether you call the 3000HL an AT or an XT, its high performance, small size, and low cost add up to a winner for Tandy. And because Radio Shack has more service centers than you could visit in a year-long pilgrimage, you can buy with far more confidence than with a no-name clone. Tandy's options are on the pricey side, but if you shop elsewhere for a hard disk and a monitor, you'll end up with a reliable computer that requires little more investment than an XT and delivers a lot more muscle. —*Mark Kellner*

ATI EGA Wonder

Multimode display board

Pros: *Low price, automatic mode-switching*

Cons: *Flawed EGA, CGA, and MDA emulation*

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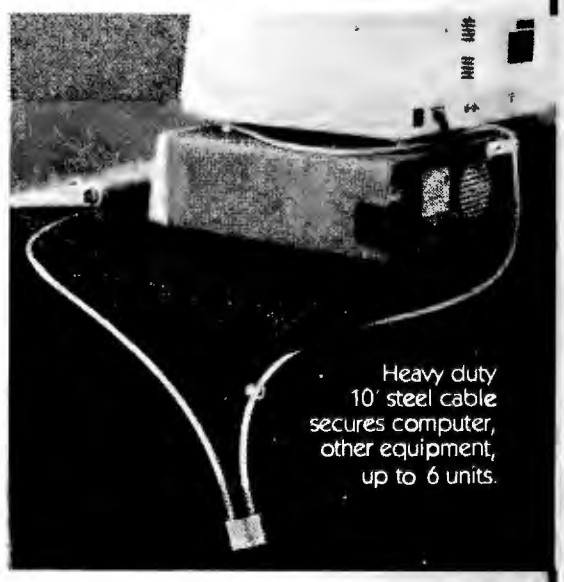

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Inexpensive clones of IBM's EGA abound, which should make moving up to decent color graphics a fairly painless venture . . . that is, until you start pricing monitors. Even no-name emulators of IBM's Enhanced Color Display never seem to dip below the $600 mark.

If you look hard enough, however, you can probably find an IBM Color Display work-alike for about $200 less than an enhanced color monitor—a fact with which ATI Technologies is well acquainted. A half-slot display board designed to reduce the expense of high-grade graphics, ATI's EGA Wonder attempts to produce EGA-quality images on a standard color display.

The EGA Wonder can emulate four graphics boards, including IBM's Monochrome Display Adapter (MDA) and CGA, as well as the Hercules Graphics Card (HGC). As with IBM's EGA, the EGA Wonder's enhanced color mode supports a resolution of 650 by 350 pixels with 16 simultaneous colors from a palette of 64. In this mode, the EGA Wonder can drive either an enhanced color display or a monochrome monitor (with 16 shades of gray); but the real hook is the way the board tries to trick a CGA-compatible color monitor into delivering enhanced color performance.

The EGA Wonder accomplishes this feat with interlaced scanning. Ordinarily, the electron gun in a CGA monitor scans the screen in a single sweep, leaving spaces between the scan lines. The EGA Wonder uses interlaced scanning to sweep the screen in two stages: one pass to produce CGA-like resolution, and a second to fill in the spaces between the lines.

Unfortunately, interlaced scanning has its drawbacks, the most obvious of which is flicker. When the EGA Wonder is hooked up to a CGA monitor, both text and graphics flitter like an old-time nickelodeon. Another problem is "blooming," which occurs when the board drives a monochrome monitor. When the screen changes in MDA mode, the image starts

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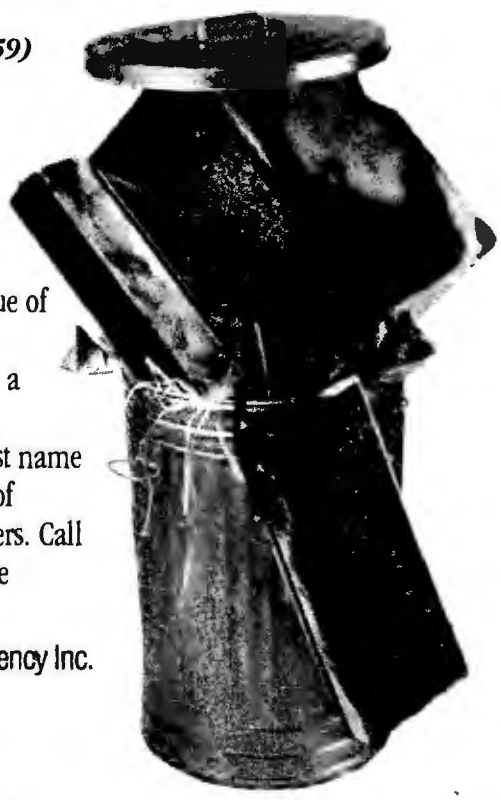

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off about two-thirds size and expands to full screen over a period of several seconds.

When operating in text mode on a monochrome monitor, the EGA Wonder exhibits another annoying habit: producing "ghosties," or random, blinking characters on the screen. The EGA Wonder's ghosties are generally transitory, appearing and disappearing at irregular intervals, but sometimes the little phantoms accumulate—especially when the board is driven by *Microsoft Word*. In addition, colors sometimes streak when the EGA Wonder is used with a CGA monitor in CGA mode.

As with the Paradise Autoswitch EGA (see *From the Hardware Shelf, PCW,* December 1986), the EGA Wonder automatically switches between modes. The mode-switching worked well during testing, even with unruly programs like *Flight Simulator* and *Jet.*

The main problem with the EGA Wonder is that it tries to do too much. In doubling the resolution of a standard color monitor, it pushes a mediocre piece of hardware beyond its limits, yielding a predictably mediocre result. Couple this inherent weakness with inconsistent CGA and MDA emulation, and the EGA Wonder can't live up to the demands of increasingly sophisticated users. *—TJ Byers*

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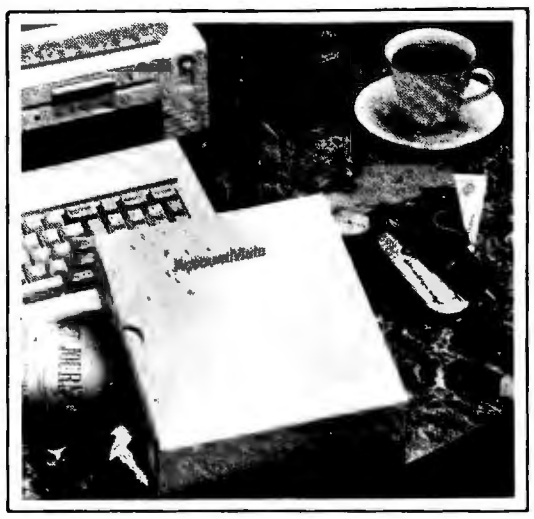

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The board comes in two configurations. The $155 64K version stores about 30 pages; for another $25, you get 256K—the equivalent of about 130 pages. You could save a few bucks and upgrade the board with 256K-bit chips yourself, but at these prices, the factory-installed route is worthwhile.

Ditron includes a set of simple utilities, two of which let you reconfigure the board as LPT2 or LPT3. The most interesting extra, however, is a memory-resident program that enables you to control the buffer from within any program. Once you invoke it, you can send a linefeed or a formfeed to the printer, swap ports LPT1 and LPT2 or LPT2 and LPT3, stop the printer, print up to 255 multiple copies, erase the buffer's memory, or even interrupt the current printout to print another document. I detected no clashes with other memory-resident programs, including *SideKick*.

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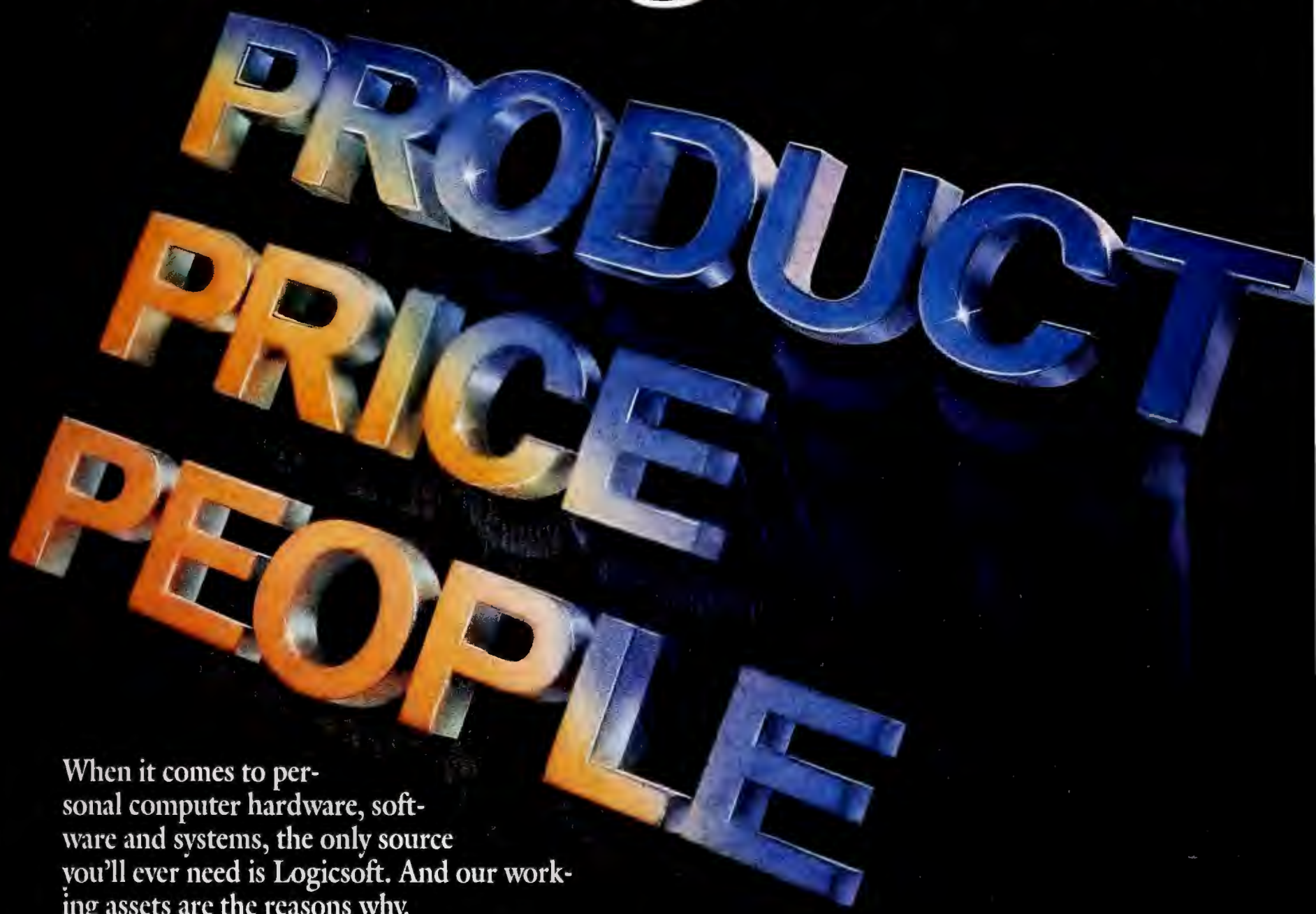

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Marlene Nesary is an Assistant Editor and Karl Koessel is Technical Editor for PC World. *Mark Kellner is data processing coordinator for the Salvation Army in Washington, D.C. TJ Byers is a freelance writer and the author of* Inside the IBM PC AT *(McGraw-Hill, New York, 1986). David Weinberger is a Brookline, Massachusetts, technical writer for a major desktop publishing firm.*

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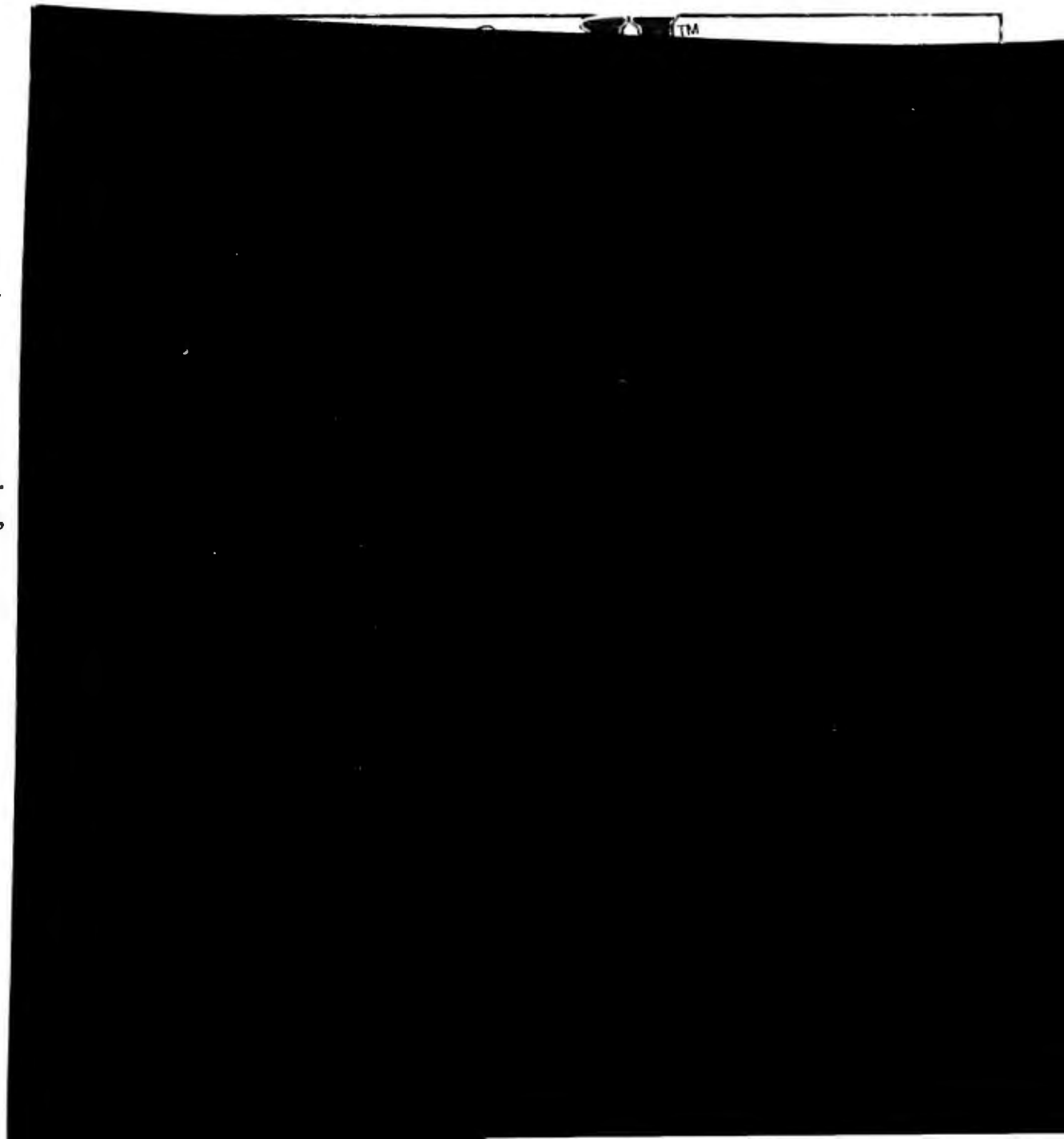

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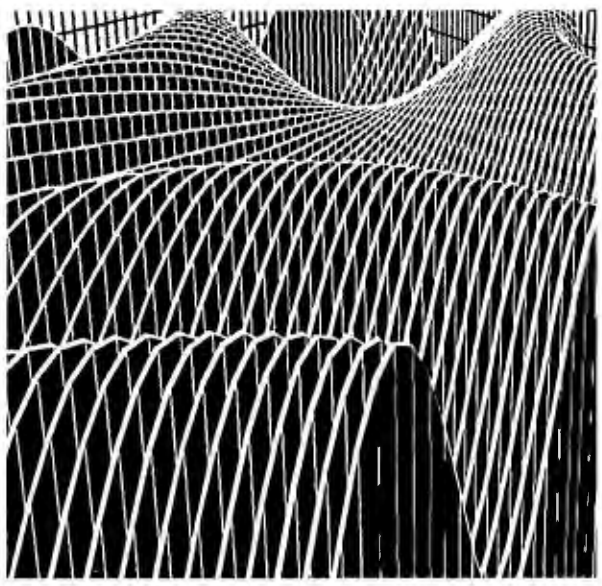
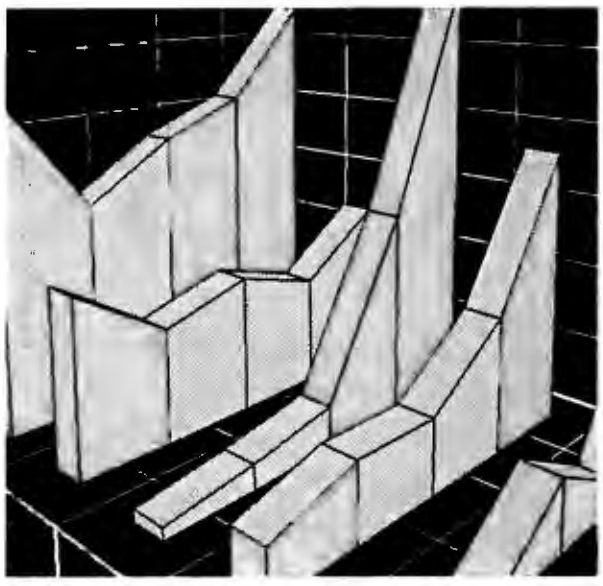
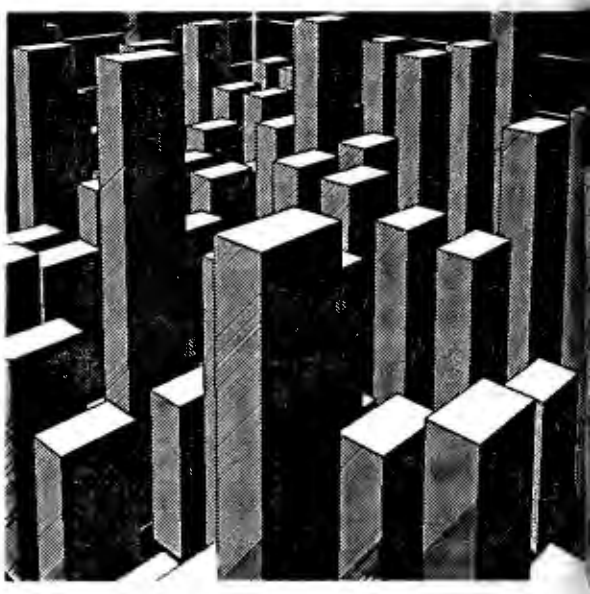
Every now and then in the software industry something momentous comes along and changes attitudes overnight. The introduction of Enable 2.0 (with a LAN version, and now available on 3½" disks) promises to be one of those events.







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Perspective. *The* graphics package. As *Personal Computing* just wrote, "other products cannot even come close."

Now, Perspective is fully bundled in Enable 2.0. Which means you can now have an integrated system beyond all others. Word processing, spreadsheet, DBMS, communications and mind-boggling graphics all in one. All offering the power business users need (for confirmation, just read our "Raves" column to your right).

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Note: the six remarkable 3-D graphs you see on these two pages were drawn using Perspective. Which should give you greater perspective on Enable 2.0's vast potential.

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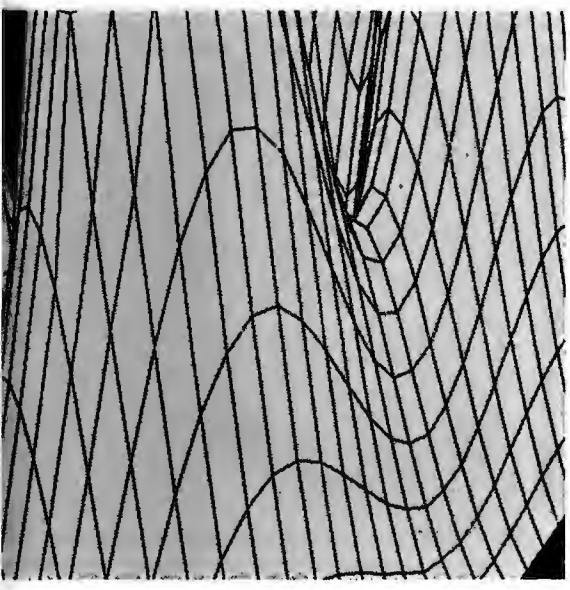
*Compatible with WordStar, MultiMate, EasyWriter, VolksWriter, PeachText, DCA, DIF, ASCII, 1-2-3, VisiCalc, SuperCalc 3, SYLK, dBASE, Condor 3, PC File III.

IN A NEW PERSPECTIVE



ne after another, ne raves keep flowing in.

aves! Raves! Raves! Reviewers were uding Enable even before 2.0.

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"Each of the five modules... has a epth of features and functionality rare an integrated package..."

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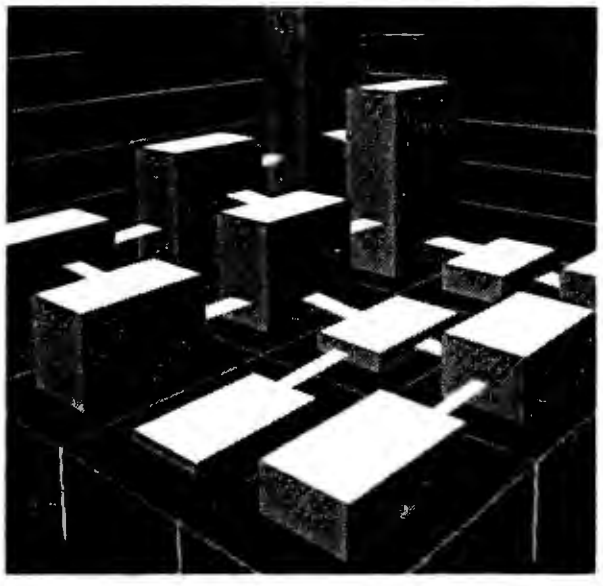
Enable 2.0 is bound to generate a hole new file of raves! Including our own.



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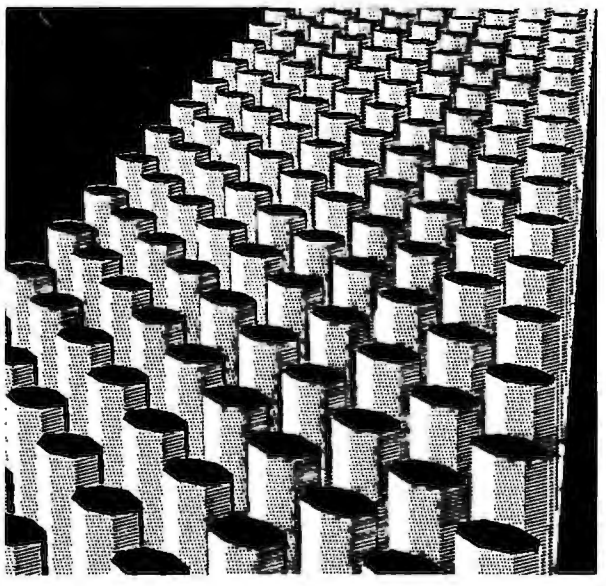
(Available 2nd quarter, 1987)



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Team Borland

Although its turbocharged president gets most of the press, Borland's vitality has a broad base—resounding success in the software market, a strategic stock offering in Europe, and solid management.

Paul Freiberger and Dan McNeill

Last fall at COMDEX, Borland International hosted the week's major party. Held at Las Vegas's Bally Grand Hotel, the event featured mandatory polka-dot ties for the men, flowers for the women, and a banner emblazoned "Turbo Jazz" hanging above the bandstand. At one point Borland president Philippe Kahn climbed onstage and invited anyone familiar with a musical instrument to join him. Partygoers picked up trumpets, guitars, and oboes and began to improvise; Kahn played clarinet and later, sax. On the floor, doing a mean boogie, was Microsoft chairman Bill Gates.

Kahn hopes Gates will dance to Borland's tune more often.

It could happen. In business only three years, Borland recently surpassed Software Publishing to become the nation's fourth largest software company. Analysts predict Borland will continue rapid growth despite—or perhaps because of—its flamboyant and unconventional standard-bearer.

Incorporated in May 1983, Borland began with a slender capital base of $20,000. Soon it issued two programs, Turbo Pascal and *SideKick*. Astute market analysis, economical yet effective packaging and distribution, and clever pricing carved an immediate niche for both programs. Each year, company sales and net profit increased substantially (see Figure 1).

Kahn Comes On

Most people credit Borland's success to Philippe Kahn, a shrewd, robust Frenchman. Paul Cubbage, analyst for the San Jose market research firm Dataquest, comments, "If I were going to invest in Borland, I would want to know where Philippe was. He's very important to that company."

Kahn has a master's degree in mathematics from Université de Nice but has little formal business training. He likes to linger after hours at the office, auditing CompuServe for consumer reactions to his products and personally responding to them. Charm makes him an excellent salesman, and he is particularly adept at setting industry tom-toms abeat for his products.

Borland's all-star line up, clockwise from top left: Philippe Kahn, Spencer Ozawa, Spencer Leyton, and Marie Bourget

Ward Schumaker

Kahn moved to the United States in December 1982. "The business started as soon as he arrived," says Spencer Ozawa, Borland's executive vice president and cofounder. A microcomputer salesman in the same building, Ozawa found Kahn a compelling personality. "One day I was trying to close a sale, and Philippe came by to assist me with his technical knowledge," Ozawa recalls. "His presence alone influenced the gentleman to buy a number of products from me. He's a very convincing person."

Although quick to learn, Kahn was untutored in the ways of American business. "He didn't know the ropes in the United States," says Ozawa, "Things like sales tax, business licenses, how to ship UPS, and how to get from point A to point B."

Over a series of lunches, Ozawa explained these mysteries to Kahn and soon the two were in business. Ozawa handled technical support, human resources, and shipping—what he calls "the less creative areas"—while Kahn controlled product development, advertising, and marketing.

Featuring graphics and interactive capabilities, Turbo Prolog has been selling well to large corporations working on expert system development.

"Borland seems well run, and they have really good product sense," says Dataquest's Cubbage. "It's easy to find products to publish. It's hard to pick the right ones and push them into the market. Philippe is a genius at that."

Kahn's oracular talent admits of no simple explanation. "There's a lot of gut feeling involved," he says. "Languages are simple. There's a list—Pascal, C, BASIC, Prolog—and you just decide which ones to do. New ideas, like *SideKick* or *Lightning,* can come to you in your hot tub. Or you're walking in the mountains, and suddenly you have this idea. After that, you just elaborate on it."

Explicable or not, hunches fueled Borland's ascent. Kahn guessed there'd be a market for a good Pascal compiler; five months after incorporating, he and Ozawa shipped Turbo Pascal. The program was fast and efficient, selling well in education, hobby, and power user markets, as well as becoming the darling of many professional Pascal programmers. By the end of fiscal year 1983, the company showed a 14.7 percent pretax profit.

Next Kahn targeted a more general market, pioneering a new category of product with *SideKick,* the package that popularized RAM-resident desktop accessories (see *From the Software Shelf, PCW,* February 1985). *SideKick* swept aside rivals that soon followed, selling over 750,000 copies to date.

Diversify, Diversify

With *SideKick* and Turbo Pascal producing geysers of cash, Borland became a significant force in the marketplace. Kahn's intuition that the company needed a still broader product base led to the purchase of Analytica Corporation. Borland paid $240,000 in cash for $6.5 million in Analytica tax losses set against future taxable income; Analytica's main product, a RAM-based, flat-file data base called *Reflex* (see "Reflex: Analysis With Finesse," *PCW* September 1985); and ten Analytica employees (including Brad Silverberg, now Borland's director of engineering).

At its original $495 price, *Reflex* sold a meager 1200 copies in nine months. Borland repackaged the program, slashed the price to $99.95, and shipped 100,000 copies over the next nine months.

In its second year, Borland unveiled two other well-received products, *Turbo Lightning* and Turbo Prolog. Like *SideKick, Turbo Lightning* aimed at a broad segment of users; its innovative reference engine provided text handlers with the first RAM-resident spelling checker and thesaurus operating in real time.

Turbo Prolog, another compiler, is as fast and efficient as Turbo Pascal. Featuring graphics and interactive capabilities, this object-oriented language has been selling well to large corporations working on expert system development (see "A Prolog to the Future," *PCW,* December 1986).

By 1986 Borland had substantially diversified its product line. Revenues were well distributed by product: 2 percent came from Turbo Pascal, 24 percent

from *SideKick,* 17 percent from Turbo Pascal toolboxes, 11 percent from *Reflex,* 11 percent from *Lightning,* and the rest from other products. After-tax profits ran an impressive 19.2 percent.

Michael Murphy, editor of the *California Technology Stock Letter,* estimates that for fiscal year 1987, Borland will ring up $40.7 million in sales and $8.4 million in profit after taxes; 1988 sales should reach $56.9 million with an $11.8 million after-tax profit. Healthy figures indeed.

Growing Pains

But you can't take a firm from certificate of incorporation to international clout without major changes. Borland's staff explosion is one obvious transformation: In three short years the company has grown from 2 employees to 250.

Another important shift has occurred in product distribution policy. Borland began with direct mail, selling first-rate items like Turbo Pascal for $49.95 at a time when competitors were charging as much as $300 for similar products. "We did it that way because it was the only way, " explains Ozawa. Distributors weren't interested in talking terms with unknowns. "A distributor wants exclusivity," continues Ozawa, "net 90 days, discounts—many things we couldn't afford."

Yet the company's triumph over the marketplace was impossible to ignore. Flush with the success of its mail-order scheme, Borland relished the fact that distributors were coming to it.

Now Borland relies heavily on distributors and retailers, and the cost of its programs has risen accordingly. Says Kahn, "When a company does only mail order and a product is advertised for $54.95, $54.95 goes straight to the company. Today, if we sell a product for $100, we get $40, with 30 days' credit to the distributor. Obviously, we had to push our price higher to survive. It's simple mathematics."

Moreover, mail-order buyers must pay the suggested retail price, just as if they'd gone to a store. "We don't want to compete with our dealers or the mail-order houses that carry our products," Kahn says. "That explains why only about 18 or 19 percent

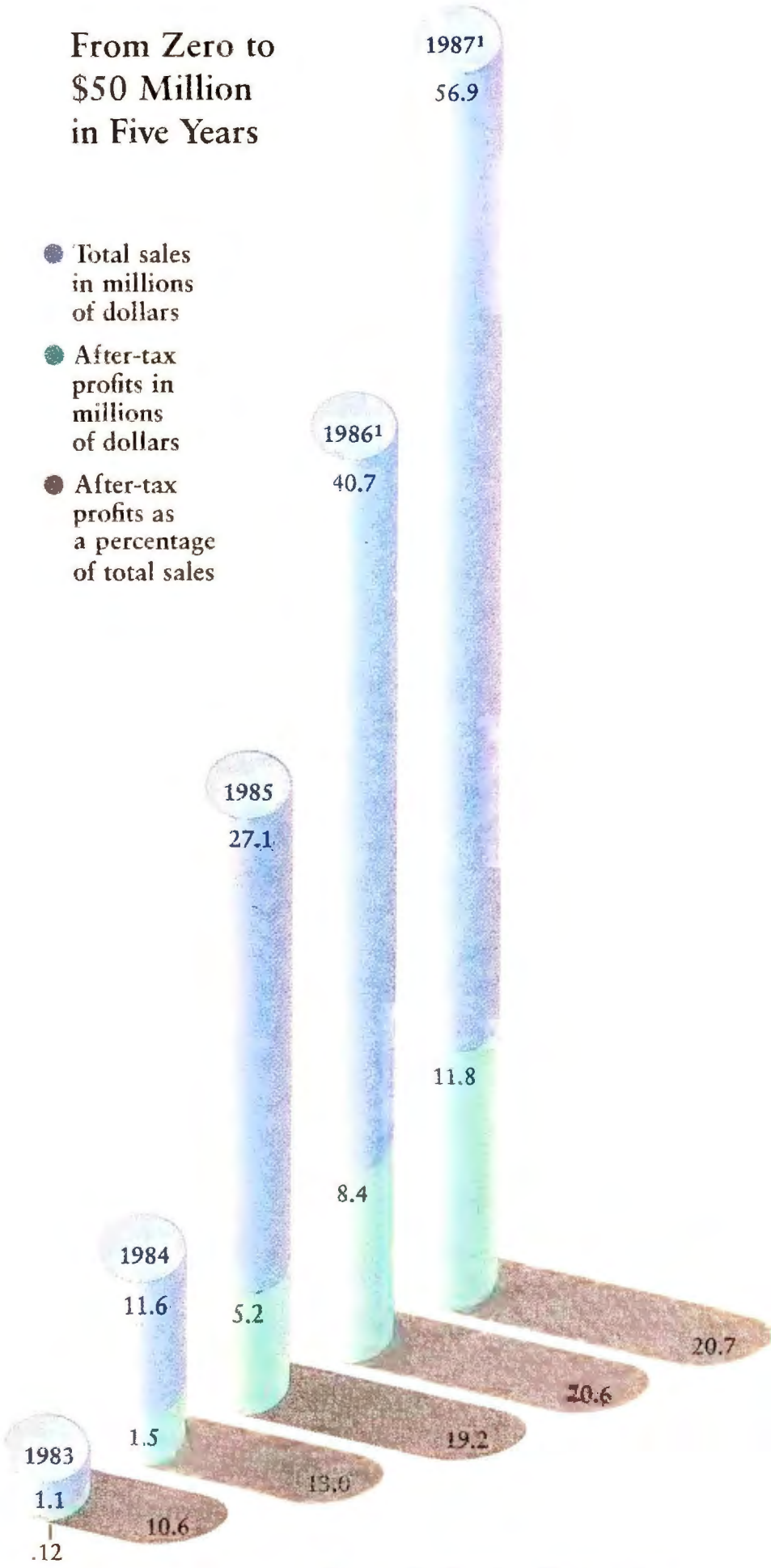


Figure 1: Borland's earning curve for fiscal year ending March 31 the following year

[1]Estimates by Michael Murphy, editor of the California Technology Stock Letter

of our current sales are by mail. We're not essentially a mail-order house any more."

Though Borland's vitality is now a matter of record, the company had one brush with calamity. In May 1985, Kahn nearly sold the firm to McGraw-Hill. Despite the flourishing success of Turbo Pascal and *SideKick,* Kahn feared he couldn't finance the company. "I felt I needed help. A lot of people were saying, 'What do you know about management?' Besides, I was more interested in designing."

'European investors look at things for the longer term. They're not continually selling. That keeps your stock stable and shows a lot of confidence.'

Fortunately, the deal died at the last second. According to one source, a *Wall Street Journal* article announced that Kahn was an illegal alien. The next day, even though McGraw-Hill's board of directors had already approved the transaction, Harold McGraw terminated it, declaring loftily that he refused to buy a firm from an illegal.

"When the deal fell through," says Kahn, "it was like suddenly losing your family. But then we looked at it and said, okay, great, we'd better do it on our own. I wasn't ready to go through it a second time, no matter what the company or the money."

Marie Bourget, Borland's vice president of finance, is blunter. "Thank God it didn't happen," she says.

Company Culture

Borland hasn't changed in one important respect: company atmosphere. "The feel of the company is very much like a start-up," says Brad Silverberg. "It's filled with enthusiasm. You work long hours and spend every dollar as if it were your own. It's a fantastic place to work."

Spencer Leyton, vice president for business development, reports that Borland has a surprisingly low turnover rate for any kind of company—nothing like the typical turnstile pace of most computer firms—another testament to its work atmosphere.

Perhaps the parties are significant. Borland's celebrated employee bashes soon evolved into computer fair revels. "The one that started all the notoriety took place in March 1985," Ozawa says. "It had a Greek theme. We got a lot of unfavorable press for that party: We were wearing togas."

A penchant for high jinks doesn't detract from Kahn's cunning nor weaken his grip on Borland's helm. Both the company president and a member of the board of directors, he owns 41.4 percent of the firm's outstanding shares. Additionally, a trust from other stockholders gives him control of at least 65.6 percent of the voting stock.

Kahn's power is everywhere evident. On Monday nights, for instance, company officers hold a free-wheeling agendaless meeting where they discuss all facets of the business. "Philippe expects a contribution on every topic from everyone," says Marie Bourget. "Every now and then he gives us a 'term paper.'" Kahn assigns a topic and outlines what he expects: Everyone must deliberate alone and respond in writing.

Kahn tolerates disagreement, but, as Bourget says, "In the end he usually wins." Silverberg agrees, adding, "Sometimes he'll tell me I'm dead wrong, but he'll let me make my case."

Going Public

Borland made a curious public offering of about 24 percent of its stock on June 18, 1986. The offering took place on the London Unlisted Securities Market, where citizens of the United States and Canada are barred by law from purchasing shares. Murphy's *Stock Letter* estimates that Borland gave up $6 million due to Europe's generally lower stock pricing.

Why did Borland take this unorthodox route?

"We had a lot of ties there," says Bourget. "Almost 80 percent of our shareholders are European. A lot of them were founders of the company."

Going public in Europe also offered commercial advantages. "The cost was substantially lower," Bourget says. "We saved between $500,000 and $1 million. Europe requires less frequent reporting—

every six months. And European investors look at things for the longer term. They're not continually selling. That keeps your stock stable and shows a lot of confidence."

Moreover, Borland seeks greater name recognition in Europe, believing that its products are well suited to that market. "Naturally, languages sell well because they don't have to be translated," notes Bourget. "Someone technical enough to use Pascal or Prolog can get by. And we have *Reflex* translated into French."

'We like to come out with a root product, then with products that work with it, amplify it.'

North Americans will not be able to buy Borland stock until July 1987 at the earliest. But Kahn may not make it available even then. "There's not really a reason for us to do it," he shrugs. "Going public is a real pain in the neck—the *Wall Street Journal* and all the analysts calling."

However, as Bourget observes, Borland may have to tolerate such irritations. "Once you get beyond certain sales figures, assets, and a number of shareholders, you have to file with the SEC whether you're public or not," she says. "We'll probably have to file with our first quarter of 1987. We find a lot of U.S. interest in Borland, and it might be to our advantage to open up the company when the time is right. A lot of people are just waiting."

Trends and Risks

What's up for Borland in 1987? The recently released Turbo BASIC is already providing a formidable challenge to Bill Gates and Microsoft's QuickBASIC 2.0.

Some industry watchers speculate about a *1*-2-3-like program. Kahn is emphatic about the comparison but enigmatic about the rumor, saying, "Borland doesn't do clones. If we did something, it would be better than Lotus."

Leyton offers some intriguing commentary on the Borland product philosophy. "We like to come out with a root product, then with products that work with it, amplify it. We've been primarily a language company, and we're going to do more," he promises, adding, "we're very much in touch with the power of the machine and how to make the most of its application capability."

Another language compiler? More toolboxes? An application that really takes advantage of the 80386 chip?

Borland International and Philippe Kahn have been nearly synonymous entities. What would happen to Borland if something happened to its turbocharged dynamo?

Leyton acknowledges that losing Kahn would have meant serious problems for the company at a critical point a year or two ago. But management becomes more solid every day. Says Leyton, "When you've got a knowledgeable leader, that person's smarts spread throughout the company."

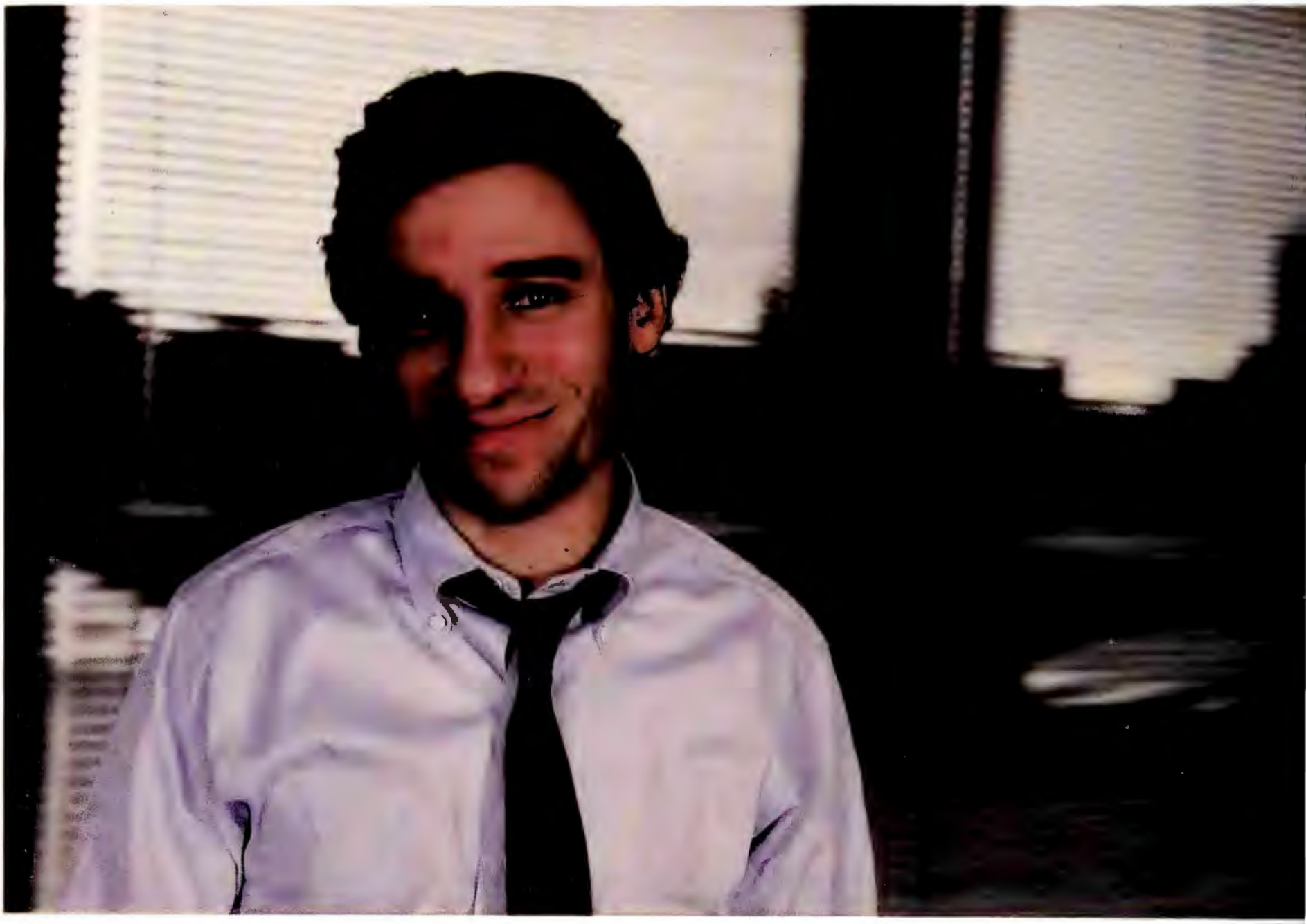
In the meantime, Leyton's attitude is: Why hide your guiding light under a bushel? "If one of your company assets is a charismatic leader, of course you'll use it," he says. No doubt we'll be seeing lots more of the Buddha of Borland.

Paul Freiberger and Dan McNeill are coauthors of Computer Sense *(Bantam Books, New York, 1986). Paul Freiberger is a business writer for the* San Francisco Examiner, *and Dan McNeill has written many books and articles about computers.*

Lotus Repositioned

A 35-year-old ex-newspaperman plots a growth path for the world's largest independent software firm.

Eric Bender



Under Jim Manzi, Mitchell Kapor's hand-picked successor, Lotus has diversified without losing its iron grip on the spreadsheet market.

On this sunny day, from a corner office high in the Lotus Development building overlooking the Charles River, the company seems about as bullet-proof as any software firm could get.

"We're in much better shape than we were entering 1986, across the board," says Lotus chairman Jim Manzi, turning back from the Boston skyline. "This is a great period for the company, with new products and new markets."

Sales of *1-2-3* are hitting record levels. *Symphony* continues to quietly rake in the money. A stream of recent debuts all look strong in the early going: the *HAL* add-in; the *Freelance Plus* graphics package; the *Manuscript* word processor; and the pair of offerings built on background-processing technology acquired from Software Arts two years ago, the *Metro* "pop-in" package and the *Lotus Express* electronic-mail software.

Lotus is boldly going where no software firm has gone before, and that shows on the bottom line: $282.9 million in revenue and $48.3 million in income in 1986. A once-skeptical Wall Street has voted with enough confidence for the Cambridge, Massachusetts, powerhouse to take a two-for-one stock split. And peace apparently has broken out on the long-turbulent Lotus/customer front.

But in Manzi's eyes, this happy state of affairs does not necessarily extend very far beyond Lotus's doors. "From product and market standpoints, all of 1987 can be summed up in three words: a gigantic mess. All of this noise about 286s and 386s and *Windows* and multitasking and networks during the last six or eight months has been mind-boggling and almost brainless. And it's going to get worse.

"Our biggest opportunity is to avoid all that stuff and to provide a clear growth path for our customers, to offer interesting new applications, and to make the transition from one set of technologies to another as painless as possible."

The Lotus Leader

Within Lotus, Manzi enjoys a considerable reputation for quick wit and no reputation at all for suffering fools gladly. Now 35, he worked on a daily newspaper for three years and then went to graduate school to prepare for diplomatic reporting. He had enjoyed journalism, but while at school, "it just struck me that I wanted to try something less reflective, more in the midst of it all," he says.

After graduating with a degree in economics, he worked for McKinsey & Company, an international management consulting firm. "At McKinsey, in a sense you change jobs every six months or so because of the diversity of the work you do," Manzi remarks. He spent four years there, much of it overseas.

In late 1982, just before *1-2-3* shipped, he came to Lotus to consult for several months, working with company founder Mitchell Kapor on planning. Afterwards he kept in touch with Kapor, who later invited him to join the fledgling firm.

Arriving in the spring of 1983 as marketing director, Manzi got along famously with Kapor. Named vice president in October, he was appointed president and chief operating officer a year later, and then chief executive officer in April 1986.

Three months later, Kapor astonished the industry, including most of Lotus's staff, by walking away from the company.

"We were in the midst of a major announcement in New York City," Manzi recalls. While he knew Kapor was contemplating the move, "the timing was a total shock," he says. "But we decided that if we didn't announce it immediately it would leak out slowly and just prolong the suspense. I guess I heard on Monday, and on Thursday we made the public announcement. And there were the requisite negotiations in between." It was, he sums up dryly, "an interesting week."

The Software River

Kapor still drops by Manzi's office on occasion, on his way to see his current codevelopers. This most famous Lotus alumnus continues to work on a long-term embedded-AI project with Edward Belove, Lotus's corporate vice president for research, and S. Jerrold Kaplan, principal technologist. Lotus hopes to ship the resulting package, which will run on any PC, sometime this year.

Kapor's work is just one of the software streams flowing through Lotus. There's a big push, of course, to extend the core products, with *Speedup* and *Learn* add-ins as the most recent examples. *1-2-3* release 3 clearly is lurking somewhere; but unlike developers that issue new releases every year or so, "we will not do upgrades for the sake of doing upgrades," Manzi insists. "If we don't deliver enough added value

at the moment we introduce the upgrade, nobody's going to buy it. Customers will either stick with what they've got or go elsewhere."

"*HAL* is in its own right a way of delivering dramatic new functionality to the *1-2-3* installed base without going through an upgrade process," he remarks. "And those people who don't want it don't have to push more and more stuff into memory."

A Macintosh sits next to the Compaq behind Manzi's desk, and he types memos with *Jazz*. "We have some very good people working on Macintosh products," he comments. "To the extent that the Macintosh has recently become more successful in some of our key markets, we're thinking about doing some new things. And maybe some of those things are already in the works."

Lotus also continues its thrust into information services, which began in a big way two years ago. In February its One Source financial data base system became the first CD ROM-based service to go weekly (see "Bright Light on Financial Data," *PCW,* April 1987).

And Lotus continues its long and occasionally weary march into micro-mainframe links with the Application Connection, which provides a fairly intelligent interface to various mainframe data base management systems. "We struck a responsive nerve there," according to the chief executive.

Then there are the new starts within the advanced-products group, including "one project that I would categorically call the biggest R&D project going on anywhere in our industry, in terms of the breadth and the ambition of what we're trying to do," Manzi says. (And that's all he'll say.)

The Customer Is Always . . .

"I think that our customers like us a whole lot better today than they did 15 months ago," Manzi says. "We got through the problem with the *1-2-3* release 2 upgrade, we started working more closely with our biggest and most important customers, and we started doing some other things differently.

"We haven't had a complaint about our support lines in probably eight months," he declares. "The support problem peaked maybe three or four months into the release 2 upgrade." But in mid-1986 Lotus added people and switched procedures so that now "the wait time is down to very acceptable levels."

Add-Ins, Knock-Offs

Even as Lotus announced the shipment of add-in tools for *1-2-3* and *Symphony* in January, the company estimated that about 450 software vendors and 1000 products had already rallied around the flagship packages.

Lotus plans to begin selling selected third-party software through its direct-sales operation. And, Manzi says, it's kicking around the ideas of turnkey manufacturing and documentation production.

"Our job is not to compete with the development community," he emphasizes. "We're not going to offer an add-in word processor. In fact, there was one under internal development, but we wished those people well, and now they're off starting their own company."

1-2-3 clone makers are a different story, as the recent Lotus lawsuits against Paperback Software International and Mosaic Software show (see "Courting 'Copycats' in this issue's *PC World View*). In an industry whose response to a handy new feature is usually to copy it, the move ignited a fire storm of controversy.

But the head of Lotus sees the issue in black-and-white terms: "We encourage people to do Lotus-like interfaces. We just don't particularly feel it's in our interest or our customers' or shareholders' interest to encourage people to steal our property."

Overseas Success Wasn't Overnight

"We now have the best-selling software product in Japan," Manzi notes. "We sold 10,000 copies of *1-2-3* in Japan in our first three months or so, which was great as far as that market's concerned." To achieve that goal, Lotus demonstrated the same approach that successfully launched its software worldwide.

On the development side, that strategy meant translating all program text into Japanese, licensing third-party technology that enabled users to enter the 7000 Japanese characters from a standard-size keyboard, and altering date formats, along with a host of other changes. On the marketing side, Lotus trained 800 dealers and poured resources into advertising and sales support.

"We were smart enough to spend a year and a half doing all the up-front work, as opposed to dumping American products into Japan and hoping they'd do well,

which is what some of our competitors have done," Manzi concludes.

Lotus's international sales grew about 70 percent last year, and they now represent about one-quarter of the company's business.

International manufacturing has also paid off. "Nobody else has the capacity to manage manufacturing and distribution the way we do with three manufacturing plants, in the United States, Puerto Rico, and Ireland. Other people are trying to copy us, but we're far ahead in terms of production technology, scale, flexibility, and management," he maintains. And the offshore sites have cut the tax rate about 12 points, creating hefty savings.

Running the Big Machine

There's no second-in-command at Lotus. Manzi lists the key management team: "Dan McMillan, software products; Chuck Digate, international and information systems and now electronic mail; Steve Crummey, sales and service; Mike Kolowich, marketing and business development; Ed Belove, corporate R&D; and Mick Prokopis, finance, operations, MIS, legal, and the rest."

"I want to stress that it's not just me here," Manzi says. "I've been lucky to hire some terrific people, and that's the real secret of success. We all have a good time working together. For the most part."

Manzi admits to a marriage and a conventional home life somewhere in metropolitan Boston. Beyond that, he guards the details of his private life. "I go to great pains to separate my work from my personal life, because I like to switch the work off when I go home," he says. "I work really long days during the week, from 6:30 a.m. to 6:30 or 7 p.m., and I do not like to work weekends."

Would he enjoy life in a large corporation if he weren't at the top? "Probably not," he says. "I try to remember that.

'We encourage people to do Lotus-like interfaces. We just don't particularly feel it's in our interest . . . to encourage people to steal our property.'

"There is a natural dichotomy between running a company, with the hierarchy and bureaucracy that the complexity of the tasks require, and maintaining the level of informality that we try to have around here, on all sorts of issues. Managing across that dichotomy is what will make or break a company like ours.

"It all comes down to the quality of the people you have; we do have great people at all levels of the company." He adds, "We continue to try to push decision making and risk-taking further down into the organization."

That gets more complicated as Lotus grows, Manzi acknowledges. "It's a lot harder to run a 1500-person company than it is to run a 150-person company—more than ten times harder."

Informality still reigns at Lotus's companywide meetings: At one recent meeting, a senior vice president spilled dog food across the rug in his zeal to make a competitive point. Participation is encouraged. "Anything going on at the company is fair game for anybody to ask about," according to the chairman.

Lotus culture also encourages social responsibility; one example is the Lotus banner that was carried aloft during a walk for AIDS victims last year—not exactly the norm for Boston businesses.

But the fire in the belly isn't dying down, and Manzi has few sweet words for the competition. "We're going to surprise a lot of people with the success we have after all the noise fades, after the claims and counterclaims disappear," Manzi declares. "The company that comes out on top and stays on top is going to be Lotus.

"Our biggest worry is that we'll blow it," he adds, laughing. "But we're not going to blow it; we have too many people working on it."

Eric Bender is PC World*'s East Coast Editor.*

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Let HAL Do It

Happily, *HAL*—a new star in the Lotus Development constellation—bears little resemblance to the artificially intelligent computer in *2001: A Space Odyssey.* The design of *Lotus HAL* (for Human Access Language) reflects genuine intelligence rather than synthetic intellect.

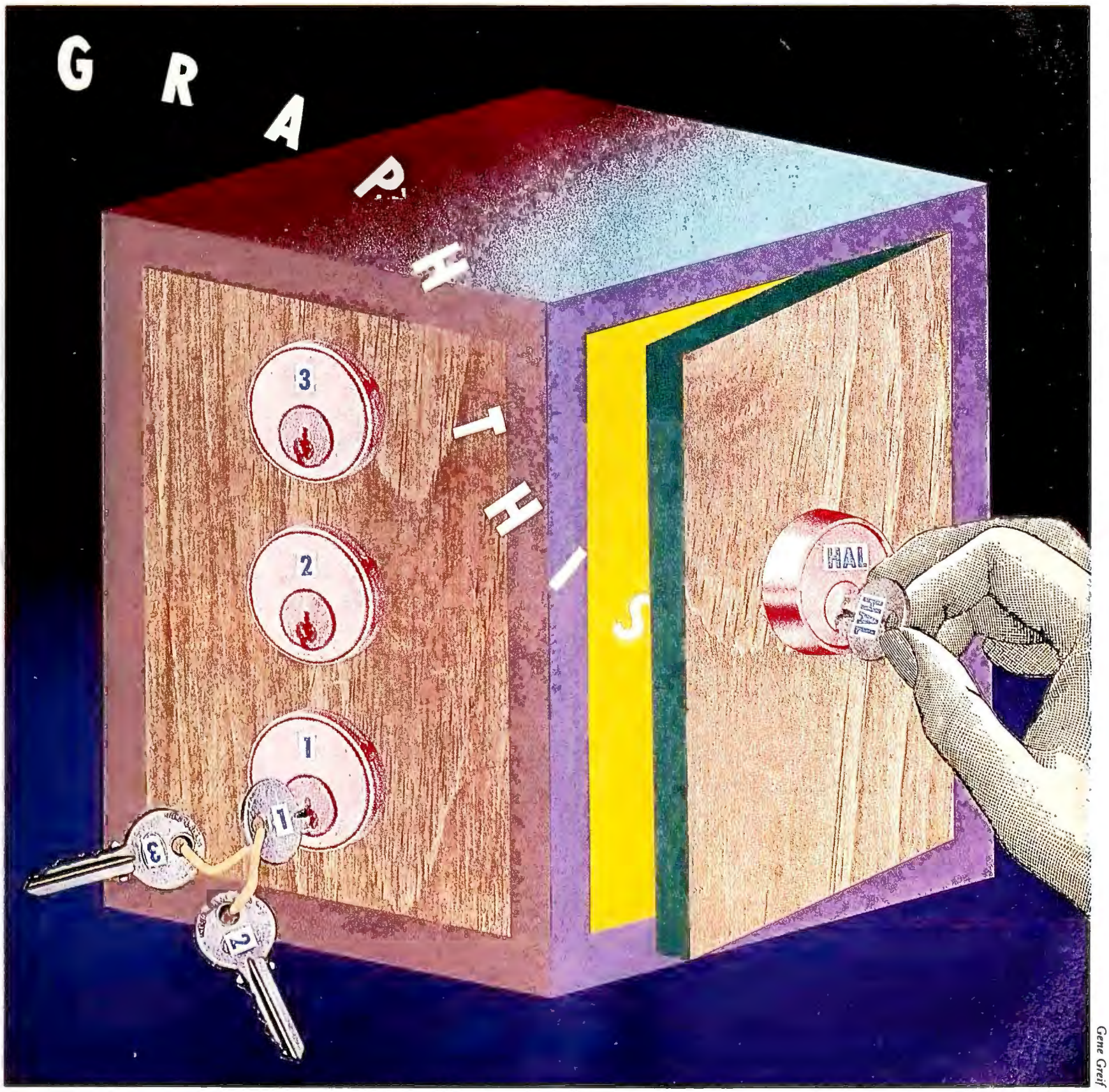
HAL is, pure and simple, an exceptionally efficient way to control *1-2-3*. It supplies experienced spreadsheet users with a command line interface, an easier and slicker method for creating macros, and the ability to link worksheets. The key to realizing these benefits lies in understanding what *HAL* can do and, equally important, what it *can't.*

A sophisticated translation tool, *HAL* converts English phrases into a series of *1-2-3* commands. You type 'graph this', and, as if by digital sorcery, *HAL* draws a bar chart of the data in the current worksheet range. The more intricate the *1-2-3* procedure, the greater *HAL*'s value. Further, *HAL* adds fundamental features and functions to *1-2-3*'s repertoire. From a command to undo the most recent errant keystroke to the worksheet audit feature, *HAL*'s enhancements would be worth the price of admission even without the English language interface. But for *HAL*'s diverse talents, plan to pay a hefty price in memory overhead: about 110K of conventional RAM and a usurious levy on available expanded memory.

Harry Miller

If you expect *HAL* to implement what it thinks you might have meant, however, think again. Although some *HAL* commands combine the functions of many individual *1-2-3* instructions, *HAL* doesn't learn much from your usage patterns. Instead, its basic assumptions about usage preferences embody the learning of developers who pored over a multitude of real-life spreadsheets. And the program does "know" some useful common terms and understands time series. A request to 'put jan to dec across' will indeed produce a list of the month names (spelled out, of course) across the current row. And the program's just as familiar with years and quarters.

HAL, Lotus's new add-in, endows 1-2-3 with English language control, an undo command, auditing, worksheet linking, and much more.



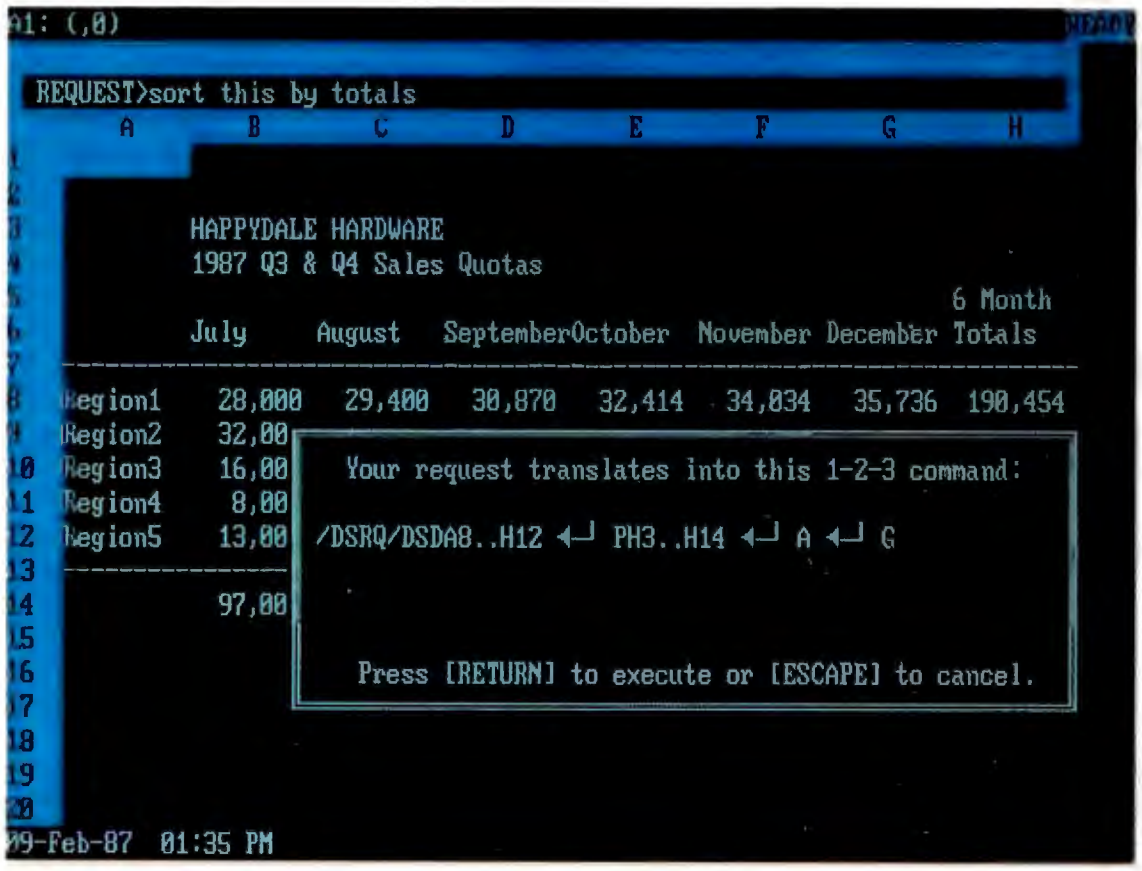
Gene Greif

Assistance With Care

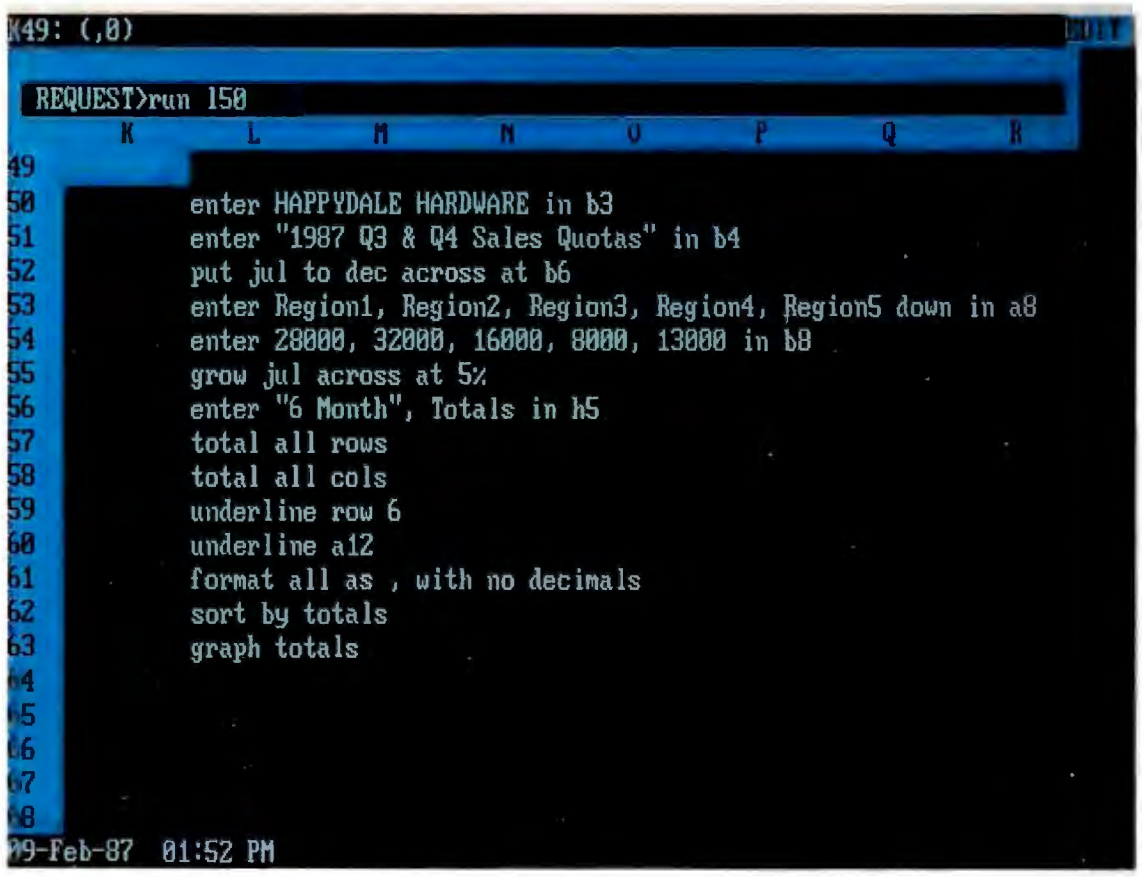
A product like *HAL* makes *1-2-3* potentially much more accessible to novices. In removing such conceptual obstacles as the definition of ranges, *HAL* substantially shortens and flattens the learning curve. The program further compresses the time between typing '123' and accomplishing useful work by providing a much simpler English command syntax.

You can think of an action as *get budget* instead of *File Retrieve Budget*. You can also forever banish the @ symbol (which usually precedes mathematical, statistical, logical, and data management functions) to the relative obscurity whence it came.

Like a little knowledge, however, a little assistance can be dangerous, and *HAL* only partially fulfills its promise as a godsend to *1-2-3* neophytes. The manual wisely advises that users have a working



Screen 1: The Translate key displays the equivalent 1-2-3 command for the current HAL request. If you need practice in deciphering 1-2-3 macro commands, try this. Note that the HAL request box has replaced the 1-2-3 control panel.



Screen 2: Because HAL commands are in English, its macros are self-documenting. This macro was created by editing a transcript of HAL requests. When invoked, the macro will create the worksheet and graph used in the other screens.

knowledge of *1-2-3* before investigating *HAL*. Nowhere in the *HAL* package will you learn about column and row cell references, the meaning of cell formats, the difference between absolute and relative addressing, or even the difference between values and labels. More important, untutored users will be at a severe disadvantage when calculations yield strange results; wending your way through ill-conceived formulas remains difficult. Nor is it possible to predict the sometimes surprising effects of cumulative operations.

Clearly, *HAL* isn't much help to the complete novice. It is designed to grow with you; its power and utility increase in direct proportion to your familiarity with *1-2-3*. Once you've mastered the basics, *HAL* can embellish work (with dashed lines under totals and titles, for example) in ways that might elude a beginning user.

Accordingly, *HAL* shines its brightest in the hands of the spreadsheet veteran. Besides adding important features, the program makes *1-2-3*'s lesser-used—and more complex—functions more accessible. Now you can sort data without repeatedly returning to the menu to define input and criteria ranges and primary and secondary sort keys (see Screen 1). This capability alone could inspire a quantum leap in the analytical output of corporate America. And with *HAL*'s Report command, generating ad hoc reports is a snap. Once you've specified the field (which groups like items) and the operation, the result appears below the current table or in a specified location.

How the HAL Does It Do That?

As a *1-2-3* add-in, *HAL* "tethers" itself to *1-2-3*'s code. With the two programs combined, all original *1-2-3* commands and facilities remain intact. You can access *HAL*'s full repertoire by pressing the backslash key. This action inserts the *HAL* request box at the top of the screen, the area usually occupied by the *1-2-3* menu or command line. Issuing the plaintive *HAL* command Stay causes the request box to linger after each request is executed; a rude Go Away banishes the box to the background.

A *HAL* request takes the form *verb-object-qualifier-destination*. In other words, you must tell the program the action to take and the data on which it should act. You can make the request more specific by adding a qualifier and a destination address. The qualifier often specifies parameters that would normally be chosen via secondary menus; adding a destination is equivalent to specifying an output range. For instance, you might say 'copy col d as values to a55'. In this example, *copy* is the verb, *col d* is the object, *as values* is the qualifier, and *to a55* is the destination address. This is a true story. Any resemblance to English language construction is purely intentional.

To ensure that *HAL* has complied with your instructions, press the <F6> Translate key to display the *1-2-3* commands *HAL* used to execute your request (see Screen 2). (Unfortunately, they'll be presented in *1-2-3*'s nearly impenetrable macro format.) In many instances you'll find that *HAL* commands require fewer keystrokes than their *1-2-3* equivalents. If you ever suffer the slightest case of buyer's remorse about *HAL*, the Translate key is a sure cure.

To accommodate normal speech patterns, *HAL* attributes special meaning to the words *this* and *it*. *It* simply refers to the location specified in the previous request. *This* refers to the current table, an area the program defines as a rectangular block of data bordered by two blank rows or columns or by the worksheet border. A worksheet might have many tables, so make sure that the cursor is placed in the correct table before you issue a request.

Say the Secret Word, and the Duck Will . . .

The test of any natural language facility is whether it lets you spend more time issuing requests than correcting the system's misinterpretations. *HAL* passes this test resoundingly.

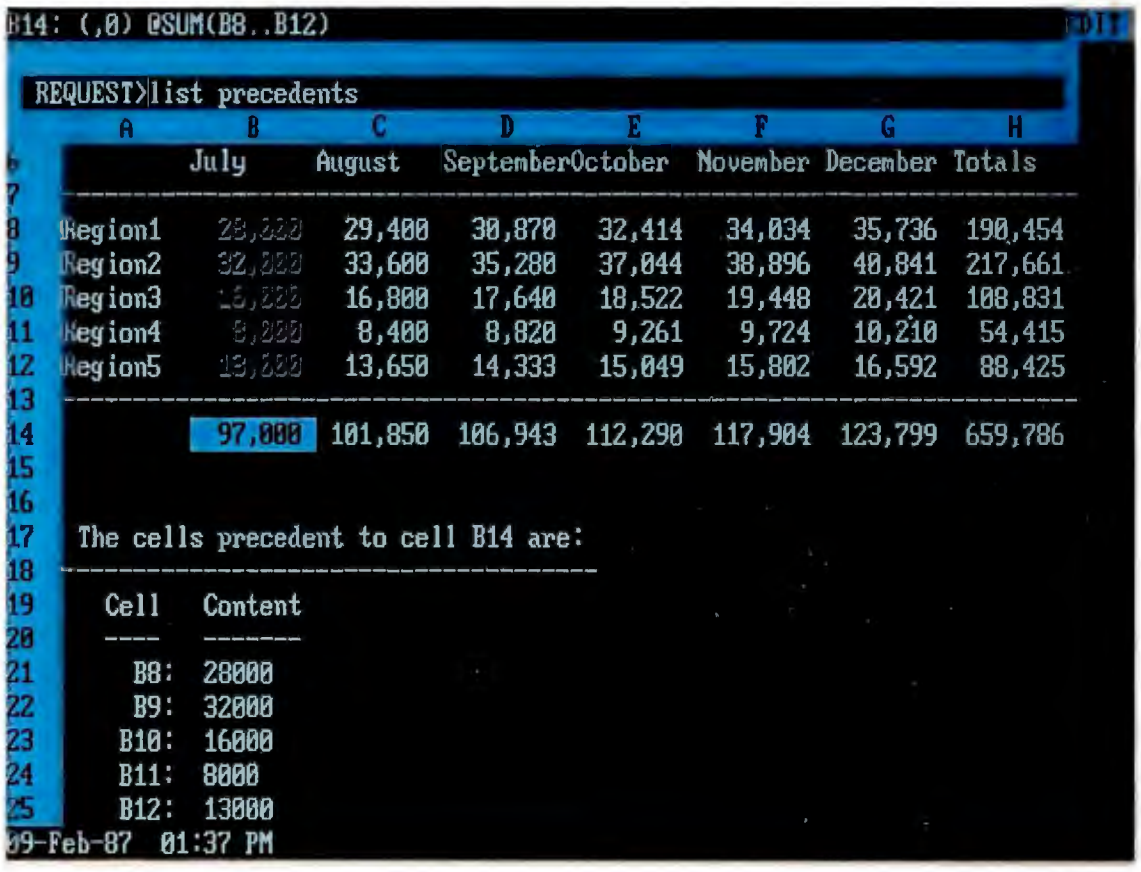
The program includes an admirable lexicon of keywords and synonyms. *HAL* starts with a vocabulary of 2000 words and can accommodate up to 64,000 synonyms. (Note that although the program permits abbreviations, you can't abbreviate synonyms in a request without first defining the abbreviation as a synonym.) In addition, *HAL* automatically understands words used as column and row labels. Even so, at some point you're likely to wonder why they didn't use *purge* as a synonym for *erase*.

If they didn't, you can—by adapting *HAL* synonym files or fashioning your own, making sure the total size of all synonym files does not exceed 64K. As ASCII files with a .PRN extension, synonym files can be created or edited with any text editor. And

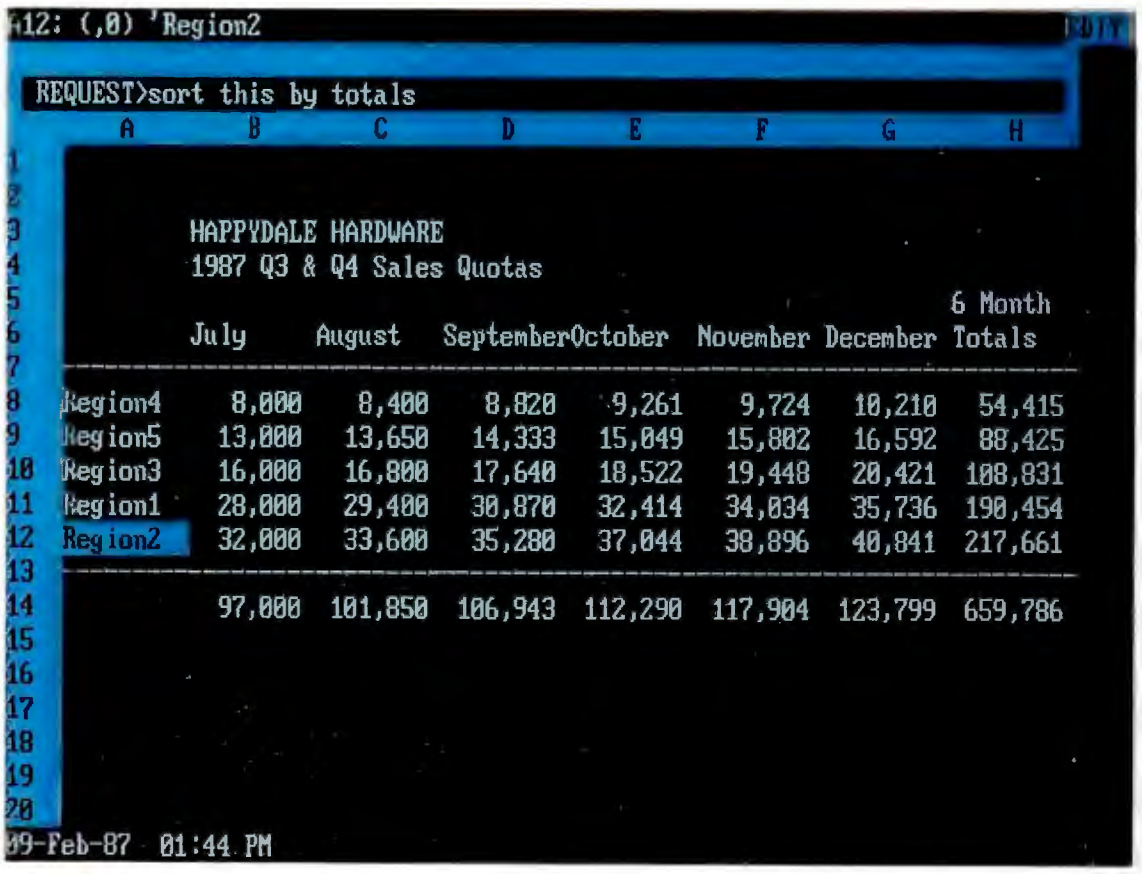
you can just as easily import files into *1-2-3* and save them by printing them to a disk file. Synonyms can replace a *HAL* word or any phrase; they can also invoke a series of *1-2-3* commands. You can thus create *HAL* macros that don't appear anywhere on the worksheet.

A New Macro Language: English

Experienced users are likely to prize the way *HAL* enables them to create self-documenting English language macros via a simulated learn mode. Normally, *1-2-3* macros read like urban graffiti: a language intelligible only to those in the know. *1-2-3* macros can be even worse than spray-painted scrawls, as *1-2-3* hotshots—who occasionally find themselves squinting at a macro listing in wonder—can attest.



Screen 3: The list of precedents (values or formulas that affect the subject cell) is reported as a series of labels in the worksheet. A request to highlight the same precedents was executed before the list was generated.



Screen 4: Data and graph functions show off HAL's efficiency. Upon receiving the request 'sort this by totals', HAL established the data range and primary sort key on its own.

Rare are those thoughtful souls who have the discipline to document their macros. The need to explain routines isn't much helped by *1-2-3*'s insistence on tedious character-by-character macro building. With *HAL,* you can play back a session transcript (including all *HAL* requests and *1-2-3* commands) and then edit them into a macro. (Finally, a learn mode for *1-2-3* macros!) Because requests are in English, they serve as their own documentation (see Screen 3). And you can expand on that documentation with comment lines entered via the *HAL* request box.

Aside from their intelligibility, *HAL* macros have a few nifty wrinkles. Replaceable parameters are implemented much as they are in DOS batch files: You provide parameter values when you invoke the macro. The *HAL* macro command Message expands the *1-2-3* macro {getlabel} or {getnumber} functions by creating a pop-up window that can display a message or prompt of up to 150 characters.

HAL's English language macros do have a few limitations. The macros can be invoked only by a *HAL* request, for example; there's no way to call a *HAL* macro or request from a *1-2-3* macro. And you can't mix *1-2-3* and *HAL* macro statements on a single line. Nor can you use the Undo feature in a macro. But serious macro application developers are most likely to lament *HAL*'s lack of subroutine capabilities. Although you can chain *HAL* macros, a called macro routine cannot pass control back to the calling macro.

Catastrophe Averted—Or Explained

HAL's contribution to the fight against noise pollution is its Undo facility, which should substantially reduce the shrieks of dismay that issue regularly from workplaces across the land. Pressing the <Backspace> key returns the worksheet to the status it had just before you issued your last *1-2-3* command or *HAL* request. Change your mind again? Pressing the *Backspace* key a second time undoes the Undo. To accomplish this feat, *HAL* lays claim to a chunk of memory and saves an extra copy of the worksheet before updating it. Besides protecting a worksheet from the peril of erroneous commands, Undo can provide quick comparisons of alternatives: You can try a new value, see the results, and then annul that action.

Of course, there's no such thing as a free undo. The feature takes its toll in RAM: 47K (for release 2) or 30K (for release 1A), plus the size of the worksheet. If your models usually just squeeze into available RAM, neither *HAL* nor its Undo feature will fit. *HAL* is clever enough to sense memory requirements: If the RAM available at the start of a *HAL* session is insufficient for Undo, that feature is automatically turned off. Should you need additional RAM midsession, you can shut off Undo with a *HAL* request; reactivating Undo requires that the worksheet be empty. If heroic measures are in order, a statement in the AUTOHAL.PRN file can start *HAL* with the Undo feature turned off.

To help you understand spreadsheet models and debug them, *HAL* can highlight and list relationships among cells. By default, lists are displayed below the current table (range). You can see all cells that depend on a particular cell, all those on which the cell depends, or both (see Screen 4). Here, reading the manual carefully pays off: The default arrangement highlights or lists precedents or dependencies from the

Executive Summary

HAL

1-2-3 enhancement

HAL is an extension to *1-2-3* that brings an English language command line interface, an undo feature, a much better way to do macros (including a learn mode), some rudimentary auditing functions, and the ability to link worksheets. The program is particularly efficient at data and graphing procedures. *HAL* should prove a boon to intermediate and advanced *1-2-3* users but is not recommended for novices. It consumes a minimum 110K of RAM.

Natural language interface	*Excellent*
Macro creation	*Good*
Auditing	*Fair*
Worksheet linking	*Fair*
Overall value	*Excellent*

current table only. Thus it's easy to neglect a critical precedent or dependent cell because neither one is in the current table.

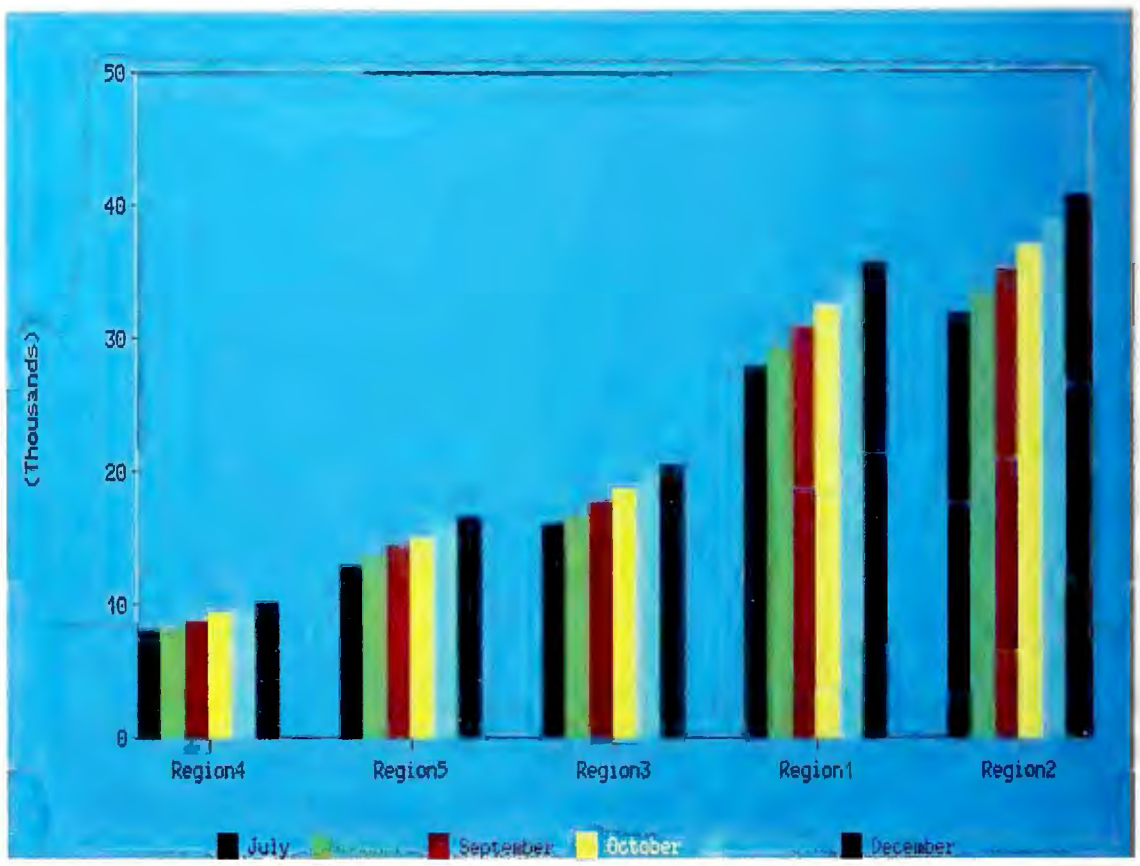
Note also that highlighting cells in this way removes cell protection; if you protect cells, you'll want to remove highlighting as soon as you've reviewed the list. Furthermore, these auditing features operate at an extremely leisurely pace. Unless you're working with models small enough to make auditing superfluous, finding precedents or dependents will give you time to catch up on that James Clavell novel you've been meaning to read. In short, if your auditing needs are critical and you plan to scrutinize models faithfully, get a dedicated spreadsheet auditing product. For occasional checkups, however, *HAL* can be a big help.

On the Links

Lotus is often chided for failing to include a worksheet-linking capability in *1-2-3*. As a result, billions of *1-2-3* worksheets are bigger than necessary and unwieldy. *HAL* offers some rudimentary facilities to correct that omission. The process seems simple enough: From the target worksheet you issue a request such as 'link a30 to d30 in region1'. You can use the Undo feature to load the source worksheet file (in this case, 'region1') to confirm that the source cell address is correct. Then, as the source worksheet is altered and saved, the target worksheet is updated automatically.

This process doesn't work by magic. *HAL* uses *1-2-3*'s File Combine command to copy the contents of the source cell to the target cell. Therein lie two drawbacks: Although *HAL* can highlight or list links, the control panel display of the target cell's status information gives no hint of the link. In addition, link updates depend on retrieving and saving the source files. Implementing a series of links that are even slightly complex means there'll be a whole lotta retrievin' and savin' goin' on. The manual acknowledges the risk: A chain of linked worksheet files could yield incorrect results because the intermediary files must be retrieved and saved before the last target cell will reflect a change in the first source file.

HAL isn't much help to the complete novice. It is designed to grow with you; its power and utility increase in direct proportion to your familiarity with 1-2-3.



Screen 5: The result of the last request in the macro shown in Screen 2—'graph totals'. You'd have to enter titles, legends, and other options via 1-2-3's Graph menu.

On balance, *HAL*'s linking feature isn't implemented well enough to justify a change in work style in favor of smaller linked worksheets. That's especially unfortunate in light of *HAL*'s contribution to RAM overhead, which further constrains worksheet size. Again, if linking worksheets is a serious requirement, you're better off using a stand-alone program dedicated to that purpose. Anything beyond a simple link in *HAL* is an invitation to trouble.

The World on a String

Although *HAL*'s string manipulation is not as flashy as some of the program's other talents, it will undoubtedly prove at least as useful. *HAL* requests enable you to find and replace numbers, values, and text strings. The text string facility is especially valuable. It can manipulate text strings or partial strings (that is, text in the middle of a string) and use a text string as the destination in a Goto statement to move the cursor to the pattern's next occurrence. But none of these functions operates on dates.

The time that Lotus and the *HAL* development team spent honing the product's integration with *1-2-3* has paid off. Not only is *HAL* a smooth implementation of an add-in product, it also has excellent keyboard compatibility with *1-2-3:* Seven of the ten function keys retain their *1-2-3* assignments (for example, <F1> brings up *HAL*'s help facility).

The key to integrating *HAL* into your spreadsheet work habits is knowing when to use it and when to rely on tried-and-true *1-2-3* commands. In several areas, the choice is made for you: *HAL* can't change defaults, set titles, or split windows. Neither can it control the finer points of graphs—titles, legends, and so on (see Screen 5). Commands that can be activated with a single trip to the *1-2-3* menu are best executed directly. And you'll find that some parameters are simply easier to specify in plain old *1-2-3*. It only takes a little frustration with *HAL* to remind you that the familiar *1-2-3* menu is but a slash key away.

No Science Fiction Here

Plainly, the features that *HAL* brings to the party should be integrated into *1-2-3,* not offered as a separate product. Once you get past faulting Lotus for that, go out and buy a copy of *HAL.* If you can afford the RAM overhead and don't try to push the product past its limits, *HAL* should prove a winner.

The increased productivity and the easier access to more advanced *1-2-3* features are well worth the price of the program. The real cost of these new capabilities lies in the RAM overhead they add, however, and that cost can be steep. *HAL* beefs up *1-2-3* by about 110K, thereby trimming the maximum size of a worksheet by that amount plus the 47K set aside for Undo. Expanded memory can help some, but *HAL* grabs half of that for the Undo feature as well. If your investment in large spreadsheet models is significant, *HAL*'s added functionality may not be worth the effort of converting those models to smaller linked worksheets (certainly not on the basis of *HAL*'s link facility).

HAL expands *1-2-3*'s flexibility significantly. You must use the add-in carefully, however, because it's capable of hiding underlying operations, formulas, and assumptions. Applied judiciously by experienced spreadsheet users, *HAL* can enhance analysis tasks. On the other hand, those looking for an artificially intelligent electronic servant may find themselves waiting quite a long time for the pod bay doors to open.

Harry Miller is the Editor of PC World.

Lotus HAL
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
617/577-8500
List price: $150
Requirements: 512K, DOS 2.00 or later version, 1-2-3 release 1A or subsequent release

Building Manuscripts Block by Block

Creating a complex document can seem as intimidating a task as building a pyramid. So Pharaohs take note: Lotus's first word processor is designed primarily to handle problems unique to technical writing, but its tightly integrated outliner and advanced print formatting make it ideal for any monumental work.

Eric Brown

For over a year, the rumors flew and word processing vendors quaked: Lotus Development Corporation, the company that originated the best-selling program of all time, was going to introduce a "smart" word processor that would blow the competition out of the water. Supposedly, an expert system shell would do everything from dotting your *i*'s to bursting your fanfold paper.

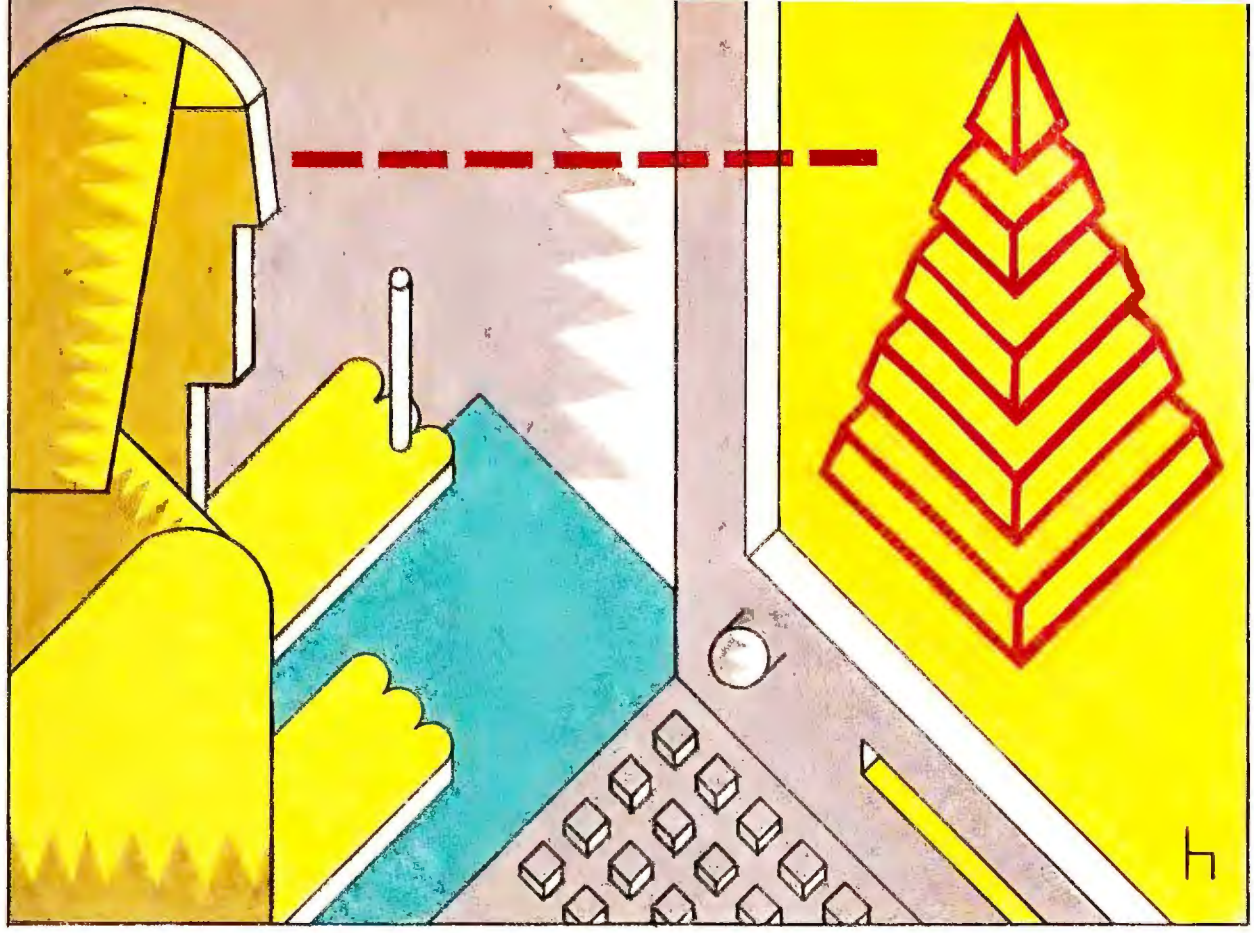
When Lotus finally introduced *Manuscript,* competitors took a few relieved breaths. In actuality, the program is being marketed as a niche product for science and engineering writers, and it forges no major breakthroughs in artificial intelligence. *Manuscript* also requires 512K RAM and a hard disk, which should further limit its audience. And at $495, it's hardly the most competitively priced word processor out there.

Nonetheless, competitors may have occasion to worry and users to cheer, because not only is *Manuscript* perfect for a multitude of nontechnical business applications, it also may well be the "smartest" word processor on the market—especially for elaborate formatting and printing. *Manuscript* is also extremely fast, managing large files (up to 800 pages, according to Lotus) with little noticeable degradation in speed.

Like *XyWrite III, Manuscript* excels at handling footnotes, tables of contents, indexes, and title pages. *Manuscript* is also well suited for work-group computing, offering a print-formatting feature that compares two drafts and marks changes right on the printed page. In addition, the program's graphics-based preview mode and ability to wedge graphics into documents put it in a class above the word-crunching rabble. Add support for equations, outlining, and column formatting, and the result is a word processor that should bring tears of joy to the eyes of technical writers.

Born to Outline

Manuscript differs most from other similar word processors in its powerful and pervasive outliner, known as the structured mode. You don't have to use the



John Hersey

outliner, but if you don't, you'll be missing out on the program's power. This mode provides the organizational framework for the long documents that are *Manuscript*'s strongest suit. Rather than simply arranging chapter titles or section names in outline form, structured mode ties those headings to their associated text.

You can create up to nine outline section levels and change level designations easily. As with *ThinkTank,* pressing <GrayPlus> expands the outline to show the underlying level, and pressing <GrayMinus> contracts the outline to hide the next level. The gray asterisk key toggles between expanding and contracting only the section you're working on. You can also press <Alt> with a number key to expand or contract the entire document (see Screens 1 and 2).

For the section tags that accompany each heading, you can choose decimal notation, Arabic numerals, uppercase and lowercase letters, uppercase and lowercase Roman numerals, no labels, or a combination of styles. When you move a section or change its level, the section tag changes accordingly. Whether or not it's visible, accompanying text moves along with the section (unfortunately, there's no marker to show whether a section contains hidden text). You can sort subsections alphabetically by placing the cursor on a section tag and choosing the sort function. Lotus has not added major innovations to the basic *ThinkTank*-style outliner, but *Manuscript*'s tight integration with text adds a truckload of value.

With Quill in Hand

Manuscript is not copy protected; all you need to do is copy the eight disks onto your hard disk and run a routine that creates (or modifies an existing) CONFIG .SYS file. You can choose from among several display boards, including the Hercules Graphics Card Plus with RamFont (see *From the Hardware Shelf, PCW,* February 1987). *Manuscript* also supports a full range of Epson, IBM, Diablo, NEC, and HP printers and even provides PostScript drivers for the Apple LaserWriter, although you can't insert PostScript commands directly into documents.

When you load the program, the Document Manager menu appears, offering the major program options along with adjuncts such as the spelling checker, the document comparison facility, and the setup routine. Selecting the edit option calls up prompts for a file name and the working directory; pressing <GrayPlus> produces a list of available documents. When you create a new file, a partial screen appears with fields for the template type, a brief document description, the author's name, and a revision number that advances each time the document is edited. This information can be

used later to automatically create headers and footers.

Manuscript's user interface reflects the program's parentage. Normally, a status line sits at the top of the program's full-screen work area showing the document name, section number, current character attributes, and editing mode. But press <F10> and—you guessed it—a *1-2-3*-like main menu appears in the status line's place.

Many of the main menu items call up other menus that provide access to a host of formatting, printing, windowing, and file management functions. Other function keys (or <Alt>-*function key* combinations) summon ancillary menus—for block moves, searching and replacing, and so on—that are separate from the main menu tree.

A number of the menu trees, especially those relating to formatting, end with data entry boxes called panels, which offer pop-up checklists and fields for entering related parameters such as justification and indentation.

A set of two-keystroke "accelerator" commands duplicates some of the more commonly used function-key commands. (Unfortunately, the program lacks a macro facility for defining custom key combinations.) For rarely used features, such as importing graphics and constructing equations, you embed backslash commands in data entry fields or directly in text. Backslash commands range from simple one-word commands to complex, multistatement programs for creating equations.

Block That Text

One striking difference between *Manuscript* and other word processors is the program's obsession with blocks of text. Technical manuscripts often have many formats; with the block approach you can shuffle these self-contained chunks without losing track of their formatting characteristics. Couple this with the program's structured mode, and you have an all-encompassing framework for handling gobs of text.

One striking difference between Manuscript *and other word processors is the program's obsession with blocks of text.*

On screen, blocks are separated by a solid line. You decide how much text to include in a single block, but you're encouraged to make the divisions by paragraph. Instead of pressing <Enter> after each paragraph, you press <Ctrl>-A to append a new block with the formatting of the previous block or <Ctrl>-O to add a block with global formatting. You don't have to work with blocks, but ignoring the block arrangement cuts you off from fully enjoying the program's flexibility.

For example, because *Manuscript* doesn't allow cursor movement by sentence or paragraph, navigating through a document is greatly expedited by block demarcation. The block approach enables you to zip to the beginning and end of blocks. For most cursor movement, *Manuscript* goes the conventional route, augmenting standard cursor keys with <Ctrl> and <Shift> combinations. Further flexibility emerges in structured mode: You can jump to the beginning of sections or subsections, as well as skip to the next or previous section at the same outline level.

By and large, *Manuscript* stumbles when it comes to deleting text. You get the basics, of course: <Del> erases the current character, <Backspace> deletes the previous one, and <Ctrl>-<Backspace> deletes the previous word. Yet there's no way to delete the word that the cursor is on without going into a multiple-keystroke, highlight-and-delete operation. Furthermore, you can't delete a line or delete from the cursor to the beginning or end of a line with a single command. Less surprising (but still disappointing) is the program's inability to delete sentences à la *Microsoft Word*.

Cut and Paste: Don't Cross the Line

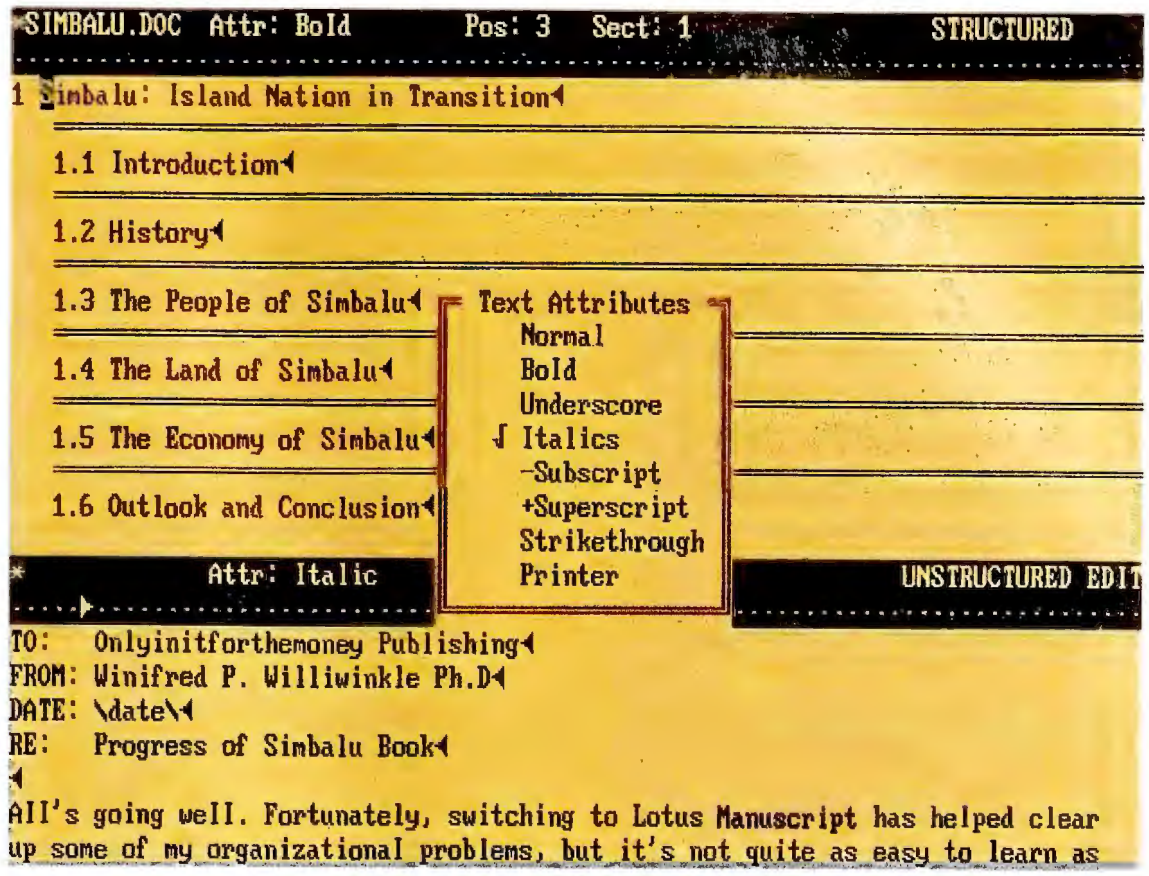
Manuscript's cut-and-paste commands offer both more and less flexibility than most other word processors. For both cut-and-paste and copy-and-paste operations you highlight text (by character, word, line, column, block, or section), load it into a memory buffer, and

paste it in a new location with a minimum of keystrokes or delay. The program also offers a move command that applies only to columns, blocks, and sections. The move command's primary application is for relocating and changing the level of sections in structured documents.

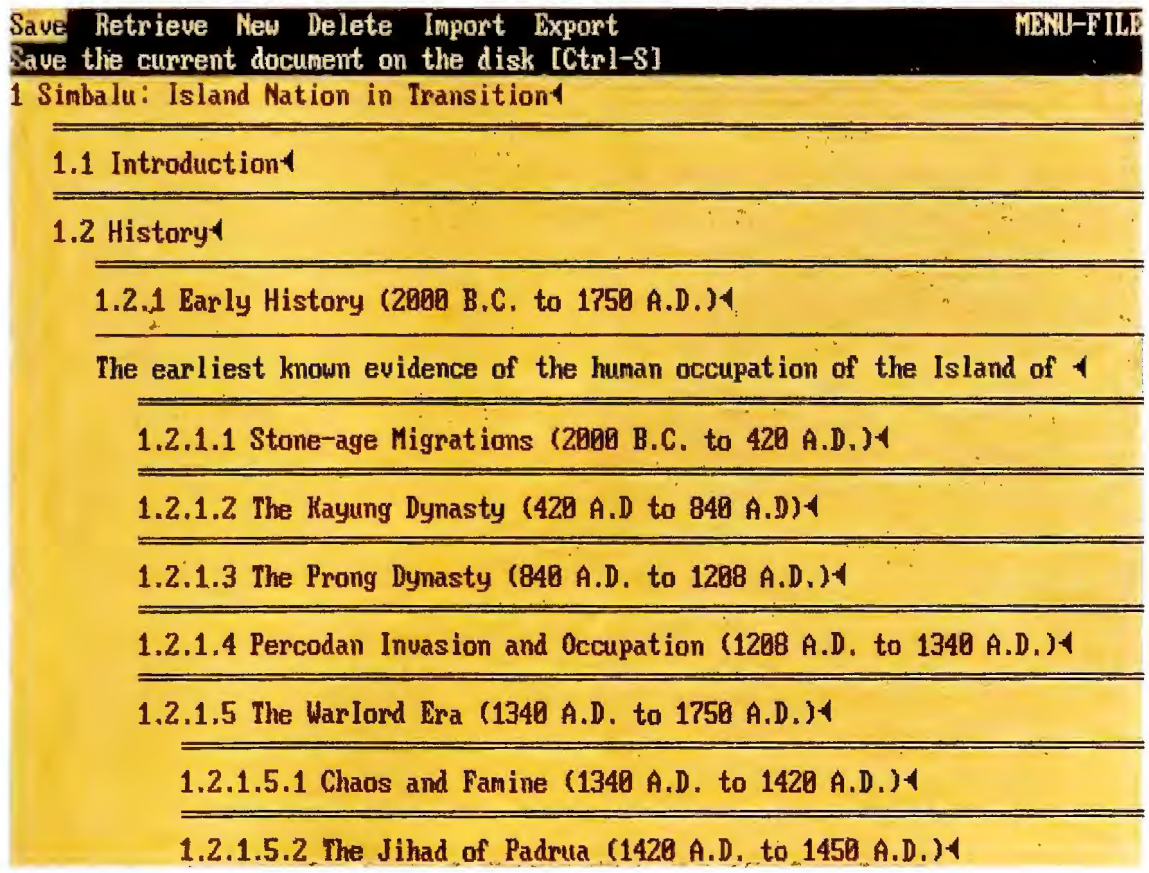
Both the move and cut-and-paste procedures work with *Manuscript*'s windowing routine, with which you can adjust the vertical size of the windows up to full screen. However, you're limited to two windows, and you can only split the screen horizontally.

The main problem with *Manuscript*'s cut-and-paste methodology is that you can't highlight text across more than one type of text unit. For instance, to cut a section of text that stretches from one block to a point halfway through the second block, you must first use the Join Block command to remove the barrier line. Similarly, if you're working in structured mode and want to delete a string of blocks stretching across two sections, you need the Join Section command. After the cut-and-paste process, you then have to go back and use the Split command to reestablish the section or block barriers.

Although it lacks a wild-card capability, *Manuscript*'s search-and-replace command set is more than adequate. You can search and replace backward and forward, globally or individually. Searches can be case sensitive, and you can instruct the program to find whole words only. More unusual is the ability to search and replace with sensitivity to print attributes. The



Screen 1: Manuscript's windowing feature lets you quickly move among tasks. With pop-up menus you can assign print attributes and other formatting commands. The outline in the top window represents a 250K document. The expand keys reveal the hidden levels shown in Screen 2.



Screen 2: An expanded version of the document in Screen 1. Selecting the file function from the main menu lets you choose from a number of file management options.

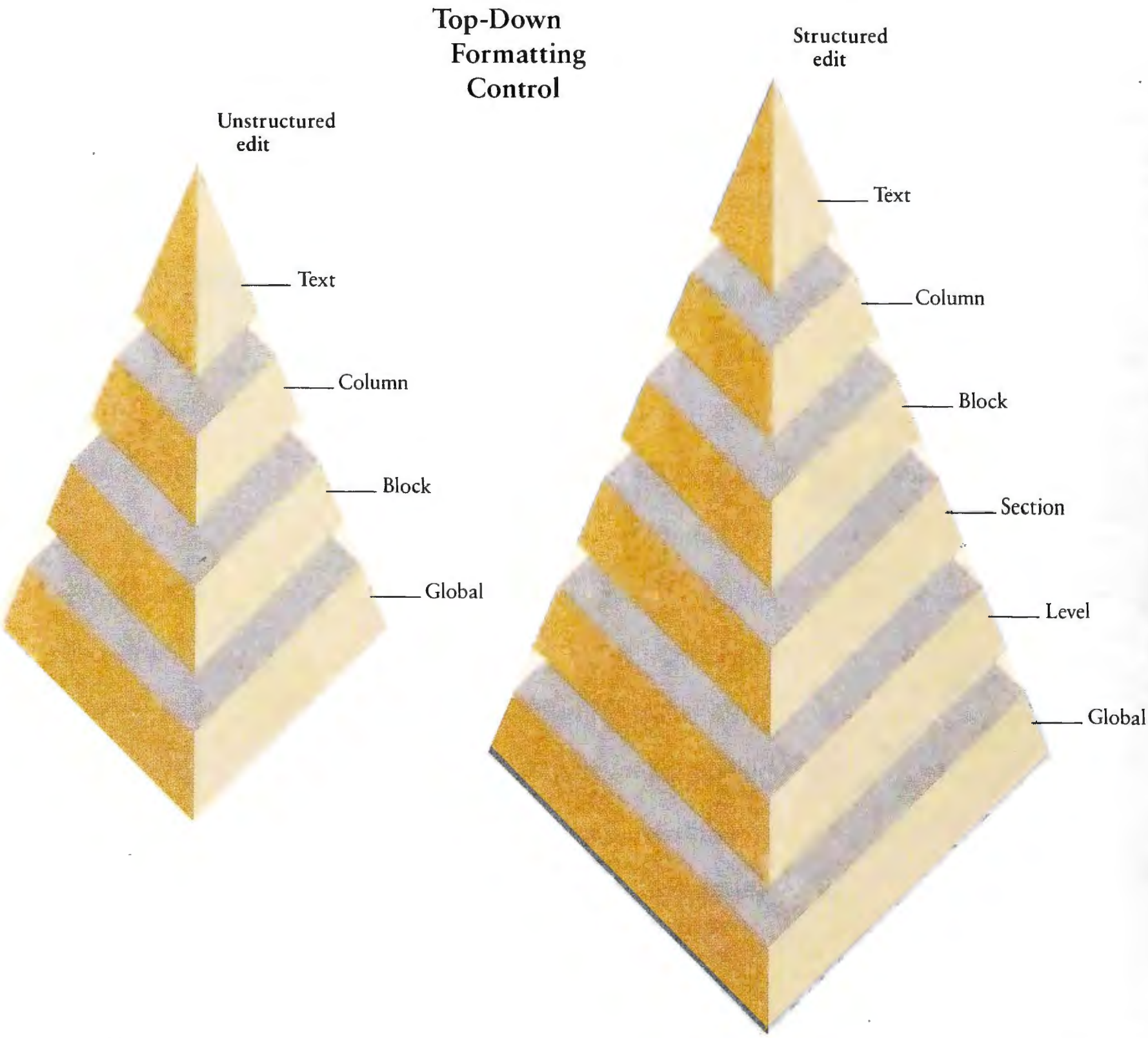
only major annoyance is that the program can't search in structured mode for hidden text unless you first expand the outline.

Formatting Frenzy

Formatting with *Manuscript* works according to a tightly structured hierarchy (see Figure 1). At the top of the pecking order is text formatting—that is, formatting the character attributes of text within blocks. At the other extreme lies *Manuscript*'s global formatting, which has documentwide effect but can be overridden by text formatting. Formatting by column or block also overrides the global format, but neither has an effect on existing text formatting.

Structured mode adds two new formatting classifications—section and level—which operate on the outline tiers of the same name. Different block formats within a section remain intact if you perform section formatting, while section formatting stays the same when you format a level.

Manuscript provides panels for formatting at every stage in the hierarchy. Normally, you deal first with the global panels, which enable you to control documentwide justification, margins, indentation, and so on. Especially welcome is a global typeface panel that enables you to assign fonts and point sizes to various textual entities. A checklist is provided for each font and point size, with the options depending on the printer you selected during installation. In addition, you can override the global



typeface by embedding font changes in the text.

In structured mode, the primary global panel leads off a series of level panels that appear in a three-dimensional card-file format (see Screen 3). Fields for levels are similar to those within the primary global panel, which includes numerous spacing options and a special section for specifying parameters for *headlines*—*Manuscript*'s term for the first block of a section.

A wide range of global and level options are available for controlling page breaks. Sophisticated widow and orphan control is built-in; paragraphs will not break unless two lines of text remain at the bottom of the page and three at the top. The program also refuses to break graphics files or tables. You can cause the program to automatically break a page after a specified section or level, but the inability to see page breaks on screen makes it difficult to design pages by eye.

A host of special global panels are provided for designing title pages and the first page of a document, and you can create different formats for odd and even pages. Options abound for laying out indexes and tables of contents; the latter can be created automatically from a structured edit outline. By embedding a special backslash command before the appropriate captions, you can also automatically create listings of figures and tables.

Manuscript enables you to save global format settings in a .SET file. As with *Microsoft Word* style sheets, you can reload this formatting file as a template to be used with other documents.

Formatting with section, block, column, and text panels—what *Manuscript* calls local formatting—is similar to working with global and level panels, only without the headline options. The major exception is the text format panel, a pop-up list of attributes that includes boldface, underscore, italics, strikethrough, subscripts, and superscripts. You even get three case options: upper, lower, and initial caps.

Manuscript gives special emphasis to block formatting. With just a few keystrokes, you can call up the primary block-formatting panel and change, say, the indents and typeface for a quotation. An abbreviated form of this panel lets you quickly change the most elemental settings without first having to highlight the block. Columns, which appear on screen

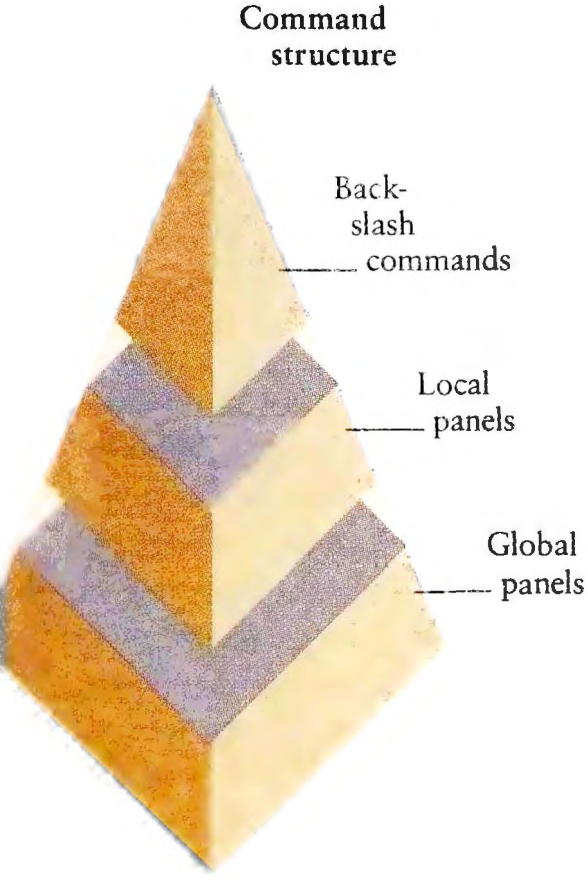


Figure 1: Sphinx-eye view of Manuscript's formatting hierarchy. Formatting commands at the top of the pyramid take precedence over those underneath.

Executive Summary

Lotus Manuscript

Word processing software

Manuscript is a fast, elegant, outline-based word processor designed for creating long reports and technical papers. This menu-driven program sports one of the best print formatters on the market and provides a unique compare function that marks editing changes between drafts. However, it lacks such features as macros, line and sentence deletion, and an undo command.

Block mark, move, and delete	*Fair*
Printing	*Excellent*
Formatting	*Excellent*
File management	*Good*
Overall value	*Good*

separated by vertical dotted lines, are defined as any vertical portion of a block and have their own formatting panel.

With more panels than a major congressional investigation, *Manuscript* clearly offers a greater number of formatting options than the average writer could use in a lifetime. Lotus provides some thoughtful conveniences—to reset any of the local format panels to global settings, for example, you merely call up the panel and press <Ctrl>-D—but there's no mistaking the complexity of this program.

House Specialties

As befits a technical word processor, *Manuscript*'s indexing and footnoting talents are first-rate. An indexing panel lets you enter the main heading, subheading, and the cross-reference text. When you print the index, *Manuscript* automatically consolidates all entries that have the same heading, alphabetizes the index (by main headings first), and appends page numbers. In structured mode, you can also create cross-references outside of the indexing process that refer to a particular section in the text.

Manuscript may have the best footnoting program on the market. You can create three types of notes: footnotes (bottom of the page), level notes (end of a level), and end notes (end of the document). After you embed a marker, yet another panel offers the program's complete set of formatting tools, not to mention modifiable default settings for superscript reference tags, separator bars, numbering schemes, and other variables. If markers are moved, their footnotes follow them and print at the bottom of the appropriate pages.

Although *Manuscript* can't pour text into a multicolumn newspaper format (except in index formatting), the program excels at formatting tabular material. You can set up column, gutter, margin, and level indents with either relative or absolute spacing. The default method, relative spacing, defines the width of each tabular column as a percentage of the total page area. If the page area changes, column spacing adjusts accordingly. You can also add, split, or move columns and add rows by copying existing ones. A special panel is devoted to borders, which can lend tables a professional, graphically appealing look.

As befits a technical word processor, Manuscript's *indexing and footnoting talents are first-rate.*

Creating equations is the most complicated program function. You use an equation backslash command followed by a formula composed of a complex command language of keywords, including function names, strings, operators, special characters, and symbols. A wide range of uppercase and lowercase Greek letters, relational and binary operators, pointers, and other symbols and characters are available. Still more formatting commands let you create such effects as vertical stacking and custom spacing.

File Conversion and Graphics

Manuscript provides an abundance of file conversion facilities. From the File menu you can import or export ASCII files, differentiating between standard ASCII characters and files that contain the IBM extended character set. From the opening Document Manager menu you can import or export DCA files and introduce *ThinkTank* documents.

Not surprisingly, Lotus reserves its most flexible conversion acrobatics for *1-2-3* and *Symphony* files. You can import named ranges and worksheets from *1-2-3* as well as SHEET and .DOC windows from *Symphony* in any of four different formats: tabular, column, document, and document image.

Manuscript can integrate several types of graphics files into a document, such as Lotus .PIC files and .IMG image files from Datacopy and Microtek scanners. The graphic won't appear on screen but can be printed or viewed using the preview function. The process involves some trial and error, but I haven't seen another word processing program that does it better.

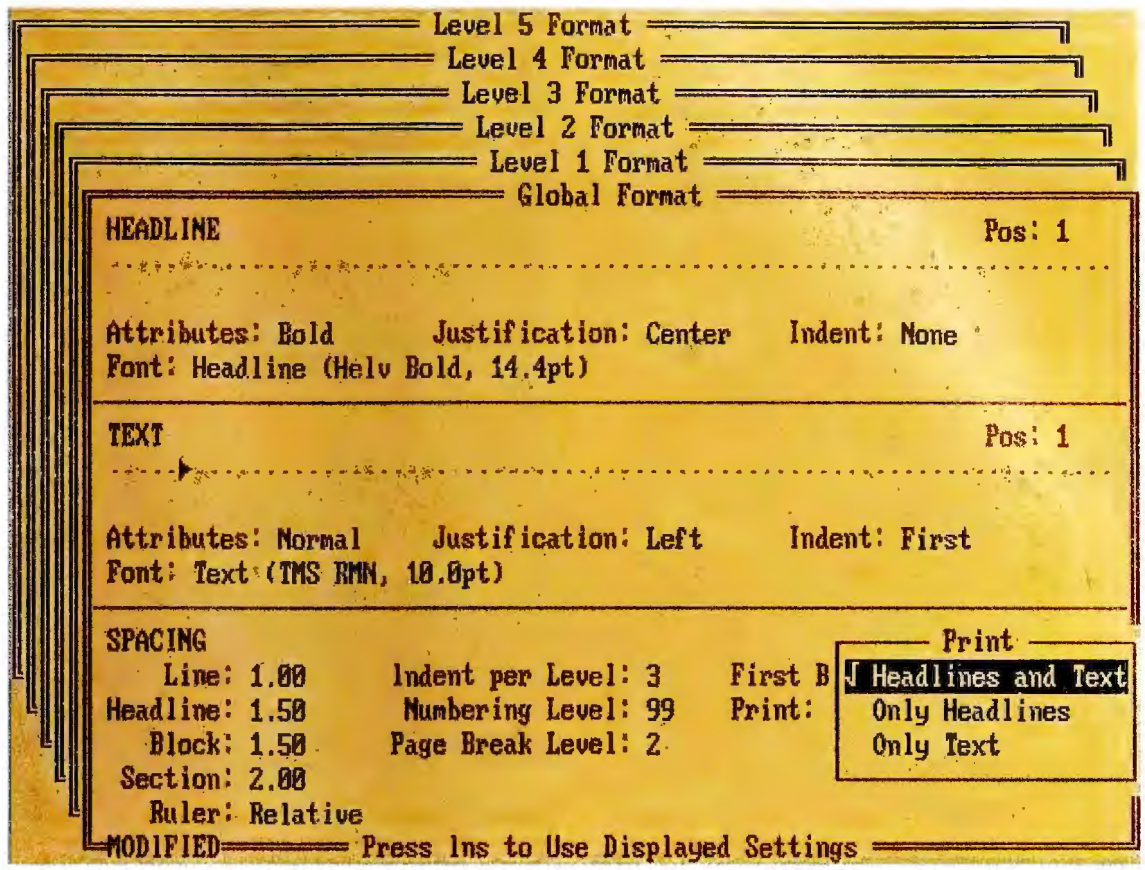
Sneak Previews and Apt Comparisons

In either of *Manuscript*'s edit modes, what you see is a far cry from what will print. All you behold are indentations, blocks and columns, and rules and borders. Print attributes are marked with underlining, inverse video, or color. However, if you have a graphics display, you can use the preview command to view your documents' line spacing, page breaks, equations, graphics, and font sizes and attributes.

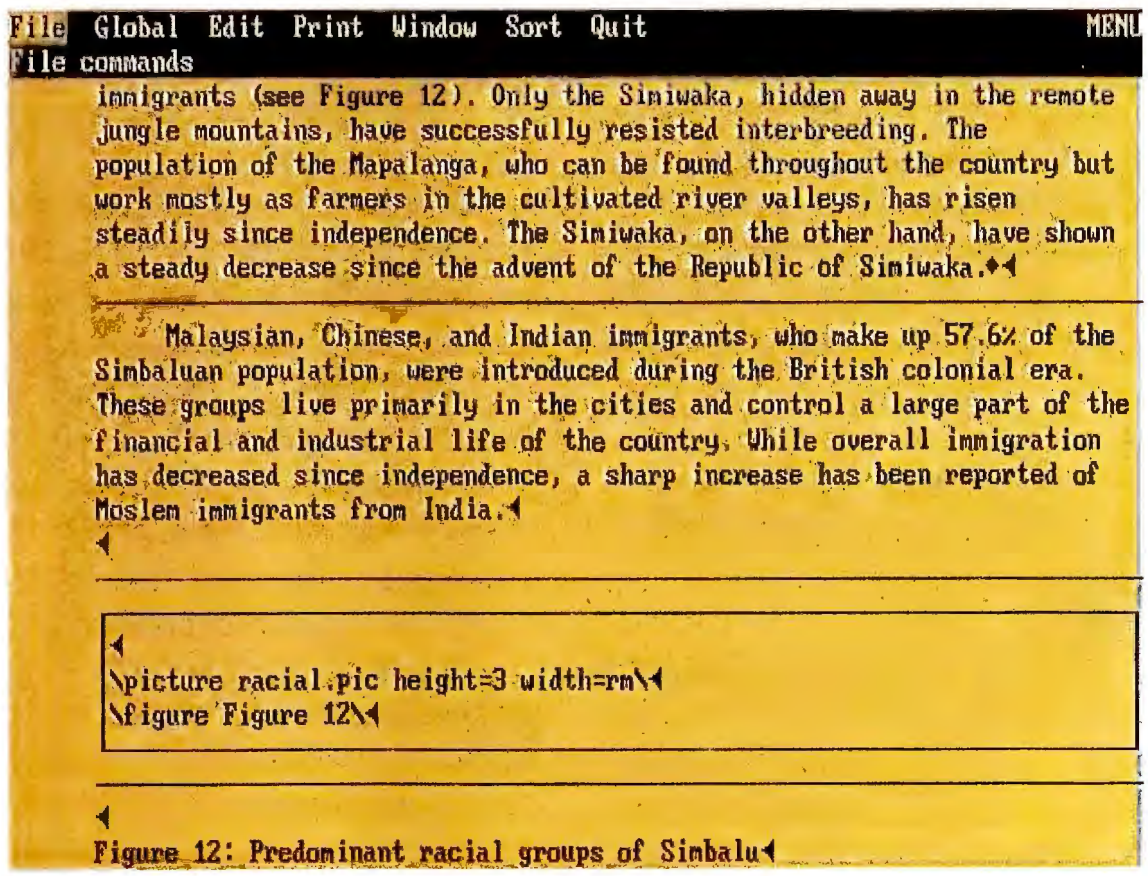
The preview screen has three sections: full-page display, magnifier window, and preview page panel (see Screens 4 and 5). You move the magnifier window around the page with the cursor keys. No fewer than nine levels of magnification are available, and you can switch between normal and inverse video. Although previewing requires loading a separate program, and converting files to graphics mode takes a while, this nod to desktop publishing can save a lot of time and paper.

Manuscript has a unique feature that compares two versions of an article and marks up a copy showing additions, deletions, and moves. This function is a godsend for companies that want to keep an audit trail for documents making the rounds among various writers, editors, and managers.

A bundle of text-marking options is available, including different markers (or character attributes) for various changes. You can also print deleted text, either delineated by markers or as strikethrough characters. If printing all the deleted text seems excessive,

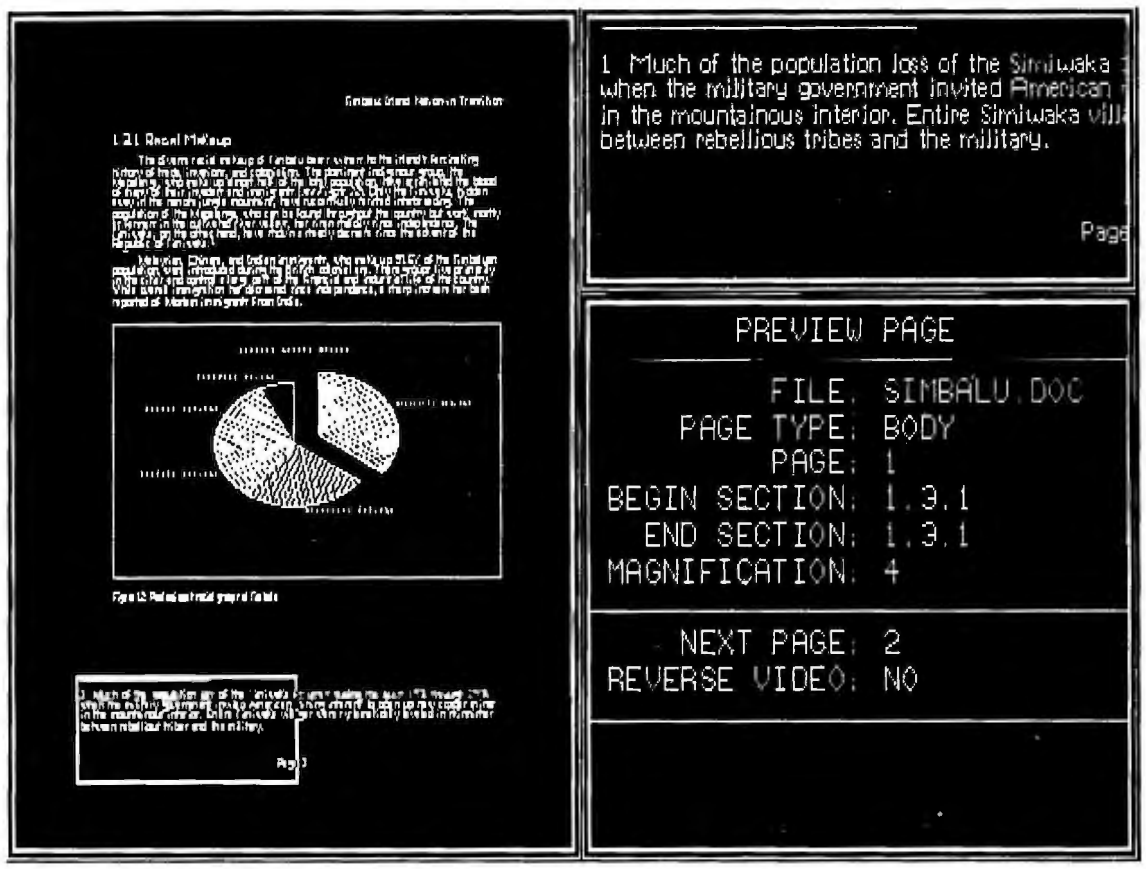


Screen 3: The primary global format panel anchors the formatting hierarchy for the entire document. You can override the options for descending levels of an outlined document by modifying the global level panels shown in the background.



Screen 4: This is what Screen 5 looks like before preview. You can easily integrate Lotus .PIC files into a document via the \picture command, but you can't see them on the editing screen.

you can choose a word limit; selecting a five-word limit prints out the first five words of deleted text, followed by an ellipsis and the last five words. Features like these are likely to win *Manuscript* an enthusiastic following in legal departments.



Screen 5: The page shown in Screen 4 as seen through the crystal ball of the preview function. The mobile box on the left page corresponds to the magnification box on the upper right.

The Wizard of Print Formatting

Many excellent word processors can perform pyrotechnics on screen only to turn into gibbering idiots when it comes to communicating with printers. Not so *Manuscript*. It takes firm control of the printer and doesn't let go until the job gets done right.

If you just want a fast copy, you can select the draft printing function, which prints straight text without the formatting. The next fastest print option, quick printing, displays formatting but uses the printer's lowest-quality fonts and lowest-density graphics.

Beyond the expedient route waits a wealth of options that can yield professional-looking material (see Figure 2). If your printer permits, *Manuscript* supports different paper sizes and can alternate paper from different bins. It takes full control of two-sided printing, prompting you through the process. You can also choose automatic hyphenation, although the program lacks an interactive hyphenation mode.

Manuscript's mail merge is a simple affair. Boilerplate text is set up as a table and requires no special formatting. This arrangement makes it easy to import *1-2-3* and *Symphony* data base files and put them to work as merge variables without modification. While *Manuscript*'s mail merge contains none of the conditional statements of programs such as *WordPerfect*, it gets the job done.

The most impressive aspect of the printing process is an error log that appears at the bottom of the screen during printing. A brief error report shows the location of snafus and displays the text in question. You can choose to print the error log, along with a document summary. Of all the program's features, the error log most resembles artificial intelligence techniques; it's invaluable in ferreting out formatting problems.

A Ponderous Proofer

Manuscript comes with an integrated version of the 90,000-word *Webster's New World Spelling Checker*, and you can also create your own custom dictionaries. Spelling checker options include accepting a word for the remainder of the session, entering a new word in a custom dictionary, or ignoring a word. You can also edit a word or let the program take a guess at possible spellings. Unfortunately, the program's guesswork is not very imaginative. It lists only four possibilities, and you can't scroll the dictionary to view other options.

Furthermore, proofing is slowed by numerous prompts. If an unrecognized word has an initial cap, the program asks you to confirm the punctuation. If you say yes, the program flags the next lowercase version of the word and attempts to correct it, even if it should remain lowercase.

More annoying is *Manuscript*'s fixation on abbreviations. If an unknown word ends with a period, the spelling checker asks if it's an abbreviation even when the word falls at the end of a sentence. And

when the program encountered the *th* in *19th century,* it blithely suggested that what I really meant was *Th.*, whether to signify *Thursday* or *thorium* I'm not sure.

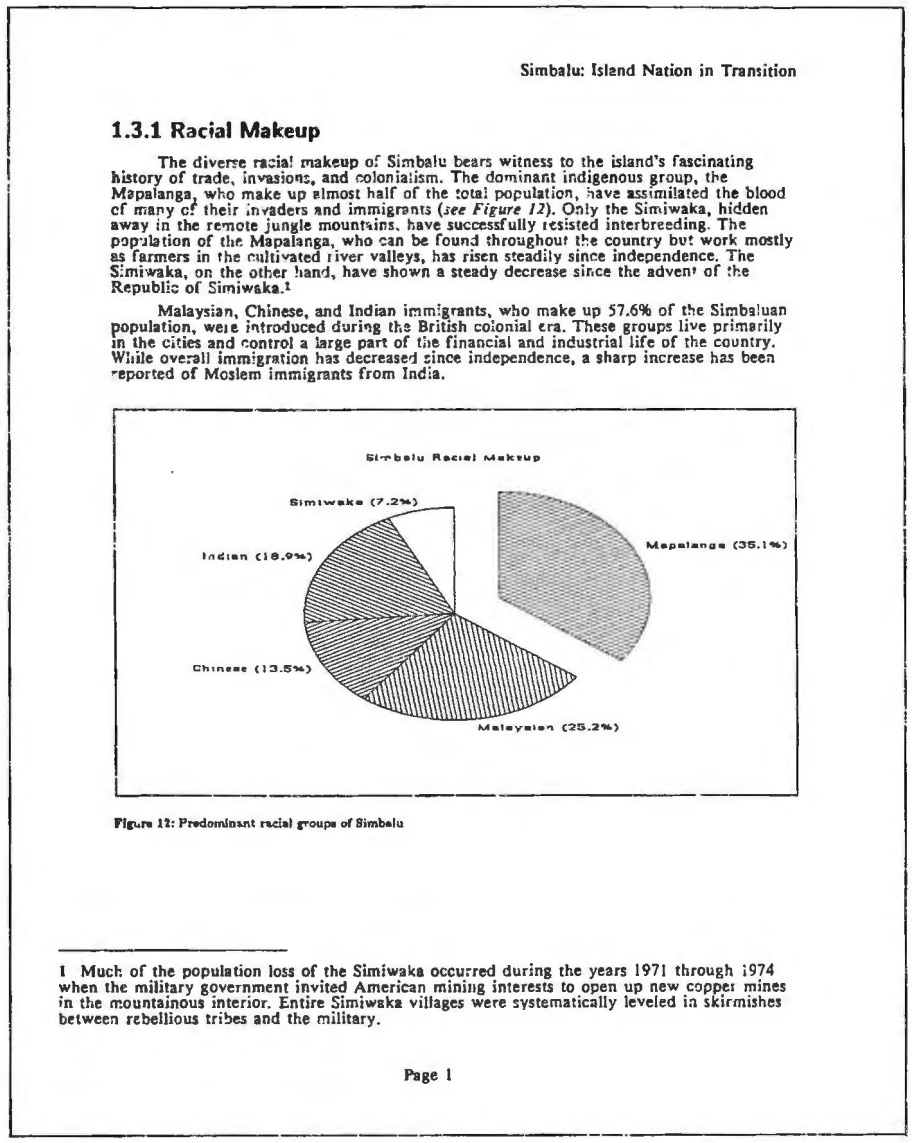
Pyramid Power

Manuscript's indexed manual is well illustrated and organized and does a good job of explaining some difficult concepts. The documentation includes a glossary, appendices, a quick reference card, keyboard templates, and a series of text tutorials. Lotus provides the usual 90-day limited warranty and a hot line for registered users. Within the program, context-sensitive help screens make pressing <F1> worth the effort. In total, Lotus provides the documentation and support you'd expect for a product this expensive and complex.

If you wish that you could more closely integrate outlining with your word processor to create long documents, *Manuscript* may be the word processor for you. On the other hand, if you rarely create long, complex documents, and the outlining process only seems to get in the way, keep looking.

All in all, *Manuscript* is an impressive program. Its formatting features are excellent, and its preview and compare subprograms open up new frontiers for word processing. *Manuscript* outshines *XyWrite III* in ease of use, surpasses *Microsoft Word* in speed and elegance, and outperforms *WordPerfect* in formatting aptitude. However, because of *Manuscript*'s lack of such common features as macros, a thesaurus, an undo command, and deletions by line, Lotus's premier word processor can't hold a candle to any of those programs in editing dexterity, perhaps the most important measure. Lotus will doubtless add editing features in future revisions, but how much it can add without pressing the 640K envelope is unknown.

For the complex documents, however, there's simply no other word processor in *Manuscript*'s league. If you're not willing to break old habits and accept *Manuscript*'s unique set of rules, you may be frustrated by this program. Yet, if you're willing to do a little rethinking, you'll be able to attack huge documents with confidence.



Simbalu: Island Nation in Transition

1.3.1 Racial Makeup

The diverse racial makeup of Simbalu bears witness to the island's fascinating history of trade, invasions, and colonialism. The dominant indigenous group, the Mapalanga, who make up almost half of the total population, have assimilated the blood of many of their invaders and immigrants (*see Figure 12*). Only the Simiwaka, hidden away in the remote jungle mountains, have successfully resisted interbreeding. The population of the Mapalanga, who can be found throughout the country but work mostly as farmers in the cultivated river valleys, has risen steadily since independence. The Simiwaka, on the other hand, have shown a steady decrease since the advent of the Republic of Simiwaka.[1]

Malaysian, Chinese, and Indian immigrants, who make up 57.6% of the Simbaluan population, were introduced during the British colonial era. These groups live primarily in the cities and control a large part of the financial and industrial life of the country. While overall immigration has decreased since independence, a sharp increase has been reported of Moslem immigrants from India.

Figure 12: Predominant racial groups of Simbalu

1 Much of the population loss of the Simiwaka occurred during the years 1971 through 1974 when the military government invited American mining interests to open up new copper mines in the mountainous interior. Entire Simiwaka villages were systematically leveled in skirmishes between rebellious tribes and the military.

Page 1

Figure 2: Produced with an HP LaserJet Plus, this final document showcases Manuscript's graphics and footnoting capabilities.

Eric Brown is a Contributing Editor for PC World.

Lotus Manuscript
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
617/577-8500
List price: $495
Requirements: 512K, hard disk, DOS 2.00 or later version

Teaching WordStar New Tricks

After years of procrastination, MicroPro has finally released a WordStar upgrade. Loyalists are largely rewarded, but will version 4.0 attract new converts?

William Rodarmor

Using *WordStar* is like reading Hemingway. We all did it when we were young, but nobody admits it today. Yet MicroPro's word processing program was once the best-selling piece of software on the planet, and the company wants to regain some of its former prominence. With the release of *WordStar Professional 4.0*, MicroPro brings an old program firmly back into the twentieth century. It may not attract many new users, but die-hard fans will love it.

WordStar 4.0 supports local area networks and laser printers, implements proportional spacing, and throws in *Word Finder*, a top-notch thesaurus developed by Microlytics. But it isn't a brand-new product. *WordStar 4.0* is essentially a repackaged version of *NewWord*, one of the more capable *WordStar* clones.

Version 4.0 incorporates most of *NewWord*'s best features (see *From the Software Shelf*, *PCW*, April 1986) while retaining *WordStar*'s familiar interface, dot commands, and keyboard command sequences. It may not catapult the company back to the top of the word processing heap, but no matter: Version 4.0 is aimed at the army of established *WordStar* users.

The problem, of course, is that there are some ten bootleg copies of *WordStar* for every legitimate copy in use. How could MicroPro bring those millions of shadowy users in from the cold and persuade them to buy *WordStar 4.0*?

With some fanfare, MicroPro announced a "limited amnesty": Any user with $89 and a *WordStar* serial number could get version 4.0, no questions asked.

In practice, it wasn't that simple. *PC World* heard that people calling MicroPro for upgrades were being grilled about their ownership of the program.

A day later, MicroPro spokesman Lee Lensky admitted that the company waffled on the policy because it was afraid that people with copies would get upgrades before the original registered owners. But MicroPro president Leon Williams says the original policy is unchanged. "If you have a valid registration number," he said, "that's all you need to get the upgrade." Did valid mean that you had to be the registered owner? "No, it doesn't," said Williams. "We will not check to see if you are registered."

Old Dog, New Tricks

Some long-time *WordStar* users feel MicroPro has been unresponsive to their gripes, but the company started soliciting suggestions on how to improve *WordStar 3.3* as early as 1985. It got an earful.

Better performance headed the wish list, of course, followed by requests for information on customizing and patching and calls for go to page, undelete, and transpose commands. To its credit, MicroPro took the demands to heart. Version 4.0 has all of the above and can also generate indexes, perform 14 math functions, and execute user-written macros (see Table 1).

Those raised on classic *WordStar* will find that version 4.0 looks, feels, and operates much like its predecessor. Although a handful of familiar commands perform new functions (such as <Ctrl>-K F, which now temporarily puts you in DOS instead of displaying the directory), *WordStar* veterans shouldn't have difficulty adapting.

The first notable changes you'll encounter are on the main menu, and they are mostly for the better. File size is now displayed, and you can open a file by pressing D and using the cursor keys to point to the file name. You can also "filter" the file display by using the DOS wild-card characters * and ?.

Building on the Past

WordStar was always aimed at secretaries, writers, programmers, and other power typists. Version 4.0 continues that tradition but also reflects its more forgiving *NewWord* origins. If you misspell a file name while at help level 2 or 3, for example, version 4.0 asks if you want to create a new file instead of automatically creating one you didn't really want.

WordStar 4.0 also adopts *NewWord*'s handy unerase command (<Ctrl>-U), which restores text deleted with word-, line-, or block-delete commands as well as the new command <Ctrl>-Q T (which deletes to a specified character). You can also use <Ctrl>-U to quickly cut and paste (or copy) text to new locales in a document.

Although *WordStar 4.0* recognizes that to err is human, it doesn't forgive as divinely as it might. The unerase command repeals only the last erasure; unlike *WordPerfect*'s equivalent, for example, it won't stack several deletions in a buffer in case you change your mind.

Moreover, unerase lacks one critical capacity: It can't restore a file erased via the main menu or resurrect an edited file when you absentmindedly answer yes to the prompt following <Ctrl>-K Q. Older versions of *WordStar* patched with a new utility called *StarFixer* can do both (see the sidebar "Do-It-Yourself Upgrade Kit").

The program's ability to display bold and underlined text on screen will at last eliminate printing errors due to unmatched <Ctrl>-P

Table 1: WordStar 4.0, WordStar 3.31q, Word Perfect 4.2, and Microsoft Word 3.1 compared

	WordStar 4.0	WordStar 3.31q	WordPerfect 4.2	Microsoft Word 3.1
Memory required	256K	128K	256K	256K
User-defined function keys	40	10	none	none
Subdirectory support	●		●	●
Mouse support				●
Macros	●		●	
Edit several files at once			●	●
Multiple windows			2	8
Go To Page command	●		●	●
Delete to designated character	●		●	
Delete by sentence and paragraph	●		●	●
Unerase	●		●	●
Automatic paragraph reform			●	●
Case conversion	●		●	
Automatic footnoting			●	●
Math functions	14		5	5
Sorting			●	●
Lines per header/footer	3	1	unlimited	unlimited
Boldface and underlining displayed	●			●
Draw lines and boxes	●		●	
Outliner			●	●
Thesaurus	●		●	●
Spelling checker	●	[1]	●	●
Proportional spacing	●		●	●
Style sheets				●
Save margins and tabs with document	●		●	●
Multiple formats in documents	●		●	●
Save and automatically return to cursor position			●	●
Save and print immediately	●		●	
Print multiple copies	●		●	●
Create ASCII file	●		●	●

[1] extra cost

B and <Ctrl>-P S print commands (see Screen 1). Those who want more—italics or half-height capitals—will have to turn to a graphics-oriented program like *Microsoft Word*.

Moving Right Along

WordStar 4.0 also packs a number of time-saving features. It can copy and erase files by using wild cards, which makes wiping out unneeded .BAK files a snap. (In fact, you can now look at a .BAK file in read-only mode without having to rename it.) Need to step out to DOS and format a disk? Type <Ctrl>-K F and perform the task; when you're done, press any key and you return automatically to your place in the document. Another speedup: <Ctrl>-<PrtSc> saves a document and zips you directly to the Print menu.

Best of all, *WordStar 4.0*'s new Shorthand function supports the creation of up to 36 macros that can hold both text and commands. Macros are listed on the Shorthand menu and played back by typing the appropriate letter or number. Maximum macro length is 50 characters, but file-handling commands can help exceed the length limit. If a standard closing paragraph for a letter exceeds 50 characters, for example, you can write a macro that imports a file holding the appropriate text.

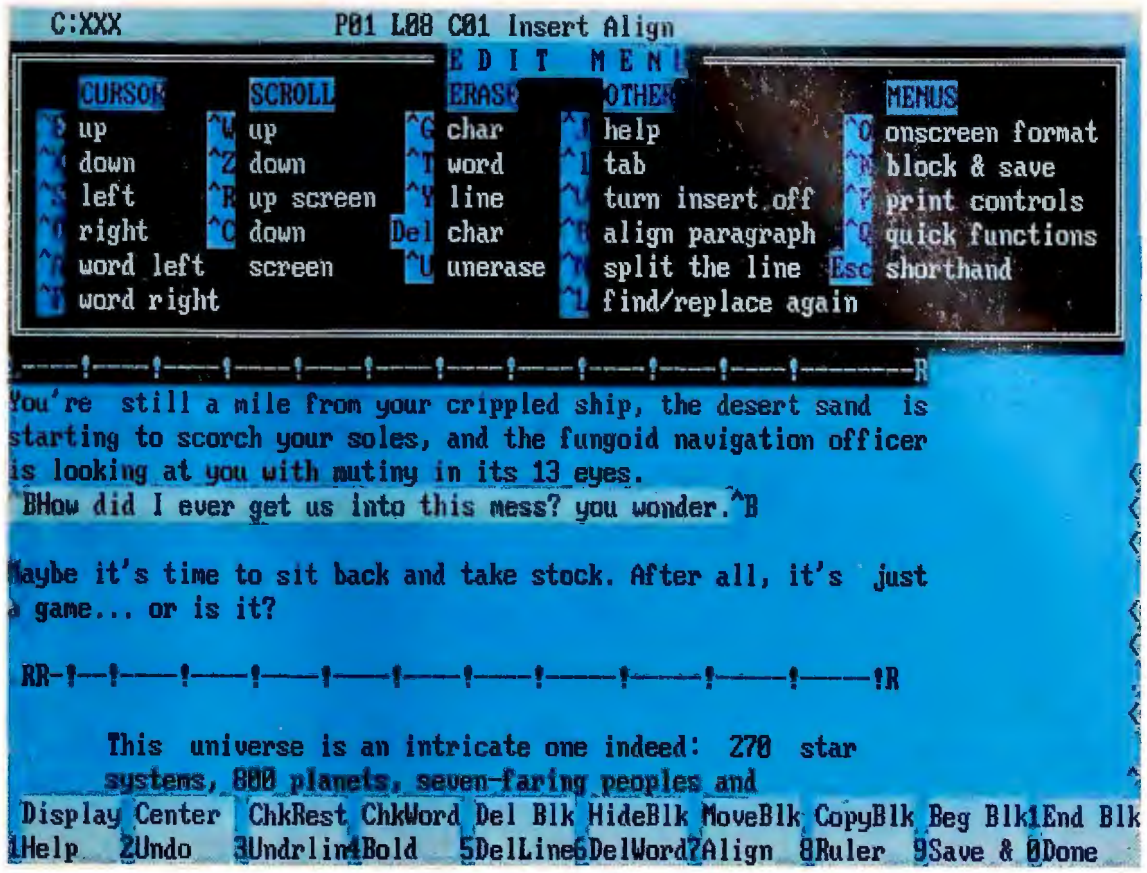
Unlike a full-fledged macro processor, *WordStar 4.0* lacks a "learn" mode and thus can't transcribe keystrokes as you perform an operation. Writing macros

from scratch is a nuisance; the Shorthand menu prompts are terse, and if you make a mistake, you have to start over.

But once created, macros can be surprisingly powerful. To underline boldfaced portions of a document, for example, you could write a macro to search a file and add paired <Ctrl>-P S's to each set of paired <Ctrl>-P B's.

Other minor changes: MicroPro is offering a special LAN version of *WordStar 4.0,* but claims that its basic release will support networking in rudimentary fashion with a simple file-locking mechanism. If one user opens a file and a second user tries to access it, for example, the second person will be warned that the file is in use and will be prevented from editing it until the first user is done.

Version 4.0 also has new tasks for some of *WordStar*'s venerable dot commands. You can now produce headers and footers with up to three lines. Ruler lines embedded with .RR are now saved with the document. And a handy, long-overdue feature shows up at printout time: At last, .CW will set character width on a dot matrix printer.



Screen 1: In customizing WordStar 4.0 with WSCHANGE, you can paint the screen with an array of colors. Boldfaced or underlined text gets special treatment. Another change from version 3.3: Ruler lines are now saved with the document.

Doing It the Hard Way

To some people, saying that version 4.0 is better than version 3.3 may seem like damning with faint praise. Some of version 4.0's new features and improvements are so awkward to execute that you wonder why MicroPro bothered.

For instance, version 4.0 converts lowercase letters to uppercase (or vice versa), but only after you enter a knuckle-busting command sequence. The <Ctrl>-K " sequence will uppercase text after you mark a block, but you must carefully release the <Ctrl> key after the K and before the ". Programs like *PC-Write* can do the same thing with a single keystroke. And although *WordStar 4.0* can now transpose words, it has the distracting habit of flashing the Shorthand menu on and off in the process.

Telecommunicators, who love to hate *WordStar,* may feel version 4.0 is a good-news/bad-news joke. The notorious "high bit" hasn't been mustered out, but it can now be removed by printing a file to disk and typing 'ASCII' at the Name of Printer prompt. Hard carriage returns littering a received file can be stripped out, but it takes a typical *WordStar* jury-rig to do it.

Team <Ctrl>-Q Q with version 4.0's new <Ctrl>-6 command, which turns hard carriage returns into soft ones, and the program will race through a file, snipping off the hard return at the end of each line. Before you start this operation, though, mark the double returns between paragraphs with a unique character, since those returns will be stripped out as well. Later you can restore the end-of-paragraph returns. It works, but it's work.

Do-It-Yourself Upgrade Kit

From the day *WordStar* first appeared, tweaking the program has been a major cottage industry. Frustrated users have patched the program code with DEBUG, traded fixes like baseball cards, and resorted to RAM disks to boost *WordStar*'s sluggish performance.

This do-it-yourself mania reached its zenith three years ago when "Ward Starr" and "Mel Murch" wrote *UnderGround WordStar,* a handy assortment of tips, tricks, patches, and plugs. The book sold thousands of copies, and its authors—computer writers and *WordStar* masters Stephen Manes and Paul Somerson—became cult heroes.

Now Manes and Somerson have gone themselves one better by not only publishing an expanded *UnderGround WordStar,* but also including a utility disk called *StarFixer* that does the patching for you. Your copy of *WordStar* will literally never be the same.

StarFixer can customize *WordStar*'s function key assignments, messages, and other defaults and push its speed to the limit. It can also eliminate those tedious opening screen messages. *StarFixer* will convert files from *WordStar* to ASCII format (and vice versa) for telecommunications. And before you unwittingly print out 20 pages of underlined or boldfaced text, *StarFixer* will even scan a document for unpaired print control characters and supply a rough word count to boot.

Best of all, *StarFixer* will do what no version of *WordStar* can: retrieve files that you accidentally delete.

Other niceties: a 43-line display on an EGA-equipped system, a template for linking files with *MailMerge* at print time, and a batch file for programmers that loads *WordStar* in nondocument mode and disables the paragraph reform command. And *StarFixer* works with virtually every *WordStar* release except 4.0.

In fact, the only thing wrong with *StarFixer* is its timing, since *StarFixer* corrects many of the persistent problems that *WordStar 4.0* specifically addresses. Although the book and disk are a great bargain at $29.95, MicroPro's $89 upgrade is going to give them a run for the money.

So what's a buyer to do? With *WordStar* version 4.0, you get a whole new package; with *StarFixer,* you burnish your beloved (and probably much-patched) program. No new commands to learn, no training the temps.

If nothing else, the *WordStar* faithful have two options instead of none. They can buy the company line—or stick with the upstarts and sculpt their shopworn releases to their liking. It's about time they got a choice. —*W. R.*

UnderGround WordStar and StarFixer
Hard/Soft Press
P.O. Box 1277
Riverdale, NY 10471
212/601-4763
List price: $29.95 plus $2 postage
Requirements: 256K, one disk drive, DOS 2.00 or later version
Not copy protected

Up and Running

Installing and customizing *WordStar 4.0* falls to WINSTALL and WSCHANGE, respectively. WSCHANGE enables you to alter defaults for function key assignments and labels, installed paths, margins, and printing, as well as create a smaller WSPRINT.OVR file to save disk space on a two-floppy setup. You can also use WSCHANGE to shorten the program's screen delays, but you will have to dig through the menus to find the fixes, which are hidden in the Miscellaneous section of the Other Features menu.

To gauge *WordStar 4.0*'s performance, *PC World* installed the program and *WordStar* version 3.31 in separate subdirectories on a 20MB 8-MHz AT clone. We then tested the programs with a 150K document file. The new kid was twice as fast as *WordStar 3.3* at most of the assigned chores: moving from the beginning to the end of the document (8.8 seconds versus 18.8); vaulting back to the beginning (no difference); reformatting the document (2:22 minutes versus 3:55); and saving it to the hard disk (9 seconds versus 20.5). *WordStar 4.0* held its lead even after we shortened version 3.3's screen delays with a DEBUG patch.

Printer's Progress

Supporting the universe of printers is something no word processing vendor relishes, and MicroPro has long been castigated for keeping *WordStar* rooted in the past. This time the company is making an effort to catch up.

At press time, *WordStar 4.0* supported 66 printers, and MicroPro expects eventually to support the 270 printers currently supported by *WordStar 2000*. Version 4.0 can take advantage of the HP LaserJet in portrait and landscape modes and can use proportional fonts found on the HP's B, F, Y, and U cartridges. The program also works with the Canon LBP8, Corona LLP-3000, and Ricoh LP 4080 laser printers.

Unlike earlier versions, *WordStar 4.0* also supports proportional spacing. The feature is called up by inserting paired .PS commands in the text. Although the results aren't displayed on screen, when it's time to put words to paper, the program references the appropriate character-width table tied to the installed printer's driver. You can also use the function with multiple-column formats.

Picks and Pans

Version 4.0 represents tremendous progress over earlier releases, but remember: This is still *WordStar*, and either you like it or you don't. Features common in comparably priced word processors—style sheets, windowing, built-in outliners, automatic on-screen formatting, and context-sensitive help—are absent.

But carping about *WordStar 4.0*'s imperfections is almost beside the point. Users have waited so long for a *WordStar* upgrade that it doesn't matter if it's good—it just has to show up. A month before *WordStar 4.0* was due to ship, MicroPro was fielding as many as 875 inquiries a day about the new release.

WordStar 4.0 may not be in the same league as *Microsoft Word* and *WordPerfect*, but there are those who love it. To *WordStar*'s loyal fans, version 4.0 will be a pleasure.

William Rodarmor is an Associate Editor for PC World.

WordStar Professional 4.0
MicroPro Int'l Corp.
33 San Pablo Ave.
San Rafael, CA 94903
415/499-7676
List price: $495, upgrades $89 plus $5 shipping; file server version $595, nodes $150 each
Requirements: 256K (320K with Word Finder), two disk drives, DOS 2.00 or later version
Not copy protected

Executive Summary

WordStar Professional 4.0

Word processing software

In its first major *WordStar* upgrade in years, MicroPro has added support for hard disks, LANs, and laser printers. Version 4.0 now includes unerase and go to page commands, macro capability, and an on-line thesaurus. Version 4.0 still lacks automatic paragraph reformatting, outlining, and an easy way to retrieve deleted files, but it's a real improvement over earlier releases.

Block mark, move, and delete	*Excellent*
Spelling checker	*Good*
Printer control	*Good*
File management	*Excellent*
Overall value	*Good*

Simply Integrated

Electric Desk and pfs:first choice provide handy one-stop solutions for people with light-duty word processing, data management, spreadsheet, and telecommunications needs.

Dennis Dykstra

In an age of increasing specialization, can PC users find happiness with integrated software packages? On the face of it, the answer is yes. Thousands have made the rather heavy investment in sophisticated integrated programs such as *Symphony, Framework,* and the *Smart System.*

It's also true that many who purchased those products expected a simple, all-in-one prescription for their computing needs and instead found themselves overwhelmed by complexity. With these users in mind, software producers are developing integrated packages that focus on the entry level. By limiting the number of commands and making many keystrokes common to all application modules—and by putting a lid on the price—those vendors are making an effective appeal to the low-end market.

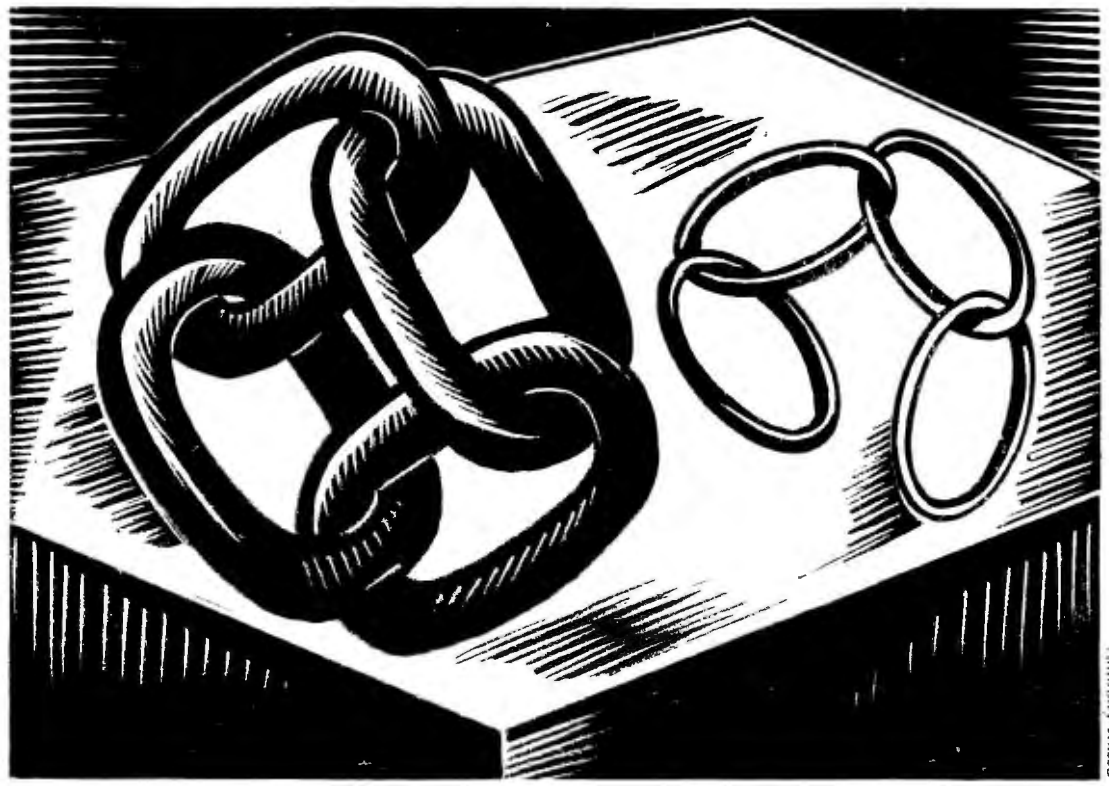
Two of the more successful integrated programs in this class are Alpha Software's *Electric Desk* and Software Publishing's *pfs:first choice.* Both packages offer the same assortment of applications: a word processor, a data management program, a spreadsheet (without built-in graphics), and a telecommunications program. *Electric Desk* was introduced almost three years ago and continues to sustain a strong sales record (see "Electric Desk," *PCW,* Vol. 2, No. 10). *first choice* is a recent entrant and runaway bestseller that uses many of the same conventions established by the popular *pfs* series.

Those who need truly advanced features—or gargantuan spreadsheets with macros—should look at higher-end products. But if your spreadsheet needs go no further than functions such as net present value or simple interest calculations, and if your data management and word processing requirements are fairly basic, either product will do the job. Generally, *first choice* makes ease of use its highest priority, while *Electric Desk* forsakes a dollop or two of congeniality for more features and the option to drive the program with user-defined macros. For easy reference, Table 1 provides a detailed comparison of the features offered by both products.

Entering Entry Level

Neither *Electric Desk* nor *first choice* is copy protected, and both install their program files on a hard disk automatically. *first choice* is the easier of the two to configure, offering a menu-driven routine for selecting printers and modems. *Electric Desk* requires that you enter a new driver name when you switch printers and supports auto-dialing and automatic log-on only for Hayes Smartmodems.

Each of the programs requires a minimum of 256K RAM. *Electric*



Anthony Russo

Desk also comes in a so-called large-memory version that can hold more data files in RAM and requires at least 384K. The program occupies three floppy disks, plus two more if you buy the optional spelling checker and thesaurus. *first choice* is slightly less imposing with only two floppies.

Novices are likely to find *first choice*'s pulldown menus more inviting than *Electric Desk*'s *1-2-3*-like command line (see Screens 1 and 2). On the other hand, as users become more experienced, they will appreciate *Electric Desk*'s macro system, which enables you to define your own <Alt>-*key* combinations and avoid menus altogether. It generally takes longer to access commands with *first choice,* although a few specially defined quick keys are offered. As with most Software Publishing products, you have to select an item number from a menu or move the cursor to a selection and press <Enter> to take an action.

One of the main differences between *Electric Desk* and *first choice* is their level of integration. *first choice* assumes you will work on one task at a time, while *Electric Desk* enables you to open several processes simultaneously. You can keep a report, a downloaded file, a data base, and a spreadsheet in memory at the same time (assuming you have enough RAM) and use a hot key to switch quickly from one to another. Though less elegant, *first choice*'s "bookmark" option automatically returns you to where you left off in a file after you reload a given module.

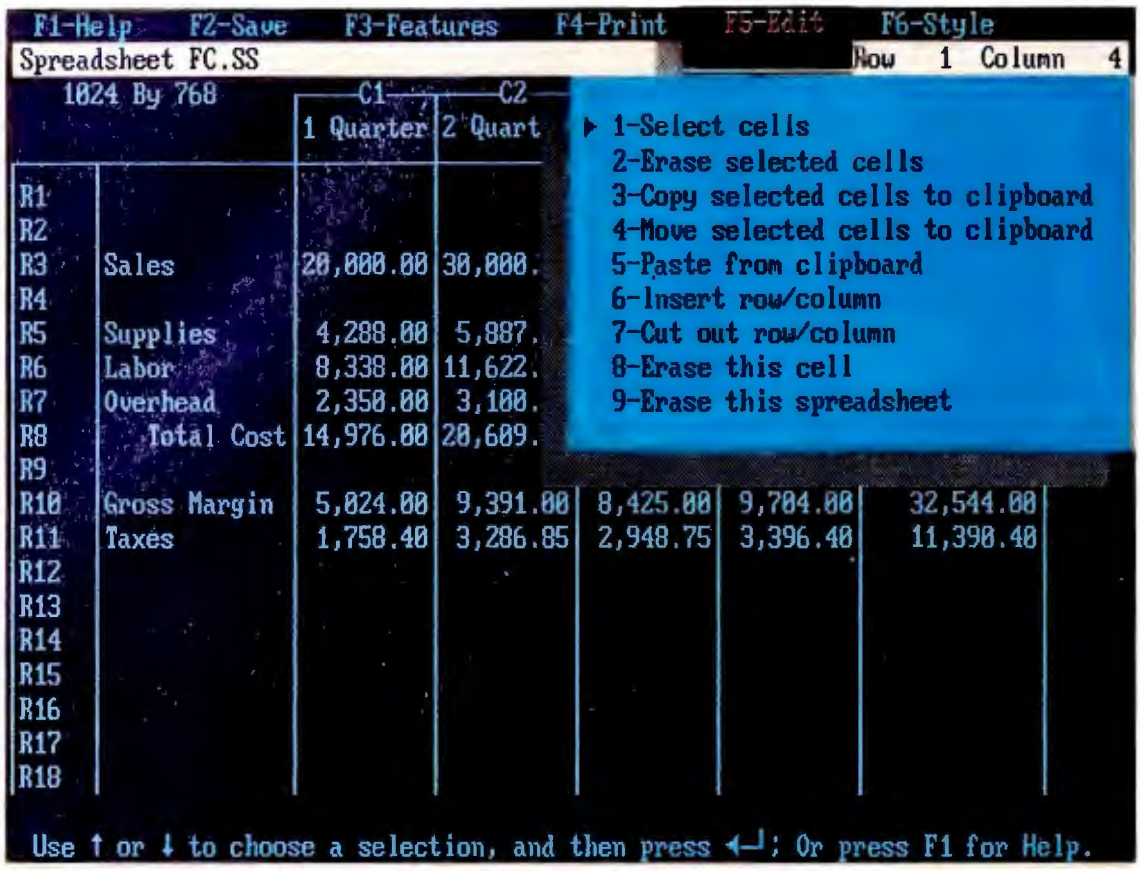
Where Words Collide

Both *Electric Desk* and *first choice* offer a reasonably complete set of word processing capabilities, and *Electric Desk* even provides some advanced extras. The main difference between these two programs and stand-alone word processors is restricted maximum document length—64K for *Electric Desk* and 60K for *first choice.*

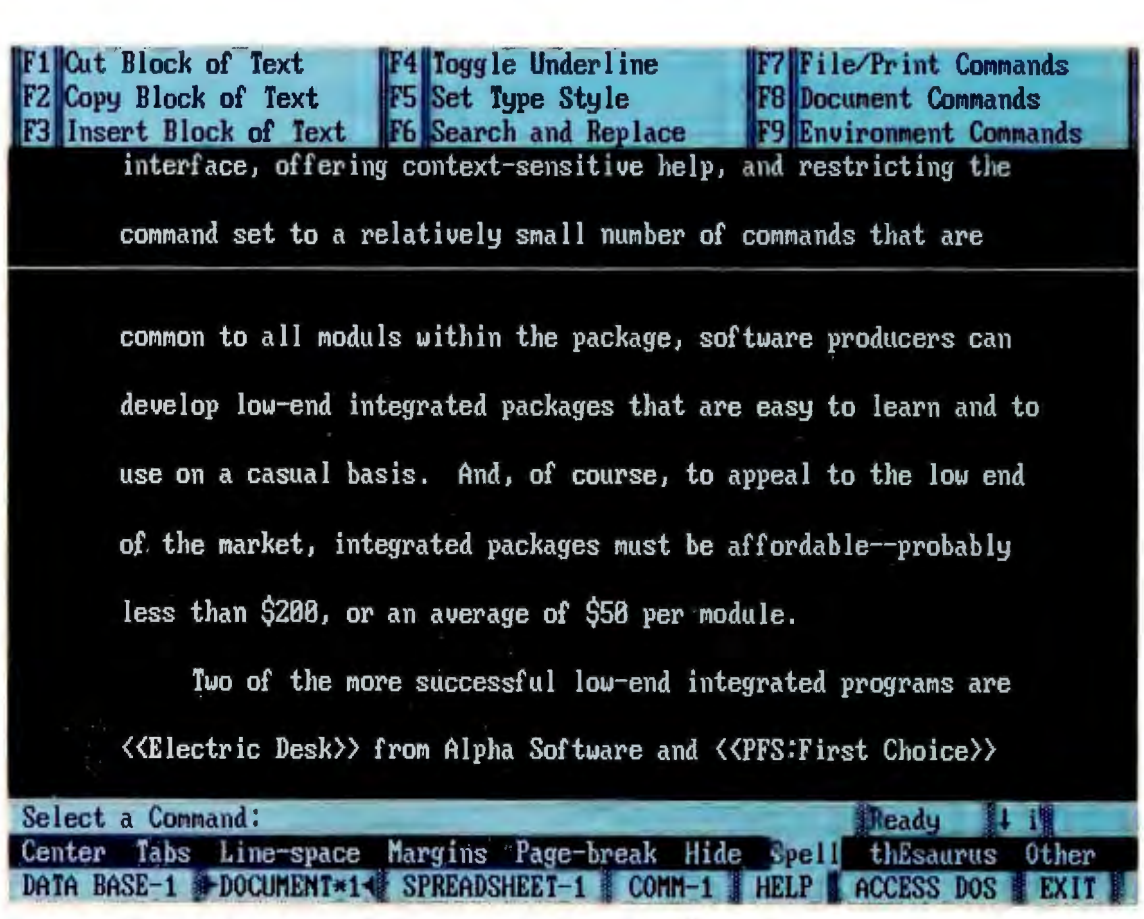
first choice uses a standard set of cursor-movement commands, which rely mainly on the <Ctrl> key plus the cursor keys for rapid transit. By comparison, *Electric Desk* is idiosyncratic, offering <End>-<CursorRight> for moving word by word, <End>-<End>-<CursorRight> to go to the end of a line, and <End>-<End>-<PgDn> to land at the end of a document. *Electric Desk*'s extra keystrokes and odd key designations may daunt those users who have experience with other programs.

The search and replace functions of both packages are nominal, although *Electric Desk*'s case-sensitive searches and ability to search for a specified number of occurrences add a bit more sophistication. *Electric Desk* also tops its rival by offering two editing features unusual in any word processor: letter transposition and capitalization or conversion to lowercase of highlighted text with a single command.

For formatting and printing, both word processors provide a standard array of on-screen amenities. Page margins and page breaks are displayed, and underlining, boldface, italics, subscripts, and superscripts are highlighted. In *first choice,* headers and footers appear on screen, with optional



Screen 1: The pfs:first choice spreadsheet, complete with pulldown menu, illustrates Software Publishing's predilection for ease of use and attractive screen design.



Screen 2: At the top of the screen for the Electric Desk word processor is the ever-present list of function keys, whose assignations change from module to module. Note the 1-2-3-like command line near the bottom of the screen.

automatically generated page numbers. Neither program, however, displays right-justified text.

Although *Electric Desk*'s spelling checker costs an extra $59, its dictionary is bigger than *first choice*'s, with 100,000 words as opposed to 75,000. Both spelling checkers present you with likely corrections and enable you to create auxiliary personal dictionaries. *Electric Desk* provides a thesaurus with the spelling checker, but it gives synonyms only for basic forms of words.

With abundant prompts and menus, plus an undo command for deletions, *first choice*'s word processor is both easier and safer to use than *Electric Desk*'s. However, *Electric Desk* provides options that you'd expect to find only in high-end word processors, such as automatic date insertion and background printing (see Table 1). If word processing is a major part of your work and you need specialized formatting, then *Electric Desk* is the package of choice. *first choice* is better suited to letters, simple reports, and memos.

Field Work

Although *Electric Desk* and *first choice* don't pretend to deliver the power of a command-driven data management program like *dBASE III*, both offer competent file managers (see Table 1). *first choice*'s file manager is easier to use—and for most purposes weighs in as an all-around better application—than that of *Electric Desk*.

first choice has a major advantage: When you alter the number or type of fields in a record, the entire data base changes accordingly. You needn't export and then

reimport the data to make it fit the new field structure. It's also easy to specify search criteria with *first choice:* You just enter the criteria into a field on a blank record entry form and execute the search command to find all matching records. *Electric Desk* requires that you type the field name and the field entry.

Only the *first choice* search routine accepts wild cards, although both packages will perform negative (that is, "everything but") matches. In *first choice,* relative matches such as less-than-or-equal-to (<=) work only with numeric data, a limitation not shared by *Electric Desk,* which (unlike *first choice*) supports AND and OR operators for linking multiple search criteria.

Both programs have fairly restrictive size limitations. *Electric Desk* supports a mere 50 fields per record, as opposed to *first choice*'s 1000 fields; yet *first choice* accommodates only 32,000 records per file instead of *Electric Desk*'s 65,000. Designing on-screen data entry forms is straightforward with both products, although *first choice*'s fields will accept 20 times as many characters as *Electric Desk*'s.

One of *first choice*'s most attractive features is its special data base report generator. This subprogram makes it easy to develop brief reports from the data base and to accumulate totals and summarize an entire data base in columnar format. Because *Electric Desk*'s data base lacks a report generator, you must use the word processor to produce reports—and even then you must build them a record at a time. If you want to generate consolidated reports with totals or other accumulations, you

Table 1: first choice is easier to use, but Electric Desk clearly has the edge on features.

Module/Feature	Electric Desk	first choice
General		
System setup	Special program	From main menu
Size of required program and data files	621K*	578K
Tutorial provided	On disk	In manual
Help key	<Alt>-<F5>	<F1>
Access to DOS from within program	■	
User-definable macro keys	■	
Accesses files outside current directory	■	■
Maximum number of processes active at one time:		
Documents	9	1
Data bases	9	1
Spreadsheets	9	1
Communications	2	1
Opens windows with a different active process in each	Limit of 2	
Word processing		
Spelling checker	Optional	■
Modifiable dictionary	■	■
Thesaurus	Optional	
Maximum document size	64K or 2000 lines	64K
Maximum page width	240 characters	132 characters
Maximum header lines	1	2
Maximum footer lines	1	2
Page breaks on screen	■	■
Hyphenation help		
Undo		For block delete
Word count	■	
Saves/retrieves ASCII-file documents	■	■
Prints both from memory and from disk files	■	■
Justified printing	■	■
Mixes single- and double-spacing in a document	■	■
Prints selected pages	■	■
Optional odd-page/even-page headers and footers	■	
Automatic page numbering	■	■
Automatic date insertion	■	
Automatic numbering of tables, figures, etc.	■	
Embeds printer controls in documents	■	■
Mail merge	■	■
Typewriter mode	■	
Background printing	Up to 8 files	

(continues)

Table 1: *(continued)*

Module/Feature	Electric Desk	first choice
Data base		
Size limitations:		
Characters/data field	1000	21,000
Data fields/record	50	1000
Data characters/record	1000	21,000
Records/file	65,000	32,000
Erases and merges selected records	■	■
Data type checking		
Steps required to reconfigure a data base	Export data; create new record structure; import data	Edit record structure directly
Automatic dialing from a record that includes a telephone number	■†	■†
Search functions by index	■	
Search by data criteria:	■	■
Wild cards		■
Relative matches	■	Numeric only
Negative matches	■	■
AND and OR with multiple criteria	■	
Special data base report generator		■
Export formats:		
ASCII	■	Print to disk
DIF	■	
Import formats:		
ASCII	■	
DIF	■	
Spreadsheet		
Size limit (640K machine)	2048 rows, 255 columns	1024 rows, 768 columns
Headings:		
Special row and column for headings		■
Multiple-line headings	■ (but each line requires 1 cell)	Up to 5 lines
Row and column headings always on screen	Optionally	■
Cell naming permitted		■
Numeric display formats:		
Default numeric style	No commas, floating decimal, no currency symbol	Shows commas, 2 decimal places, no currency symbol
Multiple currency symbols	■	■
Shows commas in numbers	■	■
Maximum decimal places	9	15
Shows percent	■	■
Exponential numeric style	■	

(continues)

need to transfer the data from the data base to the spreadsheet.

The *Electric Desk* file manager's greatest advantage is its ability to export and import entire data bases as either ASCII-delimited or DIF files. *first choice* currently lacks this capability, although a utility program that would convert *first choice* data files into ASCII-delimited files is expected to be released soon. Software Publishing also offers *first choice* owners a free utility that converts *pfs:file* files into a form readable by *first choice*.

Spreadsheet Versus Spreadsheet

With cell limits on a par with most stand-alone products, *Electric Desk* and *first choice* provide spreadsheets with more than enough elbowroom. And both enjoy a large selection of functions (see Table 2) as well as flexible data-entry, editing, and printing capabilities. You can merge part or all of a spreadsheet into a word processing document or print the spreadsheet by itself. You can also print out formulas rather than cell values if you wish.

Like most of *first choice*'s features, the spreadsheet is well designed, with rows and columns clearly delineated by ruled lines (see Screen 1). *Electric Desk*'s spreadsheet is less elegant, although the command line more closely resembles that of *1-2-3*. In both programs, tools for navigating the worksheet include paging by screenful in four directions and a Goto command.

Both spreadsheets can be recalculated manually or automati-

cally. Although the two programs have about the same number of functions, *Electric Desk* provides more trigonometric features, while *first choice* offers more options for calculating interest rates. Only *first choice* supplies a standard deviation function, but the program lacks *Electric Desk*'s internal rate of return and TRUE and FALSE operators.

Electric Desk also wins out on data portability, offering the capability to import and export either ASCII-delimited or DIF files. The *first choice* spreadsheet can't export or import data at all, even from its own file manager.

One reason the export/import issue is important is that neither *Electric Desk* nor *first choice* has built-in graphics capabilities. *Electric Desk*'s export facility at least offers a way to take advantage of most stand-alone graphics applications. Software Publishing reportedly plans to add some degree of data portability—perhaps even the ability to read and write *1-2-3* .WK1 files—but at present the *first choice* spreadsheet remains isolated.

Basic Communications

The *Electric Desk* and *first choice* telecommunications modules are simple and functional. Both modules support auto-dialing and automatic log-on. *first choice* offers a dialing directory with six preset scripts for dialing popular on-line services such as Dow Jones News/Retrieval, MCI, and The Source. Any of these scripts can be overwritten with your own log-on sequences, but the total number of entries is limited to eight. *Electric Desk* offers no preset scripts for dialing on-line services, but you can create

Table 1: *(continued)*

Module/Feature	Electric Desk	first choice
Worksheet building		
Changeable cell widths	■	Automatic
Goto cell command	■	■
Embeds comments in spreadsheet	■	■
Inserts rows and columns	■	■
Deletes rows and columns	■	■
Moves cells	■	■
Copies cells	■	■
Copies formulas with either relative or absolute cell references	■	■
Sorts rows based on key columns	■	
Copies spreadsheet into word processor	■	■
Prints selected cells	■	■
Prints formulas	■	■
Maximum page width for printing spreadsheets	240 characters	132 characters
Export formats:		
ASCII	■	■ (print to disk)
DIF	■	
Lotus .WKS		
Import formats:		
ASCII	■	
DIF	■	
.WKS		
Communications†		
Modem speeds supported	110 to 9600 bps	Any speed
Log-on script support	■	■
Automatic redialing		■
Host mode		■
Log creation:		
In word processor		■
On printer	■	
In disk file	■	
File-transfer protocols	ASCII, XMODEM	ASCII, XMODEM

* Includes the optional spelling dictionary to provide a direct comparison with first choice, which has an integrated spelling dictionary. The optional Electric Desk thesaurus requires an additional 160K of disk space.

† Modem required

Table 2: A comparison of Electric Desk and first choice spreadsheet functions

Electric Desk	first choice	Description
ABS(*x*)	ABS(*x*)	Returns the absolute value of *x*
–	ACOS(*x*)	Finds an angle whose cosine equals *x*
–	ASIN(*x*)	Finds an angle whose sine equals *x*
–	ATAN(*x*)	Finds an angle whose tangent equals *x*
AVG(*range*)	AVG(*range*)	Finds the average of a range of cells
CHOOSE(*c,list*)	–	Chooses a value from a list, depending on the value in cell *c*
COS(*x*)	COS(*x*)	Finds the cosine of angle *x*
COUNT(*range*)	COUNT(*range*)	Counts the number of nonblank entries in a range of cells
EXP(*x*)	–	Returns the exponential of *x*
FALSE	–	Returns the logical value FALSE
FV(*p,i,t*)	FV OF(*p*) AT(*i*) OVER(*t*)	Calculates the future value of an annuity *p* at interest rate *i* if held for *t* periods
–	INTEREST ON(*p*) AT(*i*) OVER(*t*) FOR(*x*)	Calculates the interest paid during *x* payment periods on a loan of principal *p* borrowed at interest rate *i* for *t* periods
HLOOKUP() & VLOOKUP()	LOOKUP	Selects a value from a lookup table
IF(*re,t,f*)	IF(*re*) THEN *t* ELSE *f*	If relational expression *re* is true, use value *t*; else use value *f*
INT(*x*)	–	Returns the integer part of *x*
IRR(*i,range*)	–	Calculates the internal rate of return for a range of cells based on an initial guess *i*
–	LOG(*x*)	Returns the logarithm of *x* (base 10)
LN(*x*)	–	Returns the logarithm of *x* (base e)
MAX(*range*)	MAX(*range*)	Finds the maximum value in a range of cells
MIN(*range*)	MIN(*range*)	Finds the minimum value in a range of cells
NPV(*i,range*)	NPV AT(*i*) OF(*range*)	Calculates the net present value of cash flows in a range of cells when the discount rate equals *i*
PMT(*p,i,t*)	PAYMENT ON(*p*) AT(*i*) OVER(*t*)	Determines the periodic payment required to repay a loan of amount *p* over *t* periods at interest rate *i*
PV(*a,i,t*)	PV ON(*a*) AT(*i*) OVER(*t*)	Calculates the present value of a series of equal payments *a* at interest rate *i* over *t* periods
ROUND(*x,n*)	ROUND(*x*) TO(*n*)	Rounds the value of *x* to *n* digits
SIN(*x*)	SIN(*x*)	Finds the sine of angle *x*
SQRT(*x*)	SQRT(*x*)	Calculates the square root of *x*
–	STDEV(*range*)	Calculates the standard deviation of the values in a range of cells
SUM(*range*)	TOTAL(*range*)	Totals the values in a range of cells
TAN(*x*)	TAN(*x*)	Finds the tangent of angle *x*
TRUE	–	Returns the logical value TRUE
–	VAR(*range*)	Calculates the variance of the values in a range of cells

and name an unlimited number of scripts and call up a list of them when you're ready to telecommunicate.

Both *Electric Desk* and *first choice* support the XMODEM protocol for transmitting binary files. However, only *first choice* enables you to set up your PC as an unattended host for PC-to-PC communications.

The most attractive feature of *first choice*'s communications module is its integration with the word processor. When you link up with a remote computer, the entire session is automatically fed directly into the word processor, so you can save the file, edit it, or send it to someone else. *Electric Desk* can only print out incoming files or save them to disk.

Two for the Road

To get you started, *Electric Desk* and *first choice* provide useful tutorials; the former's is on disk and the latter's is in the manual. Both move at an easy enough pace for almost any first-time user, introducing the major features with about an hour's worth of practice. Technical details are reserved for the reference manuals. *first choice*'s reference manual edges out its *Electric Desk* counterpart with superior writing, organization, and illustrations.

Differences aside, either program supplies adequate entry-level functionality without the frills—or headaches—of high-end integrated packages. Judging by the popularity of the *pfs* series, business users who use a PC only a few times a week will probably prefer *first choice*'s classy user interface and congenial style.

For people with more serious needs, *Electric Desk* is the better selection. True, lack of a report generator makes the program inferior in the data base department, but the other modules have the edge—especially in word processing. And because no data stands alone, *Electric Desk*'s superior file conversion ensures that you won't be cut off from the rest of your office—or from more powerful stand-alone products if you get tired of *Electric Desk*. Add to those advantages faster shifting between modules and a first-class macro facility, and it's clear that if you're willing to take the time to learn it, you'll probably work more efficiently with *Electric Desk*.

Dennis Dykstra is a professor at Northern Arizona University in Flagstaff, as well as a freelance writer and software developer.

Electric Desk version 1.1
Alpha Software Corp.
30 B St.
Burlington, MA 01803
617/229-2924
List price: $129, spelling checker and thesaurus $59
Requirements: 256K, one disk drive, DOS 2.00 or later version
Not copy protected

pfs:first choice version 1.0
Software Publishing Corp.
P.O. Box 7210
1901 Landings Dr.
Mountain View, CA 94039-7210
415/962-8910
List price: $179
Requirements: 256K, one disk drive, DOS 2.00 or later version
Not copy protected

Executive Summary

Electric Desk

Integrated package

An entry-level program with a word processor, file manager, spreadsheet, and communications module, *Electric Desk* is easy to learn and offers enough features for most light-duty applications. Its file-conversion utilities and its formatting and editing features for word processing are especially strong. The program's biggest failings are a bare-bones communications facility and the lack of a data management report generator.

Word processing	*Excellent*
Data management	*Fair*
Spreadsheet	*Good*
Communications	*Fair*
Overall value	*Good*

pfs:first choice

Integrated package

Elegant pulldown menus and a consistent command set make *first choice*'s word processor, file manager, spreadsheet, and communications module ideal for casual PC users. *first choice*'s data management reporting is particularly well designed. But overall the program is missing the depth of features necessary to accommodate serious users. A weak communications module and scant file exchange capabilities also mar the package.

Word processing	*Good*
Data management	*Good*
Spreadsheet	*Good*
Communications	*Fair*
Overall value	*Good*

The Controller's Controller

A simple spreadsheet it isn't. But if you need a heavy-duty financial management tool, Control/PC can help you gain control of vital fiscal information.

Steve Lyons

Ralph Soucie

Sure, everybody loves *1-2-3*. But if you've ever used that program to consolidate financial data for several organizational units or to track operating results and compare them to budget, you know the meaning of the word *grueling*. Now comes a program that can handle both tasks at once, with ease: *Control/PC*.

A product of Kay Consulting, *Control/PC* is not a *1-2-3* killer. It won't be stretched or jimmied in any of the thousand ways that *1-2-3* users are wont to treat their beloved program. It's not even designed for general financial modeling. This is a program that knows its place—alongside analysts who are tracking organizational performance through the budget process.

On its own circumscribed financial management turf, *Control/PC* reigns supreme over otherwise more versatile packages like *1-2-3* and *VP-Planner*. Descended from mainframe software called Control, the program is part spreadsheet, part data manager. *Control/PC*, endowed with highly specialized mathematical and reporting capabilities, doesn't flinch at mountains of data or arcane organizational structures.

The program really shines where financial operating results are being tracked against plans or

budgets for a multiunit organization. Although a hefty consolidation capability is probably its most striking feature, there's also much more.

The Fourth Dimension

Kay Consulting describes *Control/PC* as a four-dimensional data base. *1-2-3,* by contrast, is two-dimensional (rows and columns) and *Boeing Calc* is three-dimensional (rows, columns, and pages). In *Control/PC,* the fourth dimension is the datatype—a generic capability for comparing "what is" (actuals) to "what if" (plan or budget). Both sides of that equation maintain their own rows, columns, and pages. As with *Javelin,* all data resides in a central data base; but unlike *Javelin*'s multiple views, data is best viewed through the reporting process.

The simple example of a company with two departments illustrates the value of the datatype. If you used *Boeing Calc* to consolidate numbers for both departments, each department's data would occupy a page. But if you wanted to supplement the consolidation of actual results by tracking them against the budget or plan for each department each month, you'd need a fourth dimension.

In *Control/PC,* budgeted and actual results are different datatypes. *Control/PC* maintains in one file all line items—budgeted and actual—for each department for each month and will produce a variety of useful reports from this highly structured compendium of data. The fourth dimension highlights differences between planned and actual results at any organizational level of consolidation. With this ability to easily and efficiently flag disparities, *Control/PC* is the ultimate management-by-exception tool.

The program provides a dizzying array of performance snapshots. *Control/PC* can handle up to 60 different levels in an organizational hierarchy, dividing them into more than 2600 operating units. *Control/PC* manages not only a hierarchical structure but matrix-type structures as well. In the latter case, the two-dimensional matrix structure in effect gives the product a fifth dimension (see Figure 1).

Potential datatypes abound. *Control/PC* can maintain up to 25 datatypes within a file. You can, for example, create a flexible budget datatype, which permits you to specify budget items as a percentage of total sales rather than as a fixed dollar amount. You can also create several test-case or outlook datatypes, extrapolating results of alternative scenarios. *Control/PC* maintains the data in each datatype—including test cases—separately from all other data. Note that the program supports only one plan (budget) datatype, one actual datatype, and one flexible-budget datatype, but it accepts multiple outlooks and test cases.

Creating a Task

Control/PC does not permit you to jump right in and enter formulas into a spreadsheet on the fly. Indeed, despite a familiar column-and-row feel, the spreadsheet metaphor doesn't really apply. Data files are called *tasks,* and their creation is a highly structured, menu-driven process. Command lines at the bottom of the

screen denote the options at any given point, and commands are assigned to function keys. The action of any function key varies depending on where you are in the program, but Kay Consulting has strived for, and generally achieved, a logical consistency in key assignment. Scrolling through the contents of a screen, for example, involves the use of function keys <F7> through <F10> rather than the cursor keys, an approach that takes some getting used to.

To give the task-creation process some verisimilitude, imagine you're the financial officer for Sunnyside Stores, a food and drug retailer with two locations, one in Clarksville and one in Pleasant Valley. You want to use *Control/PC* to generate monthly financial reports by store and, within each store, for each of two departments (food and pharmaceuticals).

You can create a task by invoking the Tasks menu, which includes an on-screen input form into which you enter task attributes: a file name for the task, a title for reports, and the time span covered by the data. Screen 1 shows the Tasks menu, complete with the attributes for Sunnyside Stores. *Control/PC* tasks are limited to 60 columns—five years of monthly data.

From there, you move to the Stub box to create the *stub row* names. You can then design the *stub logic* that establishes the mathematical relationships among the stub rows. (The word *stub* refers to the data and design of the task itself rather than to a report generated from it. You might think of *stub* as the equivalent of *data base*.)

Performing these steps together is in some respects like designing a *1-2-3* worksheet, but implementing the first step alone is closer to creating a chart of accounts in a general ledger accounting program. Before you begin, you must know the accounts, or stub rows, to include in your task. You assign to each stub row a name and a numeric *stub ID* (roughly analogous to a line number in BASIC). Screen 2 displays stub row names.

The four columns on the right display information about the stub rows. Note the 'DI' column, where a *Y* indicates direct input and an *N* indicates a calculated result. In *1-2-3*, any individual cell can be direct input or calculated, depending on your whim. In *Control/PC*, you must specify whether each stub row receives direct input. To make life easier, direct input rows are underlined on the data input screen.

Control/PC does not use cell formulas. Instead it provides 79 *operators*, most of which are algebraic, financial, or logical and all of which are designated by

A Multidimensional Matrix Conceptualized

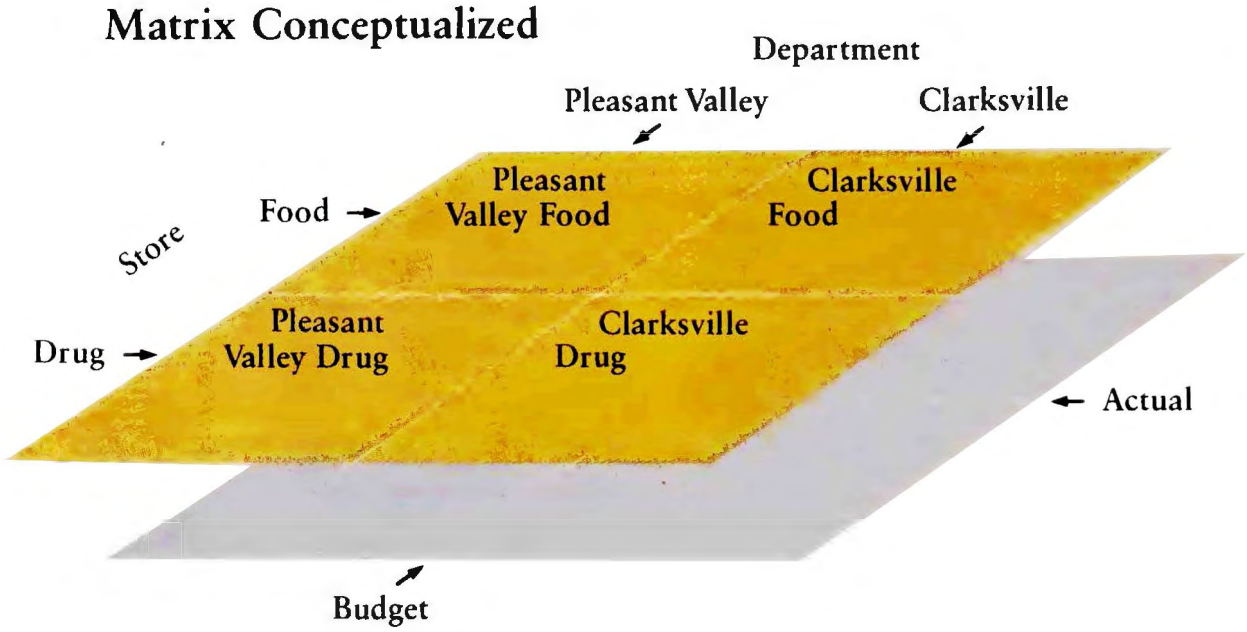


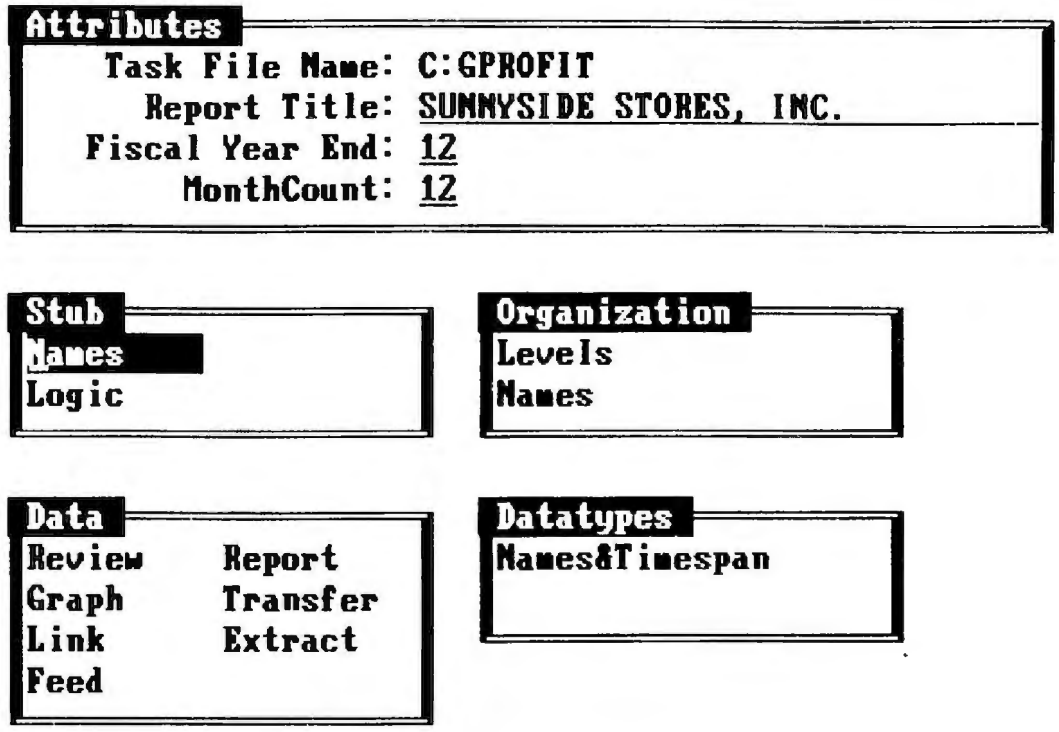
Figure 1: Thinking in multiple dimensions is hardly intuitive. This matrix conveys the way in which Control/PC treats organizational entities. In the Sunnyside Stores example, each entity—like Pleasant Valley Drug—has its own rows and columns, representing the first and second dimensions; the organization (store or department) can also be viewed in row-and-column fashion, for the third dimension. The datatype (budget versus actual) has its own matrix, for the fourth dimension. And if you consider the organizational unit you didn't select as the third dimension (department rather than store, for example), you can even discern a fifth dimension.

number. Operators include real-world business formulas pertaining to interest, investment, inventory, depreciation, lead/lag, loan amortization, cross-organizational computations, and more. Two additional operators permit use of a prior month's computed result as input for the current month.

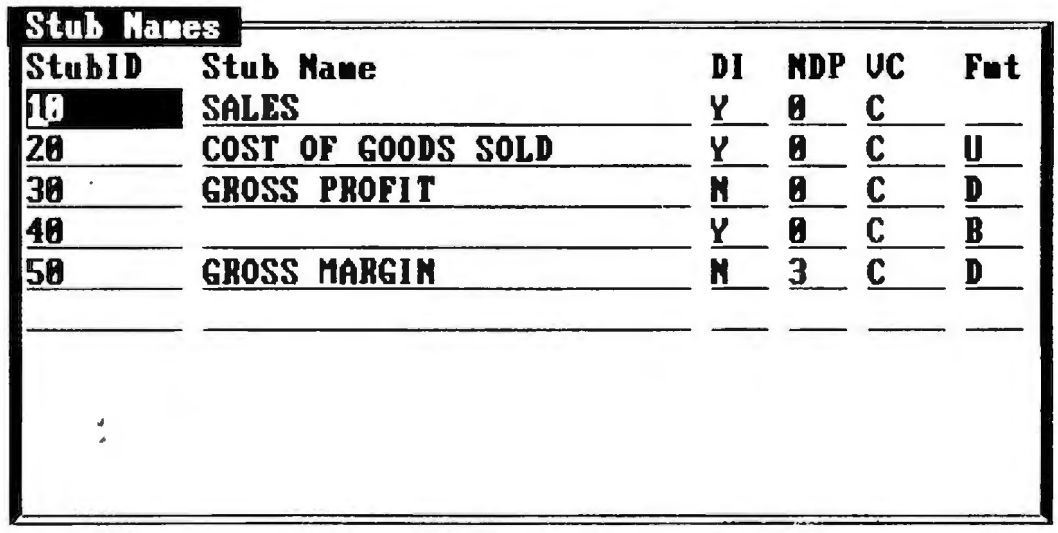
You create the logic, or formula, for any given stub row by completing another on-screen form. The exact nature of the form depends on the operator. Generally, you enter the ID for the stub row to which the computed result will be routed and the IDs for the stub rows that serve as input for the calculation. Screen 3 shows a completed form for calculating the gross margin percentage for the Sunnyside Stores task. Step 1, using Operator 1, adds Sales to Cost of Sales (entered as a negative) to arrive at Gross Profit. Step 2, using Operator 6, returns the Gross Margin (Gross Profit as a percentage of Sales).

Stub operators aren't necessarily easier to follow than *1-2-3* formulas, and the lingo can be opaque. Some means of annotating *Control/PC* logic would make for a stronger product.

Note the absence of stub columns. Consistent with *Control/PC*'s intended purpose of tracking performance over time, each column is associated with a time period within the time span specified in the task attributes box. Clearly, then, you cannot create a formula that multiplies column A by column B and places the result in column C. All mathematical operations specified in stub logic are performed within columns and apply to the entire time period in the task.



Screen 1: The Tasks menu—the starting point for all activity in Control/PC—enables you to structure your analysis and, ultimately, to generate a report.



Screen 2: In Control/PC, model parameters are entered separately from model data. This on-screen form permits entry of stub row IDs and names, and lets you specify whether the row is calculated or direct input (DI). You can also note the number of decimal places (NDP), the variance convention (VC)—a report editing feature used when comparing budget to actual—and the row format (Fmt)—single or double underline or blank.

Getting Organized

After creating the stub logic, you define the organizational structure, which controls the way in which data is consolidated. Sunnyside Stores, for instance, is divided by store level and department level. Each store contains a food department and a drug department. Data can only be entered for departments within stores. You can then classify results by store or by department.

Only after you have created the stub names, stub logic, and organizational structure can data be entered into the task. The data entry screen follows the familiar row-and-column format, but again, each column will always contain data for a specific time period.

Through the main menu's Data Review selection, data can be entered into the stub rows you've indicated as direct input. The review option will display data for any level of consolidation you specify. You can also change and recalculate data at any organizational level.

There is a key restriction here, however: The data base itself accepts data only at the lowest organizational level. While "what ifs" can be performed freely on screen, data or changes entered at any higher level will not be saved to disk. This scheme is hardly a flaw: By segregating data and program logic, *Control/PC* maintains the integrity of its complex web of relationships.

The program expedites data entry by conveniently letting you replicate data across several time periods. You can also increase amounts by fixed increments or by a constant percentage over time—useful features when making projections.

Reporting for Duty

While you're in Data Review, data will always appear in a column-and-row format. *Control/PC* takes on a freer form, however, via the Data Report function, where data can be viewed in a variety of ways.

Control/PC provides 12 predesigned report formats. You may, for instance, want a Summary by Organization report to show operating results for several organizations for a given time period. For any organization, you can turn the stub rows into columns using the Stub-Across-Top by Organization report. For any organizational level, you can display monthly results over a given time period (Data by Month report). Other reports capture the three-month outlook, operating performance, and flash actuals. A Structure report delineates organizational relationships.

A sample Data by Month report for Sunnyside Stores' actual results is shown in Screen 4. The same data can be classified by department or by store (see Screen 5); the breakdown by store is a Summary by Organization report. It's obvious that even within the 12 default report formats, a host of options is available. If you had a budget datatype for Sunnyside Stores, you could display variances between planned and actual results.

```
Stub Logic
Step  Op  Operation
[1]   1   ID:30 = ADD IDs:10 20
[2]   6   ID:50 = DIVIDE_AS_% IDs:30 10 , recalc
```

Screen 3: This completed form illustrates the model logic required to calculate the gross margin percentage for the Sunnyside Stores task. Operator numbers refer to specific Control/PC formulas.

Note that in Screen 5 the heading 'Clarksville' is truncated and that all headings are right-justified rather than centered. Such formatting is automatic but can be overridden by the program's flexible report writer. This custom report-generation facility is straightforward in operation and well documented. You might, for example, want to fashion a report that compares departmental results on a quarterly basis. Operating like a template, the report writer saves specifications in a separate disk file, and you can use those specs for any subsequent task.

In creating a custom report, the program obliges with a screen of data definition fields, and includes up to 19 column logic operators (such as multiply by a constant, raise to a power, and so on). *Control/PC* also makes short work of building a report header by offering a full array of header commands and—for items like company name and report title—mnemonics.

Kay Consulting has included a graphing component that features line, bar, step, stacked bar, pie, and combination charts, with cross-hatching where appropriate. Graphs can be generated by completing an on-screen form, and any consolidated data can be charted. The current version of *Control/PC* supports only graphics boards that are compatible with the CGA and Hercules standards. Data can be sent to IBM and Epson-compatible dot matrix printers or can be plotted.

```
5:42 PM Saturday, 11/15/1986
                          ABC Development Co.
                        SUNNYSIDE STORES, INC.
                               ACTUALS
                          SUNNYSIDE STORES

                1987 --          JAN          FEB          TOTAL

SALES                          279000       293200        572200
COST OF GOODS SOLD            (227500)     (238000)      (465500)
                         -------------- -------------- --------------
GROSS PROFIT                    51500        55200        106700
                         ============== ============== ==============

GROSS MARGIN PERCENTAGE        18.459       18.827        18.647
                         ============== ============== ==============


End of report reached.
                F3:HELP  F4:QUIT  F5:WAIT? F6:PRINT?  SCROLL: F7↑ F8↓ F9← F10→
```

Screen 4: This sample Data by Month report conveys actuals for the individual Sunnyside Stores and for the firm as a whole.

```
12:03 PM Thursday, 11/27/1986
                                                  ABC Development Co.
                                                SUNNYSIDE STORES, INC.
                                                       ACTUALS
                                              JAN 1987 THROUGH FEB 1987

                          PLEASANT          SUNNYSIDE
                           VALLEY CLARKSVIL   STORES

SALES                      310200   262000    572200
COST OF GOODS SOLD        (254500) (211000)  (465500)
                         ---------- --------- ---------
GROSS PROFIT                55700    51000    106700
                         ========= ========= =========

GROSS MARGIN PERCENTAGE     17.956   19.466    18.647
                         ========= ========= =========


End of report reached.
                F3:HELP  F4:QUIT  F5:WAIT? F6:PRINT?  SCROLL: F7↑ F8↓ F9← F10→
```

Screen 5: The data in Screen 4 can be broken down by store using Control/PC's Summary by Organization report. Note that the entities examined have not changed.

A Peerless Management Tool

A closer look at the program reveals why *Control/PC* is such a superb management-by-exception tool. Management by exception simply means focusing on areas where things seem to be going awry. The primary clue for identifying problem areas in medium to large organizations is the budget variance (the difference between budgeted and actual results).

A large variance in the wrong direction generally indicates poor performance and calls for corrective action. Occasionally, the problem isn't with operating results but with the budget itself. Even then, management must revise budgeted figures to determine how the company should respond to the reevaluated circumstances. A change in strategy may be warranted.

Control/PC shines when a budget requires revision in midstream. Here's where the flexible-budget or outlook datatypes come to the fore. The outlook datatype is essentially an updated budget, revised to reflect results achieved since the original was developed. It enables you to adjust the performance standard to reflect changed circumstances, yet preserve original budget numbers.

For variance analysis to work well, of course, the budget itself must be well conceived. *Control/PC* encourages the development of a consolidated budget from the start.

Consider the plight of the financial officer of a multiunit organization whose departments all submit their proposed budgets on *1-2-3* worksheets. Since each department will likely revise its budget several times before final approval, the worksheet structure may require repeated redesign—an awesome task if the organization consists of dozens of units, each dragging along a budget worksheet with hundreds of cells. *Control/PC*'s centralized stub logic removes the risk of repeated revisions. No matter how bleary-eyed you become, you can't accidentally decimate a formula during data entry, because defining stub logic is a completely separate process.

Fine Points to Ponder

Consolidations, which are duck soup within a task, aren't much harder between tasks. *Control/PC* includes a Data Link function that joins tasks, enabling data from task A to serve as input to task B. That's a handy feature when aggregating data from disparate types of businesses—for instance, from General Motors and GMAC. The Data Link operation fosters highly detailed subsidiary reports, with consolidation at an organizational level higher than the subsidiary level.

Although *Control/PC* is not an island, it contains few bridges to other data formats. Via the Data Feed and Data Extract functions, the program can read and write DIF and XDEF (Xerox data exchange) files. *Control/PC* can work with *1-2-3*'s .PRN (not WKS) files, rendering it useful for pulling in values, not formulas. Even then, importing *1-2-3* data is a chore that involves creating a task and then specifying the stub rows that pull data from *1-2-3* cells.

The program's Send and Receive functions enable *Control/PC* to communicate with a host running Control, the program's big-machine counterpart. Models can be created locally and then sent to the mainframe without a hiccup.

By spreadsheet standards *Control/PC* is sluggish in both data entry and data review; in addition, recalculation must be done manually. Kay Consulting notes that a math coprocessor will accelerate

Executive Summary

Control/PC

Financial management software

For financial managers who need to analyze data and prepare budgets for multiunit organizations, *Control/PC* offers impressive consolidation and reporting capabilities. The program's separate handling of data and model logic facilitates on-the-fly analysis and is particularly useful in measuring organizational performance over time.

Data entry	*Fair*
Data validation	*Good*
Data analysis	*Excellent*
Model construction	*Excellent*
Reporting	*Excellent*
Overall value	*Excellent*

performance, but few other shortcuts are available. The program's extensive overhead simply takes a toll in speed. *Control/PC* lacks a macro capability to hasten operations, and every step in the model logic must be entered individually. Even with the standard report formats, it's necessary to specify options, such as time periods. On the other hand, file size has no perceptible impact on execution speed.

Control/PC data files tend to be somewhat bulky, but a "shrink" feature, accessed through a lower-level menu, can reduce overweight disk files. I managed to compress an already small file by 40 percent. Unfortunately, this nifty option is not well documented.

Version 2.5 does not provide counterparts to *1-2-3*'s Currency, Percent, or "," Range Format options. Those features and many more figure to be part of the next *Control/PC* release, which should be available by the time you read this. The new version will also sport a redesigned interface, include EGA support, permit reports and graphs to be sent to a file (and not merely printed), offer DOS services, permit variable column widths in Data Review, support board-independent means of communication with Control, and include dollar and percent signs in reports.

Control/PC's pricing is a bit unconventional for a PC product. The single-copy price is a hefty $1500, but multiple copies bottom out at $495 for orders of ten or more.

Covering Its Tracks

Fortunately, product documentation is well written and, with a few exceptions, clear. Explanations of several of the more complex operators are cryptic in parts—but the critical functions are easy to learn.

Control/PC's help facility is extremely effective. Indeed, the program's on-line help is the most context-sensitive I've seen. Instead of leaving you to forage through an on-line encyclopedia, *Control/PC* maintains the current screen and displays a terse but surprisingly helpful one-line assist. If you need more, a single keystroke calls up a more comprehensive explanation. The on-line tutorial is likewise exemplary, and toll-free phone support is available.

Most helpful, however, is the program's intuitive design. After spending only two hours with *Control/PC*, I was able to create the entire Sunnyside Stores task, including the Department by Store matrix organizational structure, and enter two months' data—this despite Kay Consulting's description of the matrix organization as an advanced feature.

Locus of Control

Control/PC isn't a vanilla product. Used for pure spreadsheet tasks like loan amortization or for applications where variances are irrelevant, it tends to be cumbersome. But if your duties involve consolidations, budget development and analysis, and detailed projections on resource allocation—and if you typically invest a great deal of time in developing your data and reports—*Control/PC* merits serious consideration. The program seems the ideal tool for a fast-expanding retail organization that needs to project financing needs for planned store openings.

Although the product has been on the market for only a year, it boasts an impressive list of big-name users, among them Citicorp and Hughes Aircraft. If your organization isn't quite that large, the program's price may be a drawback. Traces of *Control/PC* can be found in *Javelin, Boeing Calc,* and *VP-Planner,* which are more versatile and which combined still cost less than a single copy of *Control/PC*. But if your analytical needs are as complex as your organization, *Control/PC* is a heavyweight product for a heavyweight job. ●

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Control/PC version 2.5
Kay Consulting
225 S. Sepulveda Blvd.
Manhattan Beach, CA 90266
800/826-6862 California,
800/824-3920 outside California
List price: single copy $1500, 2 to 4 copies $895 each, 5 to 9 copies $695 each, 10 or more copies $495 each
Requirements: 512K, DOS 2.00 or later version

Time Clock for Professionals

Want to turn leaden hours into golden ones? For anyone who bills by the hour, Timeslips can be alchemy at work.

Bob Zuba

Stephen A. Blumenthal

When it comes to keeping track of their time, professionals who bill by the hour know the true meaning of tedium. To avoid having to scribble down every minute's effort, lawyers, accountants, and consultants spend thousands of dollars on software to track their time, transfer the data, and produce reports for management and the Internal Revenue Service. Thanks to a powerful time-recording and -billing program called *Timeslips,* that chore just became considerably easier.

Named for the paper slips many lawyers still use, *Timeslips* is a memory-resident pop-up program that enables you to create and edit timekeeping data files and to produce bills and management reports. The many *Timeslips* commands take some getting used to, but the program is completely menu-driven, offers ample help screens, and can do a lot of work.

Timeslips' strength lies in the way it builds logical links between three main elements: the *user* (the person doing the work), the *account* (the customer), and the *activity* (the project being worked on). Those links extend throughout the program: For example, *Timeslips* can determine the billing rate according to any one of the three elements. This linkage makes the program flexible, since professionals often charge different rates for different kinds of activities (see Screen 1).

Timeslips also offers flexibility in setting up accounts. You can mix and match accounts as long as the three groups' total does not exceed 255. Ten lawyers with 200 clients can keep time slips on 45 different lawsuits, for example. If you need more than 255 accounts, coding the slips and using some creative hard disk management will help. So will *Timeslips III;* at twice the price, it handles 3400 clients and 250 timekeepers and activities.

Finally, *Timeslips* allows you to produce accounting records with a software bridge called *Time-Link: Plus.* This utility transfers data from *Timeslips* to Great American Software's respected accounting

program, *One-Write Plus*. The resulting amalgam could be a money-maker to rival the U.S. Bureau of Engraving and Printing.

Making the Time Count

To be useful, a time-billing system should accommodate busy people who are constantly being interrupted. With *Timeslips,* you can stop and restart the clock as fast as Boris Spassky does in a chess tournament.

When you start work, you simply toggle the *Timeslips* stopwatch and start the clock running with a single, user-definable keystroke (see Screen 2). (*Timeslips* ticks off the accumulating charges like a taxi meter.) If you are interrupted by a phone call from another client, you can stop the clock on the first time slip, activate a second, then return to the first without missing a beat.

Slips in Time

Watching the clock is half of *Timeslips'* talent; the other half is counting the coins. Many expenses of law practice are passed on to the client and are a nuisance to track. *Timeslips* can quickly create separate slips for such costs as telephone calls. The expense slips are posted to the client or project and billed as part of the program's regular bill-and-report cycle. That pleasant chore is handled by TSREPORT, *Timeslips'* billing-report and graphics module.

Typically, the firm's bookkeeper collects the various lawyers' time data and merges it into a composite resident file. That file becomes the data base from which billing worksheets and bills are generated.

Timeslips has enough report formats to easily satisfy most bookkeeping requirements. The Billing Worksheet report lists all unbilled time and expenses for all accounts. A Detail report shows all the information in each time and expense slip and can include four levels of subtotals. Finally, a User-Defined report enables the bookkeeper to customize a report's format.

Once a Day, Once a Month

Every month, the bookkeeper enters time and expense charges from the resident files of all the attorneys, prints the Billing Worksheet, and sends a copy to the managing partner. This worksheet can show which clients' projects produce the most revenue, and it can flag expenses that seem out of line with billings.

After the managing partner reviews the worksheet and makes any necessary adjustments, the bookkeeper decides which time slips to include in the bills and sorts them into the appropriate order: alphabetically; by descending dollar value; by account; or by activity.

The TSREPORT program marks "do not bill" slips, updates balances, and ages bills. One-month-overdue bills automatically become two months overdue, and the twins become triplets. By setting the aging date a few days before the date bills are prepared, they are always aged before they are printed. Where appropriate, the billing module also adds sales and service tax and interest charges to overdue balances.

Having decided which bills to send out, the bookkeeper then chooses the format for the bill itself. Bill format determines the amount of detail the client will receive concerning the charges.

Timeslips will include in the bill the balance of the current month; overdue balances for one, two, or three months; the total current balance; or the remaining balance in a trust or retainer account. Bills can be formatted with varying degrees of activity description or with no details at all.

The *Timeslips* printing module is more than a mere printer driver. TSREPORT can format bills for each client individually and define fields for placement of the client's name and address (nice for window envelopes). Bills can be printed on continuous forms or letterhead stationery.

Sending out bills is all very well, but a managing partner also needs to know how much money is coming in. This is where *Timeslips* makes life easy. Each client transaction appears on a screen showing the date, description, and amount of payment and the client's adjusted balance. The firm's bookkeeper can then produce a daily Transaction report showing all payments received from clients on that day. After bills are printed and the balances updated, all the transactions on the report are automatically marked for deletion.

A second report, the Trust/Retainer report, shows all transactions in trust accounts that the firm maintains.

Bridge Over Troubled Data

Bills and management reports are only the raw data needed to produce accounting statements. To save users from having to manually reenter that data into a separate accounting program, North Edge provides *Time-Link:Plus,* a bridge program to *One-Write Plus.*

Time-Link:Plus is not a standalone program, but an add-on to *Timeslips'* TSREPORT module. Accessed through the report generator menu, it creates reports in a form that the *One-Write Plus General Ledger* can read. Without the *Time-Link:Plus* bridge, distributing fee payments and expenses to the appropriate accounting categories would be tedious indeed.

In operation, *Time-Link:Plus* is practically invisible. Just tell it whether your accounting system is cash-based or accrual-based, designate which accounts are the general ledger control accounts, and let it run.

North Edge suggests that you first use TSREPORT to print out a chart of all the accounts and then assign general ledger account numbers to each account. Finally, summon *Time-Link:Plus,* select 'Control Accounts' from the Setup menu, and enter the control numbers. Most businesses use *Time-Link:Plus* this way, since they generally use a single control account for fees and a second one for expenses.

You can also use the program to post your fees and expenses by user or activity. If you do a great deal of diverse work for one client, post them by user. If you have one mammoth project—defending IBM against a Justice Department antitrust suit, for example—post by activity.

One-Stop Accounting

Timeslips can be confusing at first (some keys control multiple functions), but it is also very forgiving—you're unlikely to destroy your work accidentally. Context-sensitive help is available and will even pop up on your screen uninvited if you try to execute step 2 before step 1.

Considering how good *Timeslips* and *Time-Link:Plus* are, their documentation is disappointing. The current *Timeslips* manual is better than previous versions, but *Time-Link:Plus*'s still needs major improvement.

In a large firm, the North Edge programs could prove invaluable. Because of the way *Timeslips,*

Executive Summary

Timeslips and Time-Link:Plus

Time-billing and accounting software

For lawyers, accountants, and consultants who bill by the hour, *Timeslips* is a powerful tool: It can track time on many projects, summarize that information for reports, and prepare and print bills. With *Time-Link:Plus, Timeslips* can export the information to *One-Write Plus* accounting software.

Data entry	*Excellent*
Reporting	*Excellent*
Billing	*Excellent*
Documentation	*Fair*
Overall	*Excellent*

Time-Link:Plus, and *One-Write Plus* mesh, it would make sense to buy all three and build a time-keeping and accounting system around them. For a few hundred dollars, lawyers, accountants, consultants, and smoke blowers of every description can finally escape the tyranny of time.

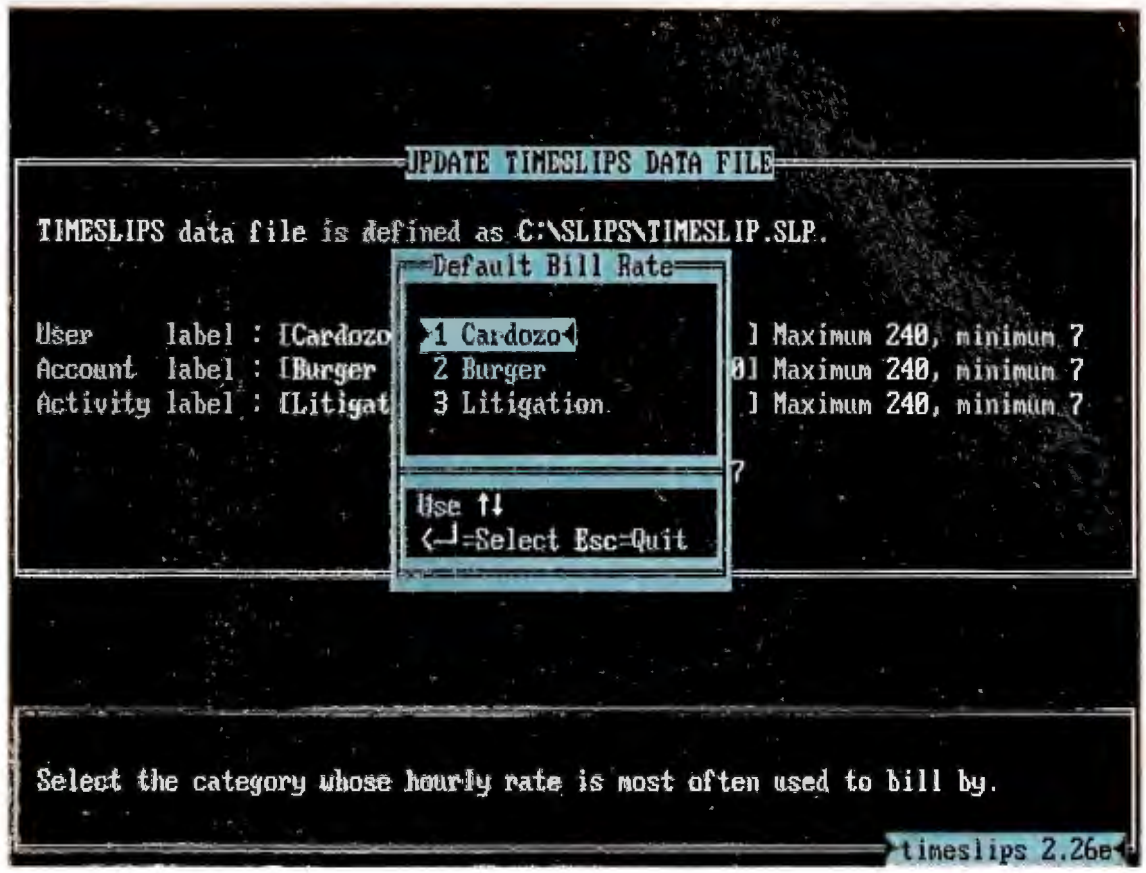
Attorney Stephen A. Blumenthal is a PC World *Contributing Editor.*

Timeslips
North Edge Software Corp.
P.O. Box 286
Hamilton, MA 01936
617/468-7358
List price: $99.95
Requirements: 384K, two disk drives, DOS 2.00 or later version
Not copy protected

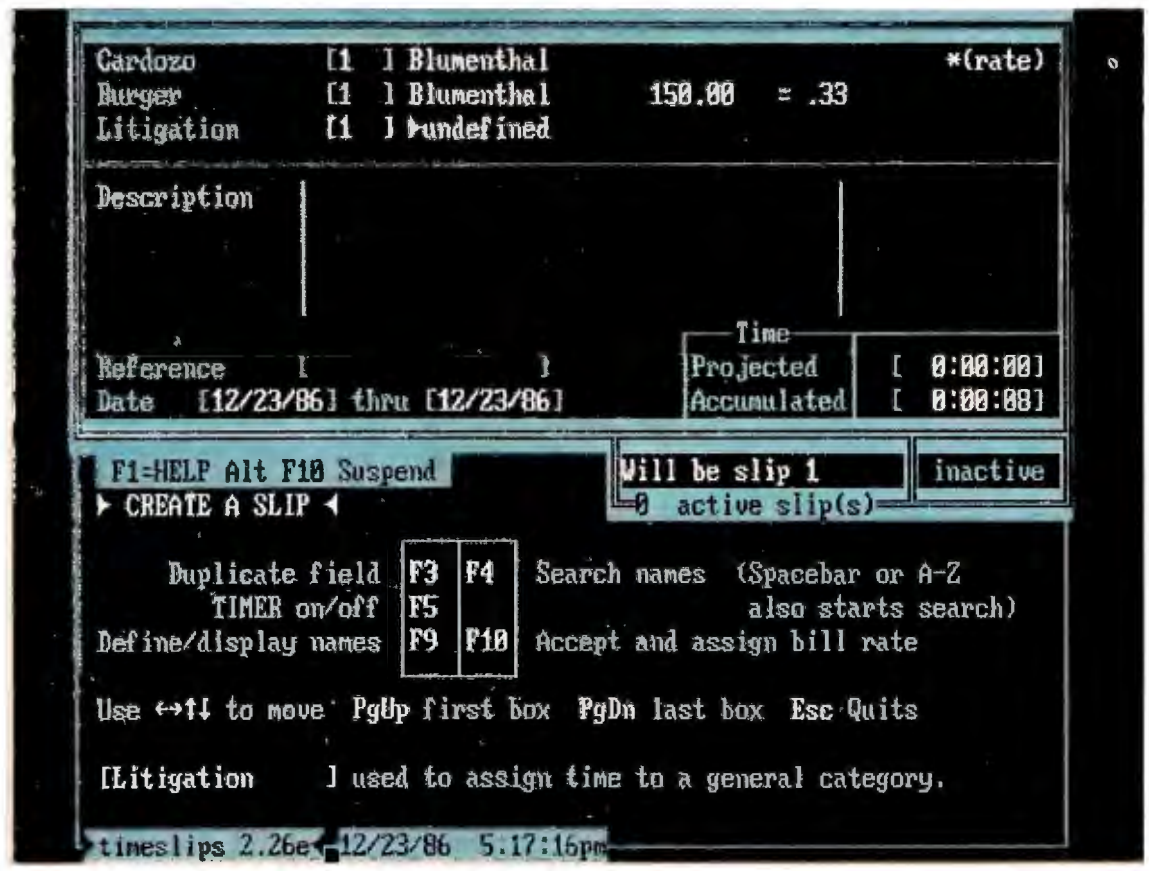
Timeslips III
North Edge Software Corp.
List price: $199.95
Requirements: 384K, hard disk, DOS 2.00 or later version
Not copy protected

Time-Link:Plus
North Edge Software Corp.
List price: $49
Requirements: 384K, hard disk, DOS 2.00 or later version
Not copy protected

One-Write Plus General Ledger
Great American Software, Inc.
P.O. Box 910
Amherst, NH 03031
800/528-5010
List price: $295
Requirements: 256K, two disk drives, DOS 2.00 or later version
Not copy protected



Screen 1: Tracking many clients and activities, Timeslips can help attorneys and other professionals remember what they are charging. And unless told otherwise, Timeslips will bill for work on a client's behalf at a default rate decided on when the attorney took the case.



Screen 2: Eight seconds into a case, and you've already made 33 cents. The Timeslips format lets you toggle the clock on and off, quickly complete new slips, and even change the billing rate in the middle of a phone call.

Graphics by Wire

PCs spend increasing amounts of time both on the phone and generating fancy graphics. By blending the two activities, LCS/Telegraphics' TeleVision takes an early step toward consultative graphics.

Michael Barton

Logging on to your favorite information service or bulletin board is like stepping back in time. Most PC communications programs remain mired in the conventions of aging teletype technology. Equally frustrating, user-to-user communications are still conducted in text mode.

Now, PC communicators can take a first step toward interactive graphics—on line. LCS/Telegraphics' *TeleVision* goes beyond the familiar chat mode, which permits users to exchange messages via the keyboard, and adds the ability to show as well as tell. However, *TeleVision*'s limitations may restrict its use to a relatively narrow business audience.

TeleVision is not a presentation graphics package, nor is it a straightforward communications program. Instead, it provides *consultative graphics,* which lets two users at remote locations simultaneously refer to the same image on screen. The program can capture, edit, and send images as well as manage binary and text transmissions. It builds a graphics pipeline between you and anyone with whom you must share medium-resolution graphics images or formatted files.

Even more striking, *TeleVision* provides unique, interactive mouse-to-mouse editing. With *TeleVision* installed at both ends of a connection, project collaborators can share an image and edit it cooperatively without touching a key. And the program's reasonably complete graphics editor enables you to build charts and graphs from scratch.

More prosaic—but perhaps more significant—the program's file-compression capabilities permit transmission of binary files through text-only electronic mail services. You can thus send word processing documents or spreadsheets without losing formatting en route. (This highly useful feature is shared by *Lotus Express,* but that program currently works only with MCI Mail.)

TeleVision's uses range from the practical to the whimsical, but for the most part they are limited to a handful of vertical applications. Realtors can share neighborhood maps with colleagues in remote locations and highlight areas whose features match a client's interests. Designers can disseminate floor plans and schematics. Desktop publishers can use a third-party utility that converts *MacPaint* art to CGA-compatible images, thereby fostering a dialogue between the PC and the Macintosh. And as the *TeleVision* documentation suggests, you can even play a vivid variant of postal chess.

TeleVision does lack some crucial features that are increasingly found in full-featured communications programs, however. And it is designed to work only with medium-resolution CGA hardware and can display only four colors at a time. LCS/Telegraphics dispensed with EGA support because

Steve Lyons

EGA files are about eight times as large as their CGA counterparts, which seemed too bulky to be practical for interactive transmission. (*Lotus Express* manages EGA file transfer rather nicely, however.) Finally, *TeleVision*'s text editor is clumsy in comparison to editors built into *Lotus Express* or *Microsoft Access,* for example.

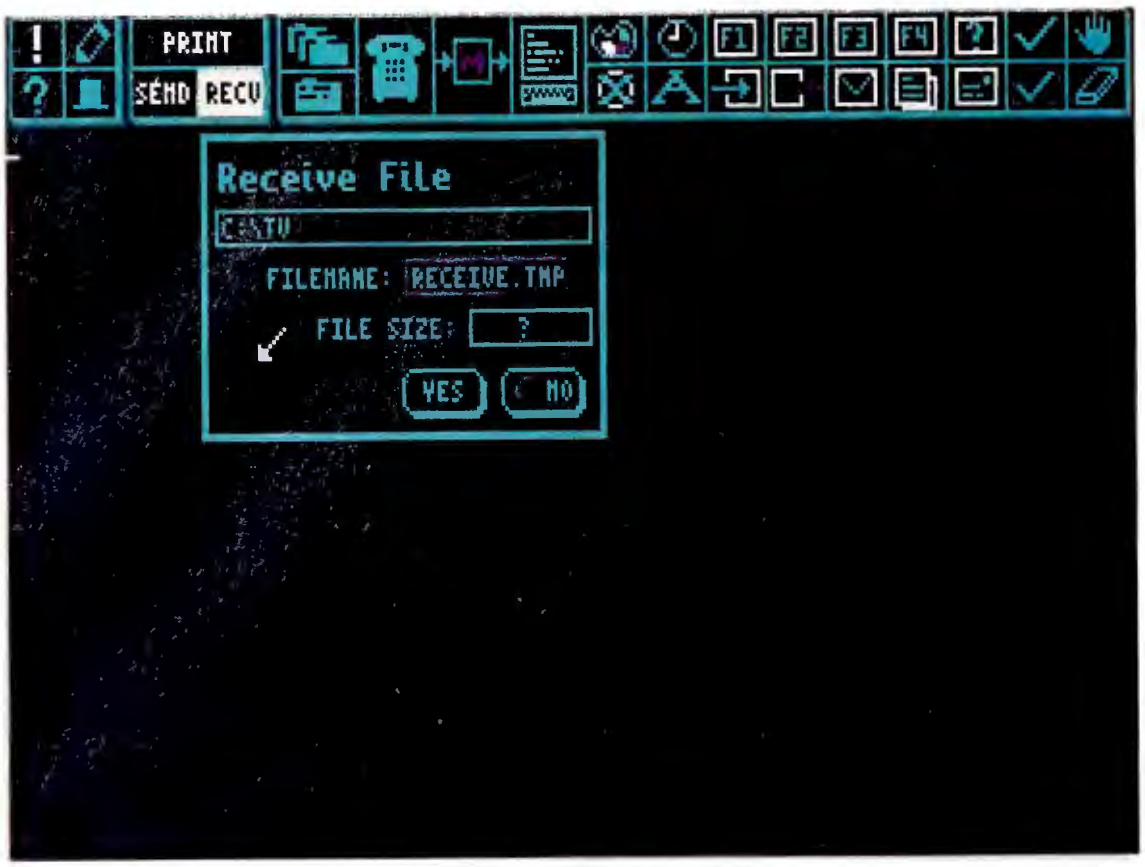
Prepare to Broadcast

TeleVision alternates between the communications and the graphics facilities; both use mouse-activated icons and supplement those icons with pulldown menus. Indeed, watching *TeleVision* without a mouse is virtually impossible, a limitation that restricts the program's audience but simplifies actual usage.

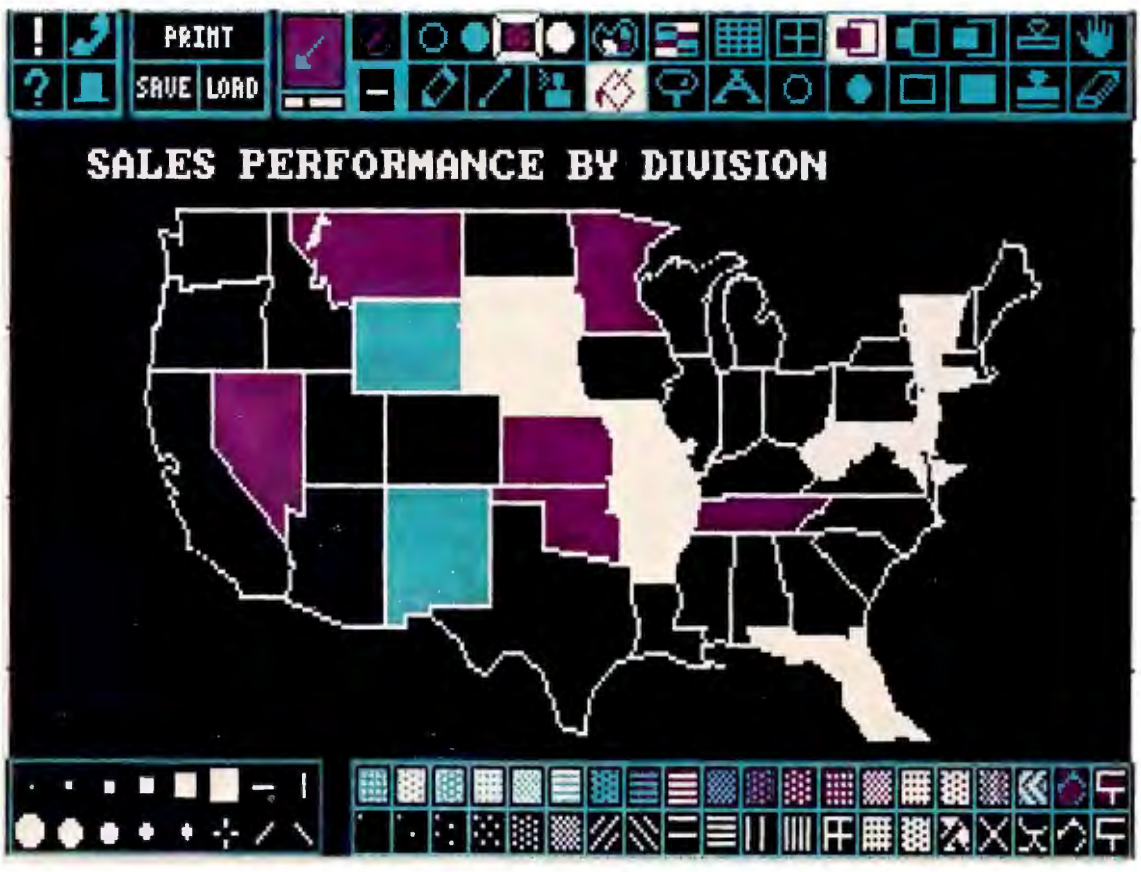
The graphics facility is a snap to learn; mastery requires but an hour or two. It provides entrée to the graphics editor, whose work areas are called canvases. With *TeleVision*'s graphics tools you can create, transfer, edit, and modify images twice the size of the PC's 80-column-by-25-line display. Output can fill an 8½-by-11-inch sheet.

The communications module is slightly less intuitive, perhaps because tinkering with communications parameters demands words as well as pictures. Prepare to spend several hours exploring the options and experimenting with calls to a variety of host computers. Then you can follow *TeleVision*'s adequate defaults or proceed step-by-step through the menus.

LCS/Telegraphics, which also markets the *TelePaint* graphics package, has kept *TeleVision* simple and compact. You can connect to many services without touching the keyboard, but you do need to learn the modest vocabulary of the mouse: click, double click, drag, and select. A single click on



Screen 1: Basic communications tasks like receiving a file are handled by TeleVision's pop-up menus.



Screen 2: Images can be downloaded from libraries on CompuServe and several other services. Here a U.S. map is modified to show sales performance by division.

a blank region, for example, discards the current option; a double click is equivalent to a carriage return.

In addition to creating graphs and charts and loading images from the package's sample libraries, you can import screens from other programs. *TeleVision*'s Savegraf utility can save any four-color CGA image to disk. Once a captured image is loaded, you simply enter the image's name in a pop-up window. The image can then be edited like any other element.

Clicking on Communications

The communications module works in units called pages, each of which consists of a full PC screen. The communications buffer holds up to nine pages of text (216 lines) at a time; any new material entering the buffer will overwrite the old. You can create an ongoing session file to select and store material continuously.

The mouse receives a brisk workout within the communications menu, where the program supports text and mouse cursors simultaneously. Clicking the mouse cursor on a character copies that character at the text cursor position. You can also navigate by mouse through a host system's menu and can interrupt the current communications task by depressing the mouse button.

TeleVision's file-compression techniques ensure extremely efficient file transfer; LCS/Telegraphics cites speed improvements of better than 5 to 1. Image, other binary files, and text files all benefit from compression. Shorter files

mean abbreviated transmission times and reduced on-line costs.

Need to ship a worksheet across state lines? With *TeleVision,* you can use text-only services like MCI Mail to transmit binary files as if they were text files. This pseudotext can be easily reconverted to binary if the recipient is a *TeleVision* user (see Screen 1).

Take Two: Filecards and Scripts

If you converse regularly with a number of other users or services, you may find you're resetting your communications parameters with disconcerting frequency. *TeleVision* can record those parameters in its Filecard system, which holds up to 14 frames, each holding an amount of information comparable to what you'd write on a 3-by-5 index card.

You create Filecards by choosing from settings on Telephone, Modem, and Protocol/Terminal menus. Next you select the Save Filecard icon, enter the file name, and confirm the choice. For novices, this straightforward approach removes some of the mystique of telecommunications and expedites the process of logging on.

Once you're up to speed with the program, you can call on *TeleVision*'s macro facility to automate repetitive tasks. Recording keystrokes as scripts is easy and can automatically establish your preferred start-up configuration, load default Filecards, set paths for image and font file directories, and tackle other tasks. In addition, scripts support unattended operation. You can place default scripts under a few function keys; other scripts are available through the communications menu.

With just a few operations, then, *TeleVision* can deftly jazz up business communications. It's no hassle to capture and enhance a *1-2-3* graph, alter its colors with the graphics menu palette icon, use the font icons to add logos or banner text, and then switch to communications for a script that sends the finished product, via EasyLink, to corporate headquarters. You can just as easily download a map of the United States from CompuServe, flip to graphics, and color in states to illustrate your division's sales performance (see Screen 2).

TeleVision's mouse-to-mouse editing permits pictorial communications that almost have the immediacy of a phone conversation. Mouse-to-mouse links can help solve problems in which quick visualization is helpful. Combining *TeleVision* with a separate voice link yields a simple form of teleconferencing (see Screen 3). Once connected, both users are automatically switched to the graphics module. Thereafter, they can swap mouse control, although each exchange delays the action for several seconds.

This kind of arrangement is suitable for project consultations such as between a builder and a client working at opposite ends of the country. Both parties can view an evolving design and make decisions on the voice line.

TV Networks

LCS/Telegraphics ensures the program's support for a host of public information and E-mail services. *TeleVision* documentation provides setup specs to access such networks as Telenet, Tymnet, DataPac, Uninet, MCI Mail, NewsNet, GTE TeleMail, and DialCom.

The company's spadework has also paid off in an array of *TeleVision*-specific services now available on various information utilities. You can haul down *TeleVision*-compatible weather charts from OMNET's SCIENCEnet. A product support roundtable and *TeleVision*-format clip-art libraries are available on GEnie. LCS/Telegraphics maintains on-line customer support on Delphi.

The list doesn't stop there. The Source features a Micro Artists special interest group for the exchange of *TeleVision* images and ideas and maintains a library of those images. Western Union EasyLink offers on-line customer support, as well as an image bank

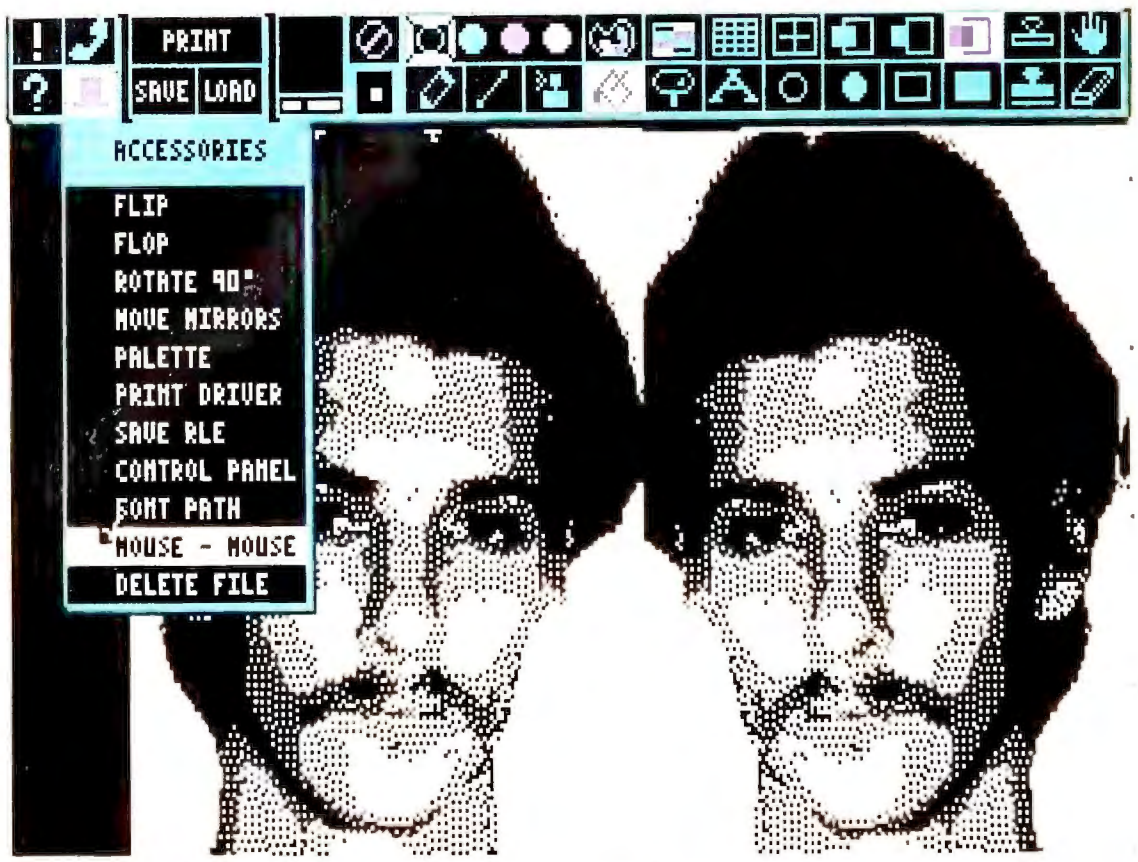
Executive Summary

TeleVision

Graphics-oriented communications software

TeleVision is an easy-to-use package designed to help users who must share graphics information between remote locations. The package transmits medium-resolution graphics images and sends binary files through text-only services.

Graphics creation	*Fair*
Communications setup	*Fair*
Communications protocol support	*Fair*
Overall value	*Fair*



Screen 3: TeleVision's mouse-to-mouse feature lets you set up an interactive graphics session so that two users can enhance the same image simultaneously.

available through FYI. Similarly, CompuServe features on-line support and images based on *TeleVision*'s proprietary monochrome Run Length Encoded technology. You can download CompuServe images that include artwork, cartoons, weather maps, and mug shots of the FBI's most-wanted fugitives.

TeleVision can emulate TTY terminals and a variety of DEC terminal configurations. Its essential file transmission protocols include XON/XOFF flow control, both XMODEM CRC and XMODEM checksum file transfers, and the Hayes file transfer protocol. Other protocols are conspicuously absent, including useful variants on XMODEM (YMODEM, TELINK, and ZMODEM) and Kermit—the last of which is often the only protocol available for micro-to-mainframe and micro-to-mini communications.

Static in TeleVision Land

TeleVision is not an all-purpose telecommunications program. It lacks such basic amenities as automatic redial. Thus far, peripheral support is spotty; the package includes drivers for 35 printers and plotters, but not for scanners. However, Microsoft-compatible mice will work, as will Kurta series digitizing tablets. *TeleVision* also features a driver for the Polaroid Palette slide maker. Additionally, the program can run under *Microsoft Windows* and exploit some *Windows* features, such as the ability to send text directly to the clipboard.

But *TeleVision* isn't much of a text editor; you won't even find support for word wrap. LCS/Telegraphics should take a hint from text-based communications software like the *ProComm* shareware offering, which lets users switch to a word processor from within the program. Such a facility would enable you to quickly edit text and return to the *TeleVision* session without losing the phone line.

In all, however, *TeleVision* is a fairly good value. Although it may lack some traits found in other packages—notably *Lotus Express*, which can also send nontext files through a text-only service—a few thoughtful design features also set it apart. Its use of mice, rich graphics editor, and burgeoning third-party support help *TeleVision* carve a unique niche in a field notorious for its reruns.

Michael Barton, a technical writer living in Cambridge, Massachusetts, appears under various noms de plume on dozens of bulletin boards.

TeleVision
LCS/Telegraphics
261 Vassar St.
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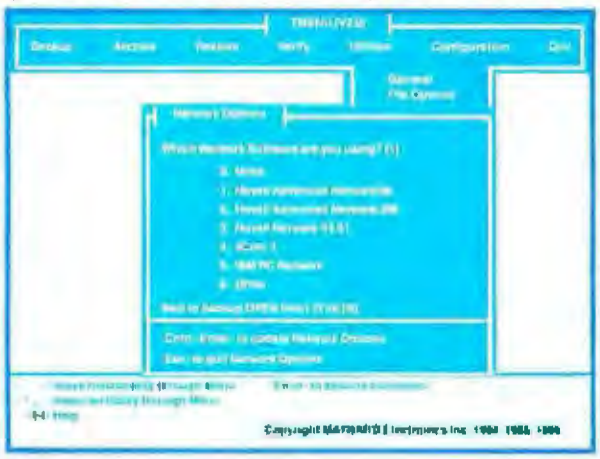

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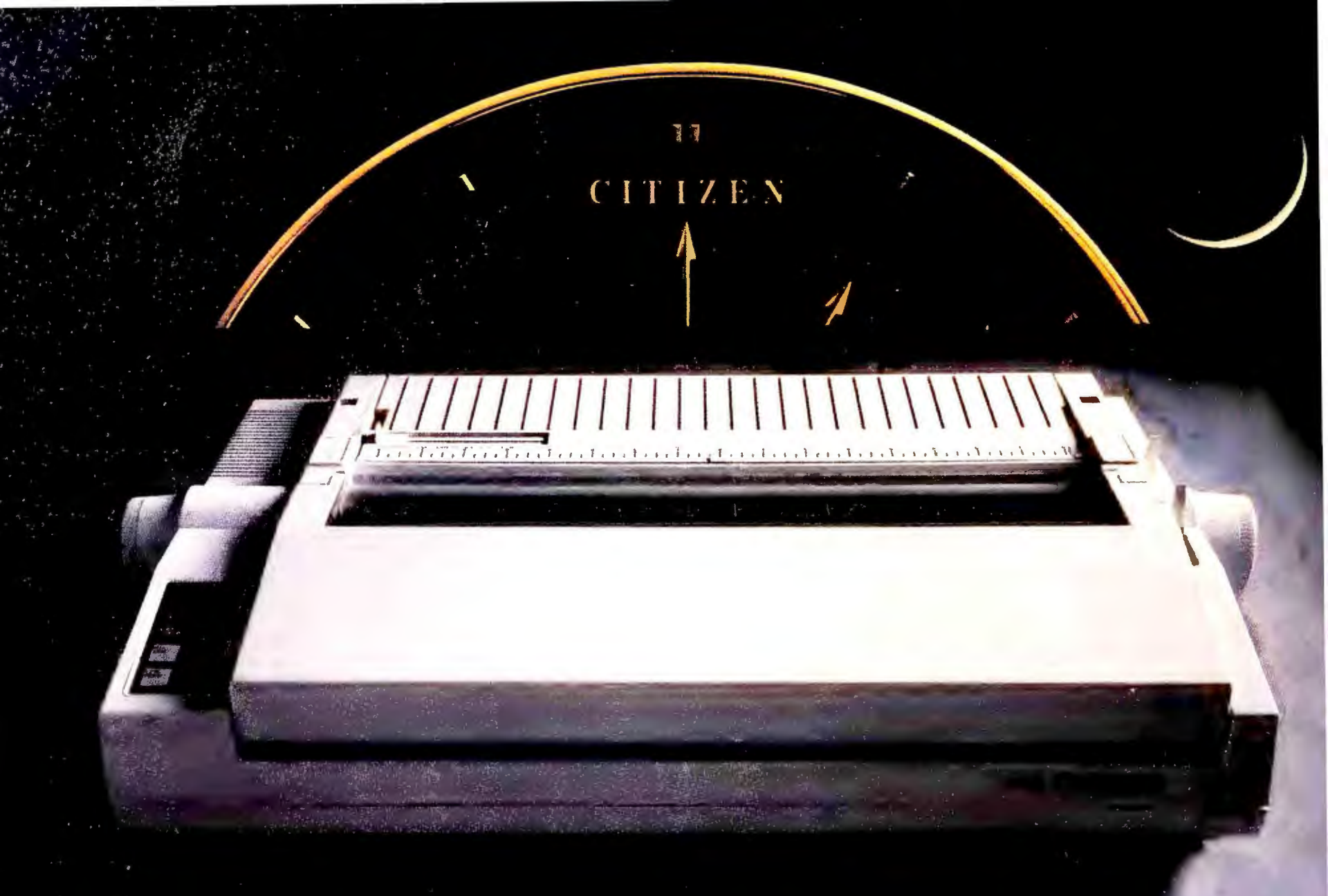

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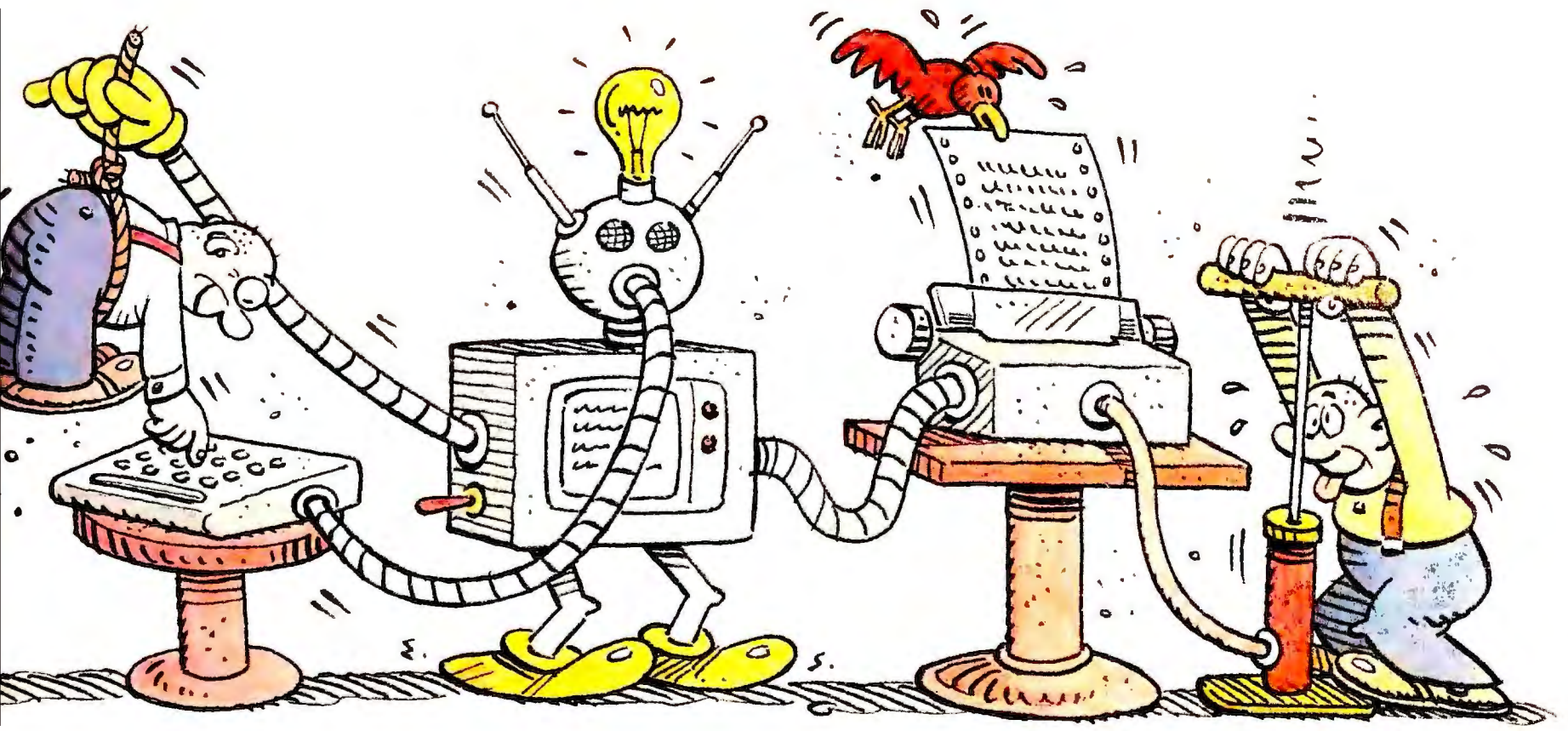

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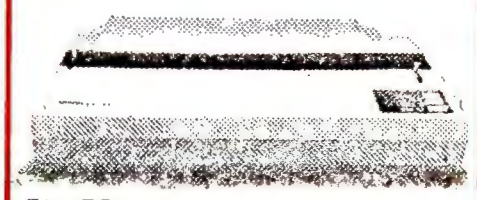

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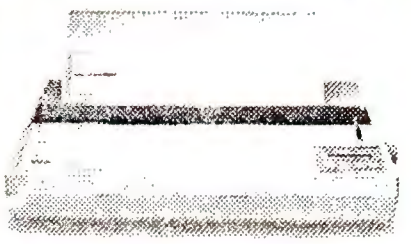

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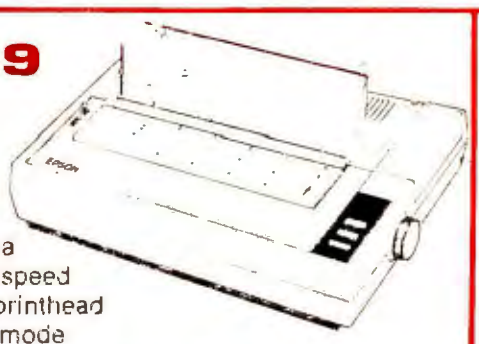

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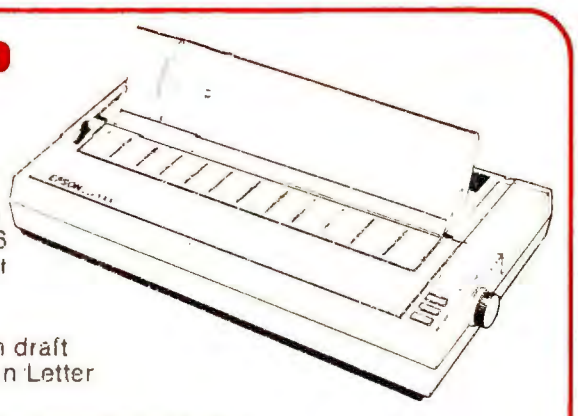

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In Pursuit of Tomorrow's PC

Reed McManus

The PC of the year 2000, described in the following pages, is a remarkable machine.

When *PC World* set out to assess what business-computer users could reasonably expect from a personal computer in the year 2000, we wanted to avoid heralding the beginning of the twenty-first century with exotic *Flash Gordon* and *Star Trek* fantasies; we wanted instead to present our readers with a thoughtful view of the next century's office-standard PC. After all, despite the mythical significance of the dawn of the twenty-first century, the event is but a scant 13 years off. So we decided that our forecasts should err on the side of conservatism: Better to be on target and slightly less exciting than colorful but off the mark.

But a funny thing happened. Once we had assembled our ideas, culled the farfetched, and debated the most promising and practical, we found ourselves staring at blueprints for a stunning personal computer—one we have every reason to believe will be widely available 10 to 13 years from now.

The office-standard personal computer at the turn of the century will be powered by fast parallel processors, read and write data on high-capacity optical disks, display data on extremely high-resolution CRTs or portable flat panel displays, and produce its output on typeset-quality color laser printers. Fiber optic digital networks will rapidly and efficiently telecommunicate data, voice, and video without modems.

These hardware developments will enable software to reach new

David Bishop

MICROPROCESSORS

STORAGE

heights; applications won't be hampered by slow processing speeds or limited memory or storage capacity. Software will be easy to use, employing artificial intelligence and natural language techniques to present seamless graphic and even vocal user interfaces.

DISPLAYS

As impressive as this machine sounds, we hope that a *PC World* reader in the year 2000, nostalgically thumbing through faded 1987 issues of the magazine, will get a hearty chuckle out of our conservative forecasts.

OUTPUT DEVICES

Our visions are, of necessity, reined in by what we now think personal computers are capable of. But innovation in the electronics industry is rapid, and the PC of 2000 may well be unimaginable by 1987 standards.

COMMUNICATIONS

After all, the microprocessor, the personal computer, the electronic spreadsheet, and the IBM PC were invented in the last 15 years.

SOFTWARE

And there's every reason to believe that the next 15 years will be just as productive. *Fortune* magazine estimates that by 2000 the electronics industry, already a $300-billion-a-year business, will more than triple to become the world's second largest industry after agriculture. Farsighted developers are already working on gallium arsenide chips and optical computers, which will literally accelerate computing to the speed of light. Unless you're a dyed-in-the-wool pessimist, looking back 10 years and playing "Who would have guessed . . . " will be as much fun in 1997 as it is in 1987. ● *Reed McManus is an Associate Editor of* PC World.

MICROPROCESSORS

Canny new conceptual approaches to processing may turn the PC into a desktop mainframe.

Ros Davidson

Comparing Intel's 80386 with the first microprocessor is rather like pitting the space shuttle against the Wright brothers' Kitty Hawk *Flyer.* In the 16 years since the debut of the 80386's humble 4-bit progenitor, microprocessing performance has taken a quantum leap. The 32-bit 80386 tucked inside the Compaq Deskpro 386 (and a whole new breed of minicomputer-like desktop systems) can process as many as 4 million instructions per second (MIPS). To those used to the poky performance of the PC's 8088, running an application on the Deskpro 386 is something of a revelation. But such revelations are only beginning.

As the drizzle of expert systems, graphics-oriented applications, and massive CD ROM data bases reaches monsoon force by the mid-1990s, performance demands will radically reshape the PC's microprocessor, bringing multitasking, artificially intelligent machines into the realm of reality. According to Siva Kumar, product manager for Intel's 80386, Intel microprocessors will easily attain speeds of 10 MIPS within the next few years. By the year 2000, the brains that drive the PC may whip through instructions at a bus-popping 30 MIPS—nearly half the speed of today's vaunted Cray-1 supercomputer.

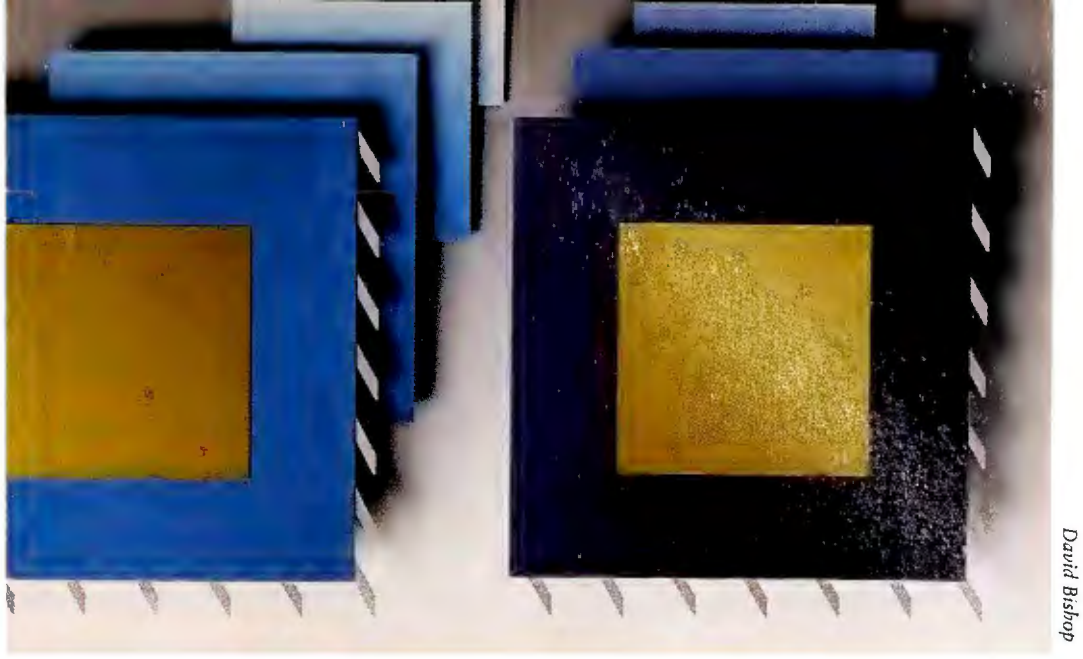
How the future PC will merge into this processing fast lane remains to be seen. To quench the thirst for ever-greater speeds, some researchers are exploring parallel-processing architectures. Dr. George Heilmeier, vice president and chief technical officer at Texas Instruments, flatly predicts that "by the late 1990s, the PC will no longer be a uniprocessor system." In addition to its general-purpose microprocessor, says Heilmeier, "the PC will have specific processors for such functions as AI, communications, and graphics," leading to vast increases in speed, performance, and functionality for users.

The serial-processing method championed by computer pioneer John von Neumann—and used by almost all PCs—tackles a problem step-by-step. Although structuring a computing task in such a linear fashion is easier, a price is paid in performance. Parallel-processing systems—where numerous processors simultaneously attack separate components of a problem and spit out an answer—may reduce that toll.

Building a parallel-processing PC is no pie-in-the-sky notion, according to Intel's Kumar. PC compatibles have already come to market using twin 80186 microprocessors; Intel's iPSC Hypercube mini-supercomputer, aimed at scientists and mathematicians, can pack in as many as 128 80286s working in tandem. Such a concept is hardly foreign: The 80386 is something of a parallel-processing system in miniature, executing one instruction while simultaneously decoding another and fetching a third.

Not surprisingly, the biggest obstacle to realizing this rosy scenario is software development. "Programmers need to unlearn sequential thinking," says Ray Asbury, programmer at Intel Scientific Computers in Beaverton, Oregon. Although mathematically repetitive operations—such as modeling the velocity of wind moving across an airplane wing—can easily be parceled out to multiple processors, other computing problems will demand the programming skills of a new generation of thinkers.

Because the first commercial parallel-processing systems for PCs will probably be expensive and complicated, they're likely to find a home with scientists, engineers, and others willing to bid high for hyperprocessing. Says Bob Harp, chairman of PC-compatible vendor Cordata, "Parallel architectures will initially inspire applications in specialized fields that



David Bishop

require massive calculations—such as image processing."

As parallel architectures take hold, specially designed parallel-processing chips and programming languages will only augment the architecture's speed and efficiency. Witness Inmos's Transputer, a microprocessor used in Floating Point Systems' T Series supercomputer that runs at an astonishing 10 MIPS. Four high-speed serial links built into the chip can send and receive data simultaneously at 20 million bits per second. According to Brad Hartman, microcomputer marketing manager at Inmos in Colorado Springs, Inmos's parallel-processing language, Occam, is "the most efficient way to use the Transputer because Occam's input/output instructions take advantage of the Transputer's high-speed links."

The Transputer also owes its celerity to its partial-RISC (reduced instruction set computer) architecture. In contrast to the 80386 and other chips that use complex instruction sets (called CISC architecture chips), RISC processors are encoded with fewer and simpler instructions. Consequently, RISC chips often outpace their more encumbered peers by executing a command at each microprocessor clock cycle.

But that speed advantage may be elusive. Skeptics rightly point out that RISC chips shift the computing burden to the operating system and applications software, which currently lag well behind hardware. Dana Krelle, Intel's technical manager for the 80386, identifies the marketplace realities affecting future acceptance of RISC technology: "Why invest money in RISC when you can get one instruction per clock cycle out of a contemporary microprocessor?"

Industrywide standardization on complex instruction set microprocessors is yet another factor. "CISC is deeply entrenched, and it's going to be very hard to change gears," says Charles Moore, inventor of the FORTH language and the NOVIX RISC chip. A case in point is IBM's RT/PC, a RISC-based multitasking, multiuser workstation that has failed to make significant inroads into its intended scientific market.

Still, the convergence of parallel processing and RISC technology for high-end PC applications such as CAD/CAM is very likely in the next ten years. Similarly, gallium arsenide, a metallic compound touted as the future semiconductor wonder, may appear in specialized systems by century's end. If some technological hurdles are cleared, gallium arsenide processors could work at least three times faster than their silicon counterparts.

"Silicon will be the standard for at least the next ten years," predicts Jeff Nutt, Motorola's technical marketing manager for the 68000 family. But major players such as IBM, Texas Instruments, and AT&T are investing millions of dollars in developing gallium arsenide chips, leading industry observers to speculate that the compound will play a prominent role in the high-priced, specialized PCs of the future.

Ultimately, "a roomful of computing power will shrink down to the desktop," says Peter Bergman, Epson's group product manager for the Equity line of PC compatibles. Future parallel-processing systems may well include task-specific microprocessors that "humanize" the PC, resulting in artificially intelligent programs that understand English and are capable of both speech recognition and speech synthesis. The HAL of *2001: A Space Odyssey* may not exist yet, but his grandfather is already on the drawing board.

Ros Davidson is a freelance writer in San Francisco.

STORAGE

Optical storage will shoulder the PC's workload, but today's mainstream storage technologies won't disappear.

Robert Luhn

To some, the term *storage* suggests a closet stuffed with last year's fashions or a musty attic piled to the rafters with back issues of *Popular Mechanics*. In the days when mainframe computers the size of Mack trucks were the only processing game in town, storage meant magnetic tape. Finding the right swatch of data involved electronically thumbing through hundreds of spools, hoisting the appropriate reel onto a deck, and drawing the data through an electronic straw at speeds languid by today's frenetic standards.

The hard disk changed all that, of course, and with the advent of the PC, the demands for fast, compact, high-capacity disk drives multiplied. In the words of one hard disk pioneer, PC users have become "speed demons, pure and simple." Not surprisingly, the XT's formerly advanced 85ms, 10MB hard disk drive now finds itself in the category once reserved for Edsels and Nehru jackets. Hard disk access times under 40ms and capacities of 20MB (and increasingly, 40MB) are now the standard; by the end of the 1990s, performance and storage requirements for the desktop PC will be considerably higher.

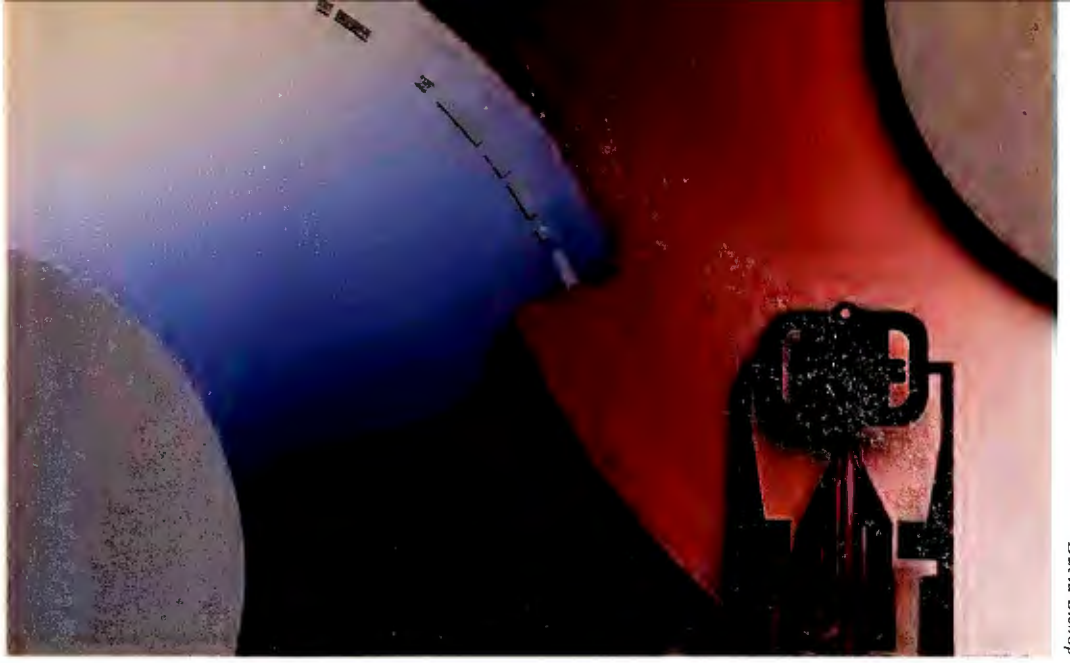
Small wonder. The typical business PC at the turn of the century will be capable of manipulating gigabytes of data, running a score of processes at once, and using voice recognition and expert systems to manage everyday affairs. "Software will drive the storage market," says E. Kevin Dahill, a senior vice president at Iomega. "When applications become effective desktop tools, you'll need massive amounts of storage and a portable medium of exchange." The question is, will a direct descendant of today's magnetic hard disk or the anticipated erasable optical disk play the central storage role?

If current venture funding is any indication, place your bets on optical. 3M has poured millions of dollars into the development of read/write media, and IBM has reportedly placed orders for optical disk drive manufacturing systems. As you might imagine, market analysts are positively bullish about the marriage of the optical disk and the PC.

"It's not a matter of if, but when," notes Ed Rothchild, publisher of *Optical Memory News*. "Read/write optical disk drives will replace almost all magnetic drives—particularly nonremovable drives—by 1997. I'd expect future PCs to rely on a 3½-inch read/write optical drive that can store 200MB to 300MB and costs less than $400." Adds Rothchild, "Two-inch drives holding 100MB are just as feasible. If powerful high-frequency diode lasers arrive on the scene, a 5¼-inch double-sided optical disk drive could easily store 1 gigabyte. Optical drives—especially in multiple-platter configurations—will match or exceed hard disk performance."

John Trifari, former director of corporate communications at Seagate Technology and president of a storage-oriented public relations firm, is less sanguine about the optical disk drive's prospects—at least as a high-speed storage device. "Read/write drives are still in the lab. Will they be able to match the performance of a 1997 hard disk? I don't think anyone knows the answer. It comes down to physics—how fast can you move a heavy optical read/write head that's essentially a collection of servos, lenses, and mirrors?"

James Porter, a longtime observer of the storage wars and publisher of *Disk/Trend Report*, believes that optical drives could succeed once a few performance hurdles are overcome. "Data transfer rates in current write-once drives are very slow," he explains, "because it takes a while for a laser to burn a pit in the optical



David Bishop

disk. Easily altered magnetic substrates and cheap, powerful lasers will solve that problem and allow you to spin the disk faster, boosting the data rate. And by 1997," continues Porter, "an integrated optics read/write head—essentially a feather-light fiber optic cable with lenses—will allow Winchester-like access times. When these pieces fall into place, the erasable optical disk drive will be fast enough for the office PC of the future—and plenty small enough for laptop machines."

If the ascendance of the optical disk drive is a foregone conclusion, where does the venerable magnetic hard disk fit into the future scheme of things? Those who sell disk drives for a living take the long view: "The hard disk isn't going to vanish—there are many cheap gains to be made in the future," asserts David Allen, founder and chairman of Tallgrass Technologies. "Anyone needing high performance—particularly in a network situation—will still turn to the hard disk. And I think you'll see a lot of PCs ten years from now that have 200MB hard disks with embedded SCSI (small computer systems interface) controllers acting as super-fast scratch pads, while removable read/write optical cartridges store the thousands of megabytes of digitized images, libraries, and so on."

And what of tape drives and the humble floppy? "The floppy disk is like the punch card—it's so cheap, I don't think it'll ever go away. But the handwriting is on the wall for tape drives," says Allen. Adds analyst Porter: "Don't forget, it's easier for a manufacturer to integrate a disk drive into a PC than it is to integrate a serial device like a tape backup system. They don't call it DOS for nothing."

In short, there's probably an erasable optical disk drive in the PC's future. "A lot of money is riding on this technology—and a lot of manufacturers are poised to take advantage of it," says Carl Rodia, a consultant to the optical disk manufacturing industry. Most industry insiders expect 3M's magnetic optical disk to dominate the read/write market through the 1990s and beyond. (Unlike contemporary write-once disks, which encode data as pits or bubbles permanently burned in with a laser, the 3M disk relies on a magnetic substrate that is heated by a laser and then encoded with a magnetic read/write head like that of a hard disk.) If, as Iomega's Dahill hints, the optical disk is eventually transformed by Bernoulli technology, flexible read/write optical disks could go for a pittance.

Of course, even educated guesses are notoriously shortsighted. The microprocessor was an inspired accident that few foresaw; similar surprises may await the PC. Developments in solid-state physics could result in a slim 2-by-3-inch card that packs megabytes of data in nonvolatile integrated circuits, rendering spinning platters and optical storage techniques obsolete overnight.

But bright ideas that momentarily capture both the spotlight and the R&D money must still overcome the technological status quo. "The hard disk has tremendous inertia," notes Ed Rothchild. But he wryly adds, "It's no coincidence that almost every major hard disk manufacturer is scrambling to get into optical technology."

Robert Luhn is a Senior Associate Editor for PC World.

DISPLAYS

Thanks to new advances in liquid crystal displays, high-resolution flat screens will usher in a new generation of portable PCs.

Eric Knorr

The shape of displays to come depends not on *how* you look at it, but *where*. For the next 10 to 15 years, traditional cathode ray tube (CRT) displays will continue to dominate the desktop. But if the PC of the future is to fulfill its promise as a convenient "informative appliance" in addition to performing its current role as a computing tool, it must be compact and portable. Only flat screen liquid crystal display (LCD) technology will offer the slim profile and low power consumption necessary for truly mobile computing.

Jack Grimes, graphics product line architect for Intel, points to the Dynabook concept proposed by Alan Kay, creator of the icon-oriented user interface adapted by the Macintosh, *GEM*, and *Microsoft Windows*. "When he joined Xerox, Kay envisioned a very lightweight, notebook-size computer with a typeset-quality display. You'd carry it around and work where you wanted to ... under a tree, wherever. The only display technology we know of now with low enough power consumption for that kind of portability is liquid crystal."

Most LCDs use a thin film of electrokinetic fluid sandwiched between two glass plates. Charges are carried to discrete points in the fluid by a grid of invisible filaments. One charge is sent through a filament on the display's horizontal axis and another through a filament on the vertical axis, creating a dark pixel where the filaments intersect. The main problem with this method is that when a group of filaments is stimulated, some of the charges leak into other areas of the fluid and muddy the resolution. Industry analysts agree that the most promising solution to this problem is *active-matrix* addressing.

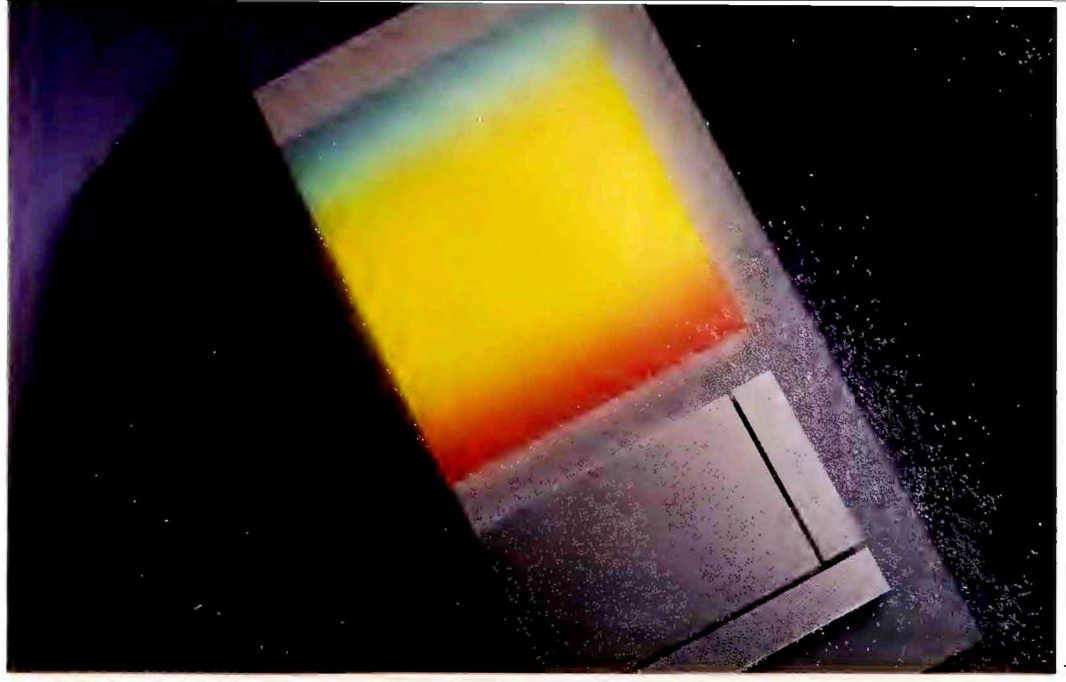
Instead of filaments, active matrixes use a transparent screen of transistors in the fluid. Intersecting charges are replaced by direct addressing, as with RAM chips. The electrically isolated transistors are set on or off, which eliminates screen refresh and produces a sharper display.

Active-matrix research augurs well for the LCD's future. "In less than 15 years the typical monochrome display will be an active-matrix LCD," says Andrew Czernek, marketing director for Zenith Data Systems. "One thousand lines is not out of the question." That would be about three times the resolution of current monochrome CRT displays.

George Fabel, director of imaging research for Techtronics, an LCD development firm, has even higher hopes for LCD technology. "My guess is that LCDs will be about a thousand lines *and* have color capability."

Given the stumbling blocks on the road to color LCDs, many would quarrel with the latter half of Fabel's prediction. An LCD reflects or absorbs white light, an arrangement not conducive to color display. Color LCDs must use backlighting combined with red, green, and blue filters, one color for each of the three dots that make up a color pixel. The dots act as shutters, blocking light or letting it pass through the filters.

Today's most stunning LCDs use low-power electroluminescent (EL) backlighting panels, which house a thin layer of phosphor that glows softly when current is applied. But because color filters are translucent rather than transparent, EL brightness is insufficient for illuminating color LCDs,



David Bishop

leaving fluorescent backlighting as the only known workable alternative. But fluorescent backlighting has two drawbacks: high power consumption and uneven distribution of light. Consequently, some of the most intensive LCD research is focused on the development of efficient fluorescent lighting.

No matter how bright the backlight, a number of researchers question the aesthetics of color LCDs. Although the appropriate color phosphors have yet to be discovered, a color EL display would be far more attractive than an LCD. According to Elliot Schlam, director of the integrated device processing and displays division of LABCOM, a military display research company, "EL displays emit light, while LCDs require light. EL displays simply look better."

However, EL displays are currently two to three times more expensive, three times more power hungry, and much heavier than their LCD siblings. Another popular emissive display type, gas plasma, shares EL's appetite for watts. And because EL and gas plasma displays are designed to shed light rather than reflect it, they'll never approach the low power consumption of LCDs.

But the biggest impediment to all flat screen displays is manufacturing technology. Assembling a matrix with all its required transistors is, reports Leonard Dietch, like constructing an "eight-by-ten silicon chip." Dietch, vice president of research and development for Zenith's systems components group, says, "The quality control issues are staggering. Even in maturity the manufacturing costs will be far greater than those of CRTs." And for the oversize, wall-mounted LCDs that some envision as the deskbound display of the future, cost and quality issues will loom even larger.

Walter Goede, section manager of tactical avionics at Northrop Electronics, estimates that it would take at least $50 million to $100 million to develop the manufacturing technology necessary to produce the display for Alan Kay's Dynabook. Zenith's Dietch, an unabashed proponent of CRTs, puts it more cynically: "I first heard that the flat panel would replace the CRT 37 years ago. We're still waiting."

No matter how compelling the future for flat panel displays, few analysts suggest that the CRT will be defunct in 10 to 15 years. In fact, most experts feel that in 10 years CRTs with the resolution and palette of today's color photolithography will be commonplace, while the quality of currently nascent color LCDs will barely equal that of today's Enhanced Graphics Adapter. The real issue is whether deskbound PCs and CRTs will still make up the backbone of personal computing, or whether the PC of the next millennium will be the portable, personal device Alan Kay envisions. If the future PC is a slim computer-to-go, place your bets now that the active-matrix LCD will be the display of choice.

Eric Knorr is a Senior Associate Editor for PC World.

Output Devices

Higher-resolution versions of today's laser printers will provide the hard copy of the future.

Timothy Onosko

For PC printers, the future is already here. The laser's hair-thin beam is lighting the way for impact printing's exit. "Lasers will completely supplant impact technology," predicts John Warnock, founder of Adobe Systems and coauthor of the PostScript page description language. "Daisy wheels, dot matrix printers, and pen plotters will become things of the past."

Laser printers use an electrophotographic process in which a beam of coherent light creates a charged image on a photoreceptive metal drum. Toner particles stick to the image, which the drum rolls onto a sheet of paper (see "Laser Printers," *PCW,* Vol. 2, No. 10). This process supports high-resolution text and graphics on the same page and produces output faster than impact printers and at far lower noise levels.

Although laser technology may share the spotlight with other nonimpact electrophotographic processes—including those involving liquid crystal shutters, light-emitting diodes, and ion deposition—these nascent methods have significant obstacles to overcome. The laser's tried-and-true printing method, essentially the same process that photocopy machines use, gives it the edge over these electrophotographic technologies. "The laser's history as a print technology provides a solid base for technological innovation," says Bill White, vice president for advanced technology at Xerox. "It's going to be around for a long, long time."

The first landmark along the laser's evolutionary path is higher print resolution. Today, 300 dots per inch (dpi) is a de facto standard for laser printers. Higher resolutions present no inherent technical problems for the electrophotographic process.

In fact, a key factor holding resolution at 300 dpi is the cost of manufacturing print controllers with the added memory and faster microprocessors necessary for printing at high resolutions and acceptable speeds. "It takes at least 25 megabytes to print at 1000 dpi. Add that to the printer's price, and the cost is too high at the desktop level," says David Spencer of DRS, a high-resolution laser print engine manufacturer. "We might be able to do it now, but tomorrow we'll be able to do it cheaper."

By the year 2000, desktop lasers will push the resolution envelope to 1000 dpi and higher. According to Frank Rowe, vice president of Colorocs, a laser print engine manufacturer, "The engines are capable of higher resolutions right now. It's just a question of developing print controllers and optics that are precise enough to lay down all the dots that compose a high-resolution image accurately on the photoreceptor."

Printware, another laser print engine manufacturer, offers one of the most promising high-resolution solutions. The company's resonant galvanometer is a semiconductor device that replaces the multisided rotating mirror found in most laser printers. Its single mirror can focus a narrow laser beam on the photoreceptive drum

David Bishop

to within a few microns. Printware plans to put its resonant galvanometer into a laser printer capable of producing output at 1200-by-600-dpi resolution.

As laser printing becomes more precise, it will also become more colorful. Laser printer manufacturers such as QMS, AST, and Xerox have already hinted that color lasers are on the way (see "The Color of the Future," *PCW*, February 1987). Through the use of a four-color printing process, near-magazine-quality color printing may be common in future office laser printers. "Color technology exists now and is just waiting for a market to develop," says Roger Archibald, product manager for laser printers at Hewlett-Packard.

In addition to color, specialized applications may require output in more than two dimensions. Advanced printers that produce laser-generated images called holograms will usher in a new era of three-dimensional hard copy.

A hologram is an interference pattern produced when one half of a split laser beam bounces off an object and recombines with the other half of the beam on a photographic plate. When the developed plate is illuminated, it acts as a diffraction grating, producing two images. Your eyes combine the images and the object appears three-dimensional.

Holographic printers could be a reality in the very near future. According to Chris Outwater, president of Advanced Dimensional Displays, "There's no fantastic new technology that has to be developed to produce a holographic printer. I'm not saying it's going to be easy, but all the pieces are here."

Outwater likens the holographic printer to a three-dimensional plotter that will produce both wireframe and "solid" 3-D models of objects. Such a printer would, for example, enable architects to show a client in three dimensions how a work space fits into an overall office system or provide engineers with a precise image of a structural design to share at a department meeting.

Outwater also predicts that the medical profession will use holographic printers to convert X rays and CAT scan data into lifelike three-dimensional pictures. "Holograms will present doctors with a unique window into the body by placing a three-dimensional image of a living human organ in their hands before surgery begins."

If holographic printers sound farfetched, Bill White of Xerox speculates that they may be just a foreshadowing of printers to come. Says White, "The state of the art for hard copy output devices is moving so fast that by the late 1990s we'll probably be using printers that we haven't even imagined today." ●

Timothy Onosko is a writer specializing in technology and popular culture.

COMMUNICATIONS

Integrated Services Digital Networks will radically change the rules of the PC communications game.

Eric Brown

Although analysts strongly disagree about the exact shape of PC communications in the year 2000, they all seem to accept one key point: By the turn of the century, the Integrated Services Digital Network (ISDN) will have replaced the analog phone line in most businesses, if not the majority of homes.

ISDN, which should provide two 64-kilobit channels and one 16-kilobit channel on a single phone line, will offer clean, digital lines for the simultaneous transmission of voice and data in various forms. ISDN will also furnish the bandwidth necessary to keep up with the powerful, bit-mapped PCs of the future.

"By the year 2000, ISDN will probably be widely available," says Will Zachmann, vice president for research at International Development Corporation (IDC). "If that comes to pass, you won't have modems. Instead, you'll have terminal adapter interfaces built into PCs."

However, the transition from analog won't take place overnight, according to Gregory Pearson, vice president for technology planning at modem manufacturer Microcom. "By the turn of the century, we're going to have ISDN," he says, "but whether ISDN will get into everyone's home is another question. Analog is going to be with us for a long time."

"By 1995, ISDN should be well entrenched in corporate America," predicts Leonard Kleinrock, computer science professor at the University of California at Los Angeles and president of Technology Transfer Institute, a Santa Monica-based consulting firm. "However, ISDN may not become the primary access to the home. Cable TV is another possibility."

Several analysts agree with Kleinrock that cable may provide a ready-made, two-way, high-bandwidth data conduit between homes and electronic services. As a prelude to fiber optic ISDN, cable could meet the increased demand for home communications in the nineties. Teamed with optical disk storage, cable could provide a multichannel, interactive medium for a stable of PC-controlled, integrated home entertainment systems.

David Ferris, a communications consultant and president of Ferrin Corporation, believes that ISDN, as well as fiber optic local area networks (LANs), will be necessary at the corporate level to keep pace with the data processing muscle of future PCs. "The communications links we have now will be grossly inadequate in 15 years," says Ferris. "PCs are going to pass around data structures that are much larger than they are today. High-resolution graphics and moving images will require higher data rates, perhaps hundreds of megabits per second."

Even though the "Year of the LAN" continues to be postponed, most observers believe that it's only a matter of time before local area networks take off. "By the year 2000, there will be very few PCs that will not be connected to LANs," says Ferris. "And most LANs will be connected to corporate communications networks."

Kleinrock predicts that the PC of the year 2000 will be a 32-bit, bit-mapped graphics workstation with tremendous storage capacity. Tied together by fiber optic LANs, such PCs will replace many mainframes and minicomputers. "The world is full of PCs," says Klein-

David Bishop

rock, "but most of the time they sit on desks and do nothing. What better way to take advantage of idle PCs than to off-load background work from mainframes?"

The Integrated Voice Data Terminal (IVDT)—a PC with built-in telephone and voice-mail messaging—is another much-ballyhooed technology that won't carve out a niche until the next millennium. "IVDT has been monstrously overhyped," scoffs IDC's Zachmann. "Put a phone on a computer? You could do that with Apple IIs back in the seventies."

Microcom's Pearson agrees that 1987 is not ripe for telecomputers, but he sees IVDT playing a significant role in the future. "If ISDN comes along, there might be a logical reason for having voice and data processed by a single machine," he says.

Kleinrock disagrees: "They're selling ISDN on the claim that it mixes voice and data, but that's not the real issue. The key benefit is in transmitting images." Kleinrock believes that voice-recognition technology needs to mature before voice mail takes off. "IVDT hasn't reached the stage it should. You need not only to copy voice but to understand speech."

Modem vendors may look uneasily toward ISDN's modemless future, but there are still a lot of modems to be sold until ISDN becomes a reality. Most analysts expect 9600 bits per second (bps) to be the most common modem speed by 2000; some are more optimistic. "The bare minimum will be 19,200 bps," predicts Richard de Mornay, vice president of marketing for Norton-Lambert, maker of *Lync* and *CloseUp* communications software. "There will be no 1200- or 2400-bps modems."

But speed won't be modem manufacturers' only concern. Modems will be more intelligent, assuming some of the PC's computing burdens. "As modems become more microprocessor-driven, you can have built-in error correction and data compression," says Pearson. "Some people mention built-in encryption as the next big thing."

Spurred by the development of ISDN, interactive, consumer-based videotex may be a part of daily life by century's end. As in every facet of PC communications, videotex's success hinges on ISDN's success. With proper software development, ISDN should be able to handle high-speed transmission of not only graphics videotex but also voice, text, music, and moving images.

So how will your PC communicate in the year 2000? At the office you'll be in command of a 32-bit, bit-mapped PC connected to other computers by a fiber optic LAN. Via sophisticated, concurrent windowing software and a terminal adapter, you'll be hooked into an ISDN data line to other offices and on-line services. At home, your PC will be connected to the outside world by one or a combination of the following media: ISDN, cable TV, and existing analog phone lines; and possibly by satellite, FM sideband, or cellular modem. You might even have a video telephone. But you won't need that touch of high technology to know the twenty-first century has already arrived.

Eric Brown is a Contributing Editor of PC World.

SOFTWARE

Charles Seiter

and

Daniel Ben-Horin

Desktop consultants, voice-driven programs, multilingual word processing, and free-form data bases lie ahead for the PC.

If nothing else, the software of the future will meet you more than halfway. When you walk into an office in 1998, the PC will sense your presence, switch itself on, and promptly deliver your overnight E-mail, sorted in order of importance. For a lot of people, the workday could start all too smoothly.

Suppose that the most urgent message concerns a lost shipment from Osaka. You load an English-to-Japanese word processor, speak into a microphone, and "write" a letter simultaneously in both languages. End the session, and the program automatically telecommunicates the message to the client in Japan, cc's your boss, and files a copy away in the company's cross-indexed optical disk archives. If the shipment were from an English or American supplier, you might set up a voice/video teleconference via PC and direct the program to transcribe the conversation and display a summary of past meetings and transactions to all those electronically present.

Sound like fiction? Given a few gigabytes of RAM, a 60-MHz 32-bit processor, and the right development tools, software developers feel they can give us such applications within the next ten years.

Before the day comes when the office PC will do everything but change the baby, however, engineers will have to iron out the basic problem of connection: how to connect PCs to other computers, to data, and most important, to the people who use them.

Right now, probably the most frustrating part of personal computing is getting things to work together. Yet most software experts feel that seamlessly linking future PCs to incompatible systems—particularly to their larger IBM cousins—will be a given by century's end. The keys? More powerful microprocessors, vast amounts of memory, and network software that enables PCs to share another system's processing work load.

As the PC evolves from a dumb terminal emulator into a smart, fully powered workstation, there won't be any real reason to keep data locked up in a mainframe.

For one thing, differing data formats will be a thing of the past. "All data created with one program will be accessible to all other programs," notes *dBASE* creator C. Wayne Ratliff, who ought to know. Ratliff is working to establish a data storage system that will enable users to keep the interface they're familiar with, such as that of *1-2-3* or *dBASE II*, while producing files that can be read and used by any other program.

But breaking down the hardware and software barriers that prevent data from moving freely is only part of the picture. PC users will need intelligent retrieval sys-

David Bishop

tems that can sift through the oceans of information stored in a mainframe or on a CD ROM.

Dan Shafer, author of *Silicon Visions* (A Brady Book, Prentice-Hall, New York, 1986), anticipates the development of "advisory systems" that will cull the appropriate information from various data bases, apply it to problems, and tell their human masters what to do. Tapping an array of legal and financial data bases, one system might suggest that a company shift its international operations while another helps a group of attorneys map strategy in a complex antitrust action.

The most dramatic software change is likely to occur in the one place where developers hope it will be noticed least: the interface between people and their machines.

Charles Simonyi and John Butler of Microsoft point out that programs that enable users to design or modify menus are the first steps toward such personalized software. "You'll see the interface of your program evolve as you use it," says Simonyi. "That means lots of help for beginners and powerful features for the now-neglected advanced user."

It's almost a commonplace to say that the link between human talent and program abilities will be artificial intelligence (AI). Bob Frankston of Lotus expects to see AI "diffused into the woodwork" in both traditional programs and development systems. This means that programming tools will wind up in the hands of people from noncomputer disciplines, which might send a blast of fresh air through the whole field of software creation.

For all the brave talk, though, nobody really expects personal computer software to take such leaps overnight. As Morton Rosenthal of Corporate Software wryly notes, "Seventy percent of the corporate *1-2-3* users still haven't upgraded to release 2." And because of its innate conservatism, the marketplace often brakes developments where it should be spurring them on.

Still, human imagination has a way of outstripping constraints. What makes the future exciting are those things we can't yet imagine. "The really dazzling new application is probably something none of us have thought of yet," says an industry observer. "And the author of that program is probably a ten-year-old kid in Nebraska who will drop out of college in disgust at our stodgy corporate software—and revolutionize the business!"

Charles Seiter is a Northern California writer and consultant on scientific programming and computer languages. Daniel Ben-Horin is a journalist and computer consultant in San Francisco.

Twelve Steps to Better Menus

Want to impart a professional touch to your turnkey application? Let a software luminary shine some light on the fine points of menu making.

Robert Carr

Menu. The very word beckons, promising a tantalizing array of options.

With the smorgasbord of PC software, menus abound; they assume every imaginable shape, color, direction, style, and key combination. Whatever the guise, menus remain the primary means of presenting program choices and the principal way users make things happen in software. Just as there are fine restaurants and fly-in-the-soup beaneries, menuing systems vary from four-star to the kind that send you groping for the antacid.

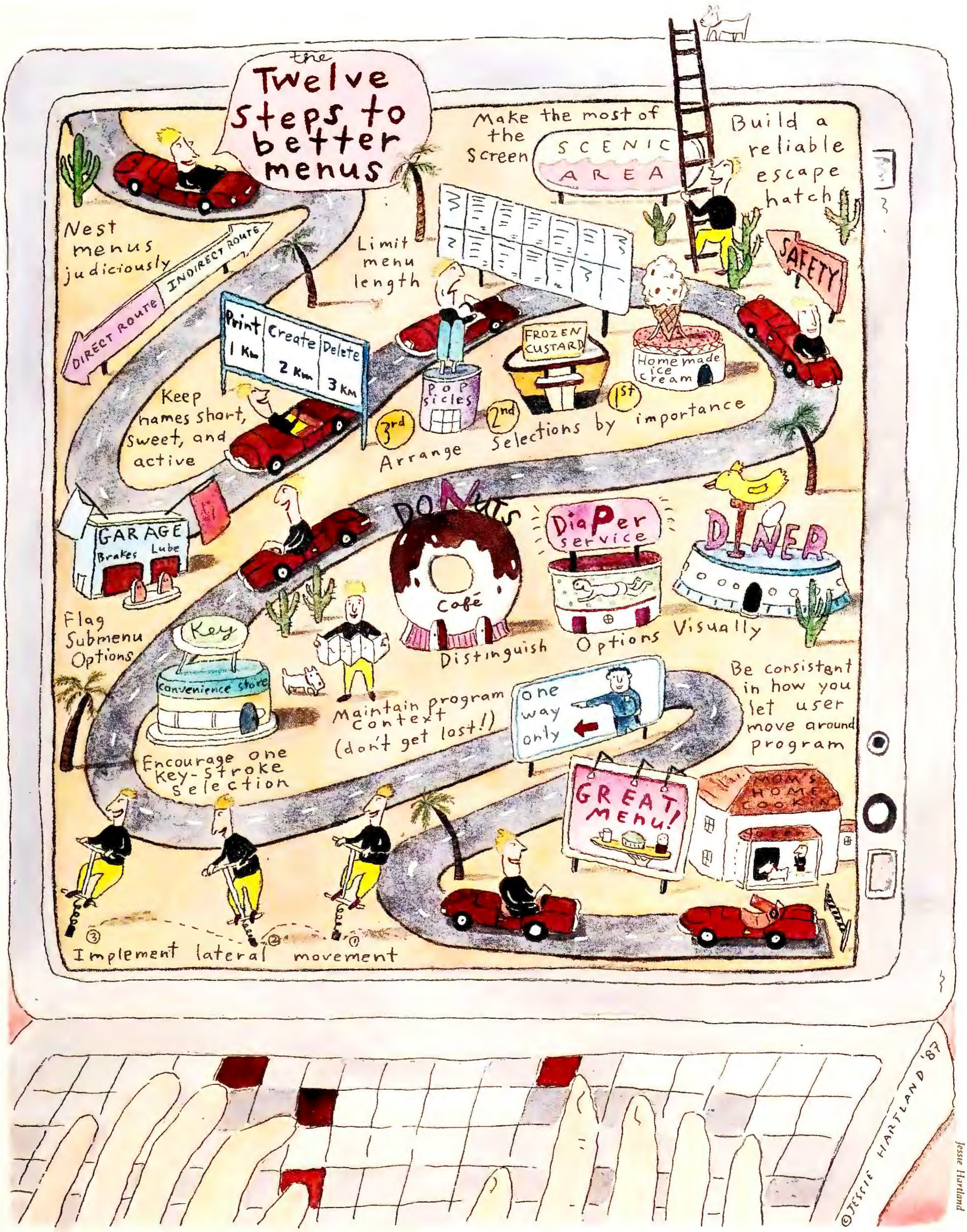
An appreciation of menu design elements (and their effects) will assist you both as a developer of office turnkey applications and as a software consumer. You can craft menus from programs in a range of genres: Solid candidates include macro processors such as *Keyworks, Metro,* and *SuperKey;* data management systems like *R:base, DataFlex,* and *Paradox;* spreadsheets-cum-environments like *1-2-3* and *Framework II;* and the growing number of application utilities and compilers (see "Transfer of Power," *PCW,* July 1985 and "SuperKey Creates Custom Tutorials," *PCW,* November 1986). Your choice of program will, of course, depend on whether you need to create a shell around several applications or build menus within a single environment.

Virtually all PC applications—custom and commercial—are erected on a network of menus that serves as the primary command interface. Menus simplify learning and using software, and the best menuing systems make the most of screen real estate—always a precious commodity. Although major differences separate commercial software from the applications you may be working on, in-house developers can learn much from off-the-shelf products. The 12 rules of thumb that follow will help you create menuing systems as effective as those designed by professional programmers.

1. Make the Most of the Screen

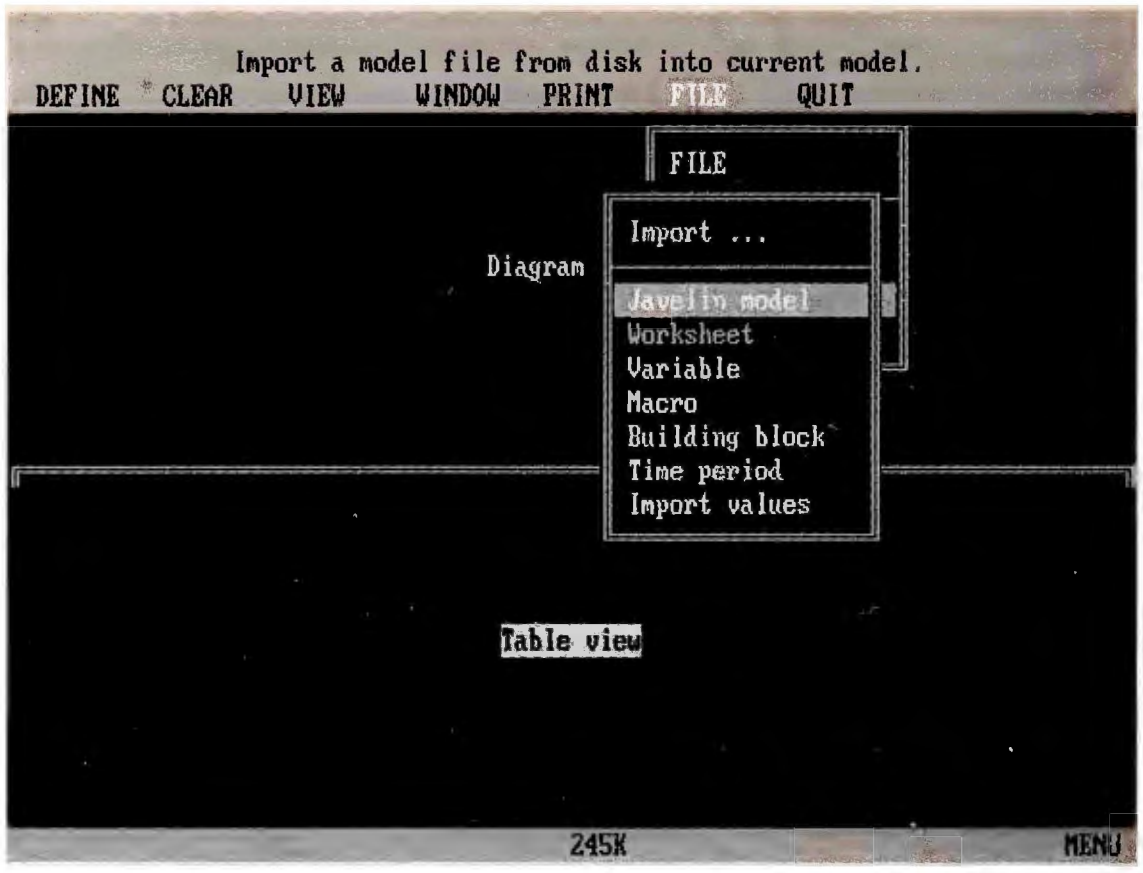
In commercial PC programs and tailor-made applications alike, menus fall into two major categories: vertical list and horizontal list.

The *1-2-3* command line exemplifies the horizontal list orientation: All its options extend across a single line at the top of the screen. Horizontal menus can just as easily be displayed across the bottom of the screen in familiar Microsoft style. Although both top and bottom menus work well, the top-line position tends to greet most users at eye level. Horizontal menus generally vanish from the screen during data entry or routine program operation.

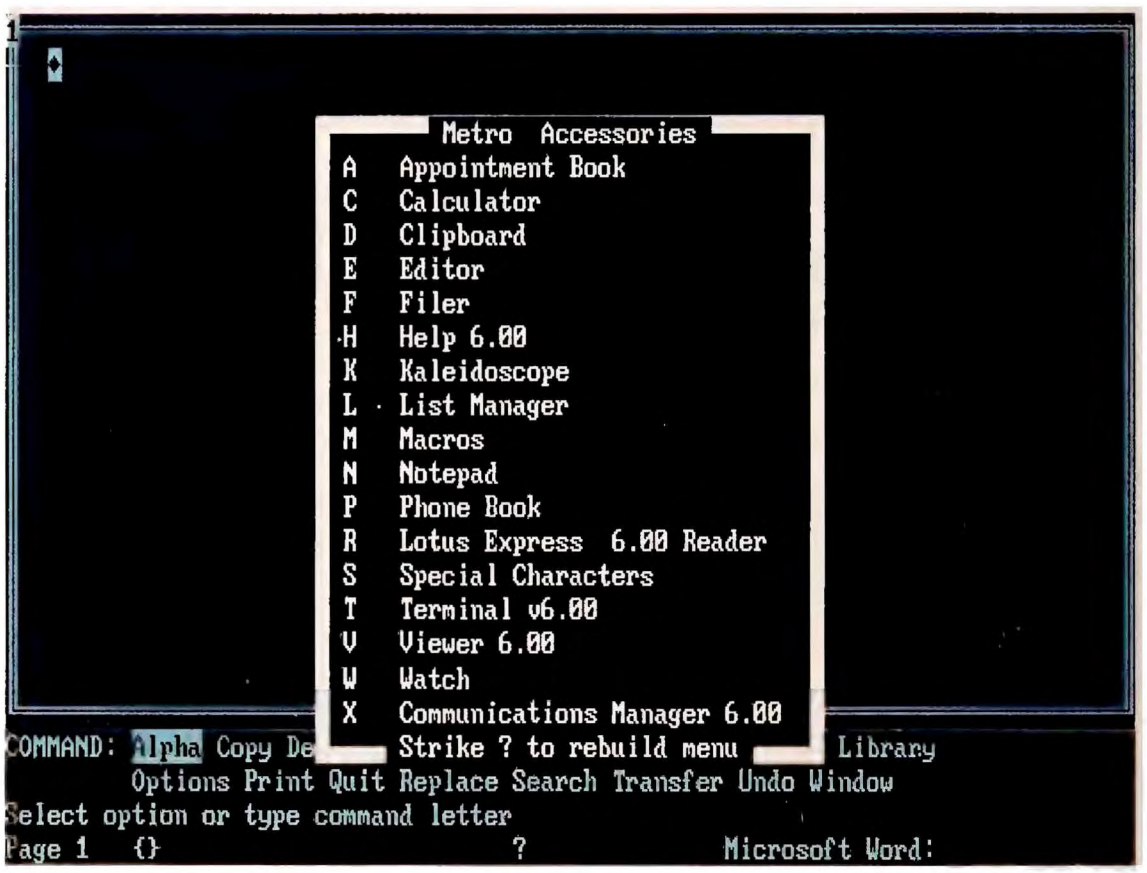


Jessie Hartland

Screen 1: Pulldown menus—like those in Javelin—excel at conveying the user's current context. Users can retain their bearings even three levels deep in the action.



Screen 2: Lotus Metro announces itself with a pop-up menu that, although substantial, doesn't completely obscure the primary application. In this instance, it leaves room for Microsoft Word's two-line horizontal menu.



Some horizontal menus run to two lines. As a rule, such a raft of choices exacts a price in reduced efficiency: Users may have to forage through the menu for the appropriate option.

Vertical menus come in three flavors: pulldown, pop-up, and full screen. The pulldown menu descends from the horizontal top-line menu bar. *Reflex, Javelin, Microsoft Windows,* and *GEM* applications all use pulldowns to good effect (see Screen 1). Pop-up menus do just what the name implies; they pop up before you on screen, seemingly from nowhere. Pop-up menus are most common in RAM-resident utilities such as *SideKick* and *Metro;* their talent for claiming a chunk of the stage goes hand in glove with their quick availability (see Screen 2). Although most program designs place pop-ups in the same place on screen, good design dictates a freedom to park menus

anywhere you like. Some programs are smart enough to locate the pop-up menu as far away from the current cursor position as possible.

Full-screen menus take over the entire display, generally itemizing options down the center of the screen. Such menus are well suited to novice users or canned data base applications. The full-screen approach does restrict flexibility as users gain experience; while the menu is displayed, the screen is obviously off limits for viewing or manipulating data. Alpha Software's *Alpha/three* is an example of full-screen menus at their best (see Screen 3).

2. Maintain Program Context

Whatever its form, a menu system should provide the clearest possible sense of context. That is, menus should make it easy for users to know where they are in the application and which menu path they followed to get there (and can retrace to exit).

Although pulldown and pop-up menus obscure portions of the screen, they do so for good reason. Where a full-screen menu takes over the display and a horizontal menu wipes out the preceding menu, pulldown menus intrude on the action just enough to provide program context and make room for menu contents. When the user is working through a menu, finding and issuing a menu command is clearly more important than displaying every last pixel of the application.

3. Build a Reliable Escape Hatch

Compare *Javelin* with *1-2-3* (see Screen 1). Note how *Javelin*'s pulldown menus trace the path taken to the current location, three levels deep in the action.

Horizontal menus use screen space economically but consequently give users just a smattering of information. You've got a scant 80 characters to play with, so command names must be short. Furthermore, it's difficult to skim the litany of choices quickly since they're not lined up in a column—the beginning of each new command must be identified before you move on to the next.

A vertical menu list, by contrast, is easy to skim if the left edges of the options are aligned. (For most of us, after all, list making is a vertical, not a horizontal, exercise.) By using left indentation to reflect the program hierarchy, full-screen menus help users gain their bearings.

Because pulldowns are actually hybrids, they have an edge over other menu designs. By mixing a horizontal top-line menu with vertical list menus, pulldowns achieve both efficient use of screen space and easy readability of vertical lists. More important, they inform users of their place in the menu system.

4. Limit Menu Length

The length of a given menu is almost as much a matter of aesthetics as it is a function of the menu style you've chosen. Horizontal list menus are limited to 80 characters per line, including spaces. Vertical list menus cannot extend beyond the 25-line display; the better ones don't even approach that limit.

The rule of thumb is to restrict menus to between four and ten options. A group of fewer than four commands doesn't warrant a separate menu; anything in excess of ten items is likely to be intimidating or self-defeating. Psychologists suggest that comprehension and recall are easiest with seven or fewer items.

Still, these are not hard-and-fast rules. If a vertical menu contains more than seven items, you can fashion subgroups within that menu. You can segment vertical lists with horizontal lines. Using another alternative, panel menus, you can present as many as two dozen commands in a well-divided assemblage of subgroups (see Screen 4).

5. Nest Menus Judiciously

Menu commands needn't do all the work; they can delegate program functions to menus elsewhere in the program. A command that invokes another menu (rather than executing a program function) hands the action off to what is known as a *submenu,* or a *nested* menu; the originating menu then becomes the *parent* menu.

In general, menus are nested for two reasons: The system contains too many options to fit in a single set of top-level menus; or a set of options (such as margin settings for printing) logically belongs underneath a command (such as Print) in a higher-level menu.

Try to avoid multiple-level nesting. Where menuing systems are concerned, broad and shallow is better than deep. Just as a single hallway that opens onto

nine rooms represents a more efficient design than a hallway that branches to just three rooms, each of which leads to another and then another still, so menu layouts should be simple and direct.

6. Arrange Selections by Importance

If your menus must go deeper, build lower-level menus from options likely to be accessed infrequently. If you're unsure which commands will be invoked most frequently, query prospective users or monitor their preferences by prototyping your system.

The placement of selections within each menu is critical. It's generally wise to list the more frequently used options at the top or left side of the menu, consigning less popular options to the bottom or right. Submenus should be placed at the bottom as well. Once again, if you're not clear which options users are apt to favor, do a little real-world research.

In addition to ordering menu selections by frequency of use, it's essential to group options according to their meaning. At the highest level, this means placing related options together, such as all file-related commands (Directory, Save, Load, and so on). For less obvious functions, use major categories such as updating, locating, or reporting as organizing concepts to gather options into purposeful menus. Your menu design will in turn help users obtain a conceptual grasp of the application.

7. Keep Names Short, Sweet, and Active

In general, effective naming of menu options is like good writing: concise and to the point. Names should be brief and immediately intelligible to users skimming the list for the appropriate choice. Long names—especially if they include words of 9 letters or more—invariably force users to apply the brakes.

Commands that invoke an action are best described with active verbs like Create, Delete, and Print. Option submenus should directly reflect the parent menu names such as Format Options or Recalc Options. Two or three words per name is plenty; if a user requires more information, on-line help should be available. Use uppercase letters sparingly; initial capitals and lowercase letters are easier to read than all uppercase.

8. Flag Submenu Options

Users should need only a quick look to distinguish a selection that leads to a submenu from one that triggers a program action. Consider clearly marking submenus by placing arrowheads to the left of the option (see Screen 4), or adding a trailing ellipsis to the name, as *Microsoft Word* dictates. The former method has one big advantage: Because the leading mark appears immediately before the option name, users needn't scan the screen for it as they might for trailing ellipses. Either approach, however, is better than neglecting to flag an option that yields a submenu. You may indeed use both without cluttering the look of the menu. Remember: Users will want (and should be encouraged) to browse through submenus.

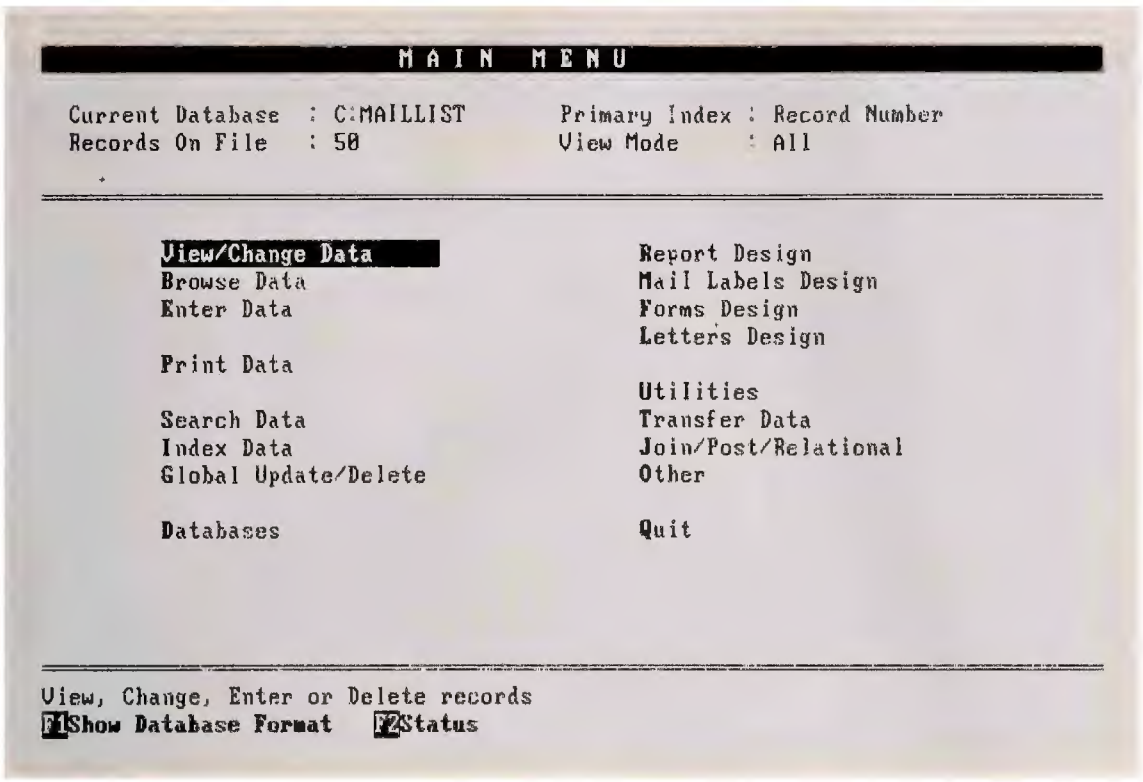
9. Encourage One-Keystroke Selection

Gastronomically speaking, it's not simply what you order, but how: You can lodge a request in impeccable Frénch or bark into the belly of a drive-in robot. Invoking menu options is a similarly varied exercise. Three approaches predominate.

With the point-and-shoot method, the user moves a highlight bar from option to option and ratifies selections by pressing <Enter>. If your menu-making environment permits you to highlight commands, try to accommodate *wraparound.* In a vertical menu, wraparound is simply the process of using <CursorDown> to move the highlight bar from the bottom option to the top; pressing <CursorUp> from the top option likewise moves the bar to the bottom option. In a horizontal menu, <CursorLeft> and <CursorRight> should also wrap around to the other end. In addition, <Home> and <End> should send the highlight bar to the first and last selections, respectively.

In a second method, popular in commercial applications, users choose a command by pressing the first letter of the command name. This method works only if no two commands begin with the same letter. If you can assemble lists of uniquely initialed selections, users can breeze through menus.

The so-called synonym method, a third approach, lists unique single-letter or single-digit commands for each menu option. Choosing a command is simply a matter of one keystroke, but don't expect every user to remember that 6 triggers the Add Record option.



Screen 3: Alpha Software's Alpha/three is a fine example of a full-screen menu. Note the single-letter highlighting of menu selections.

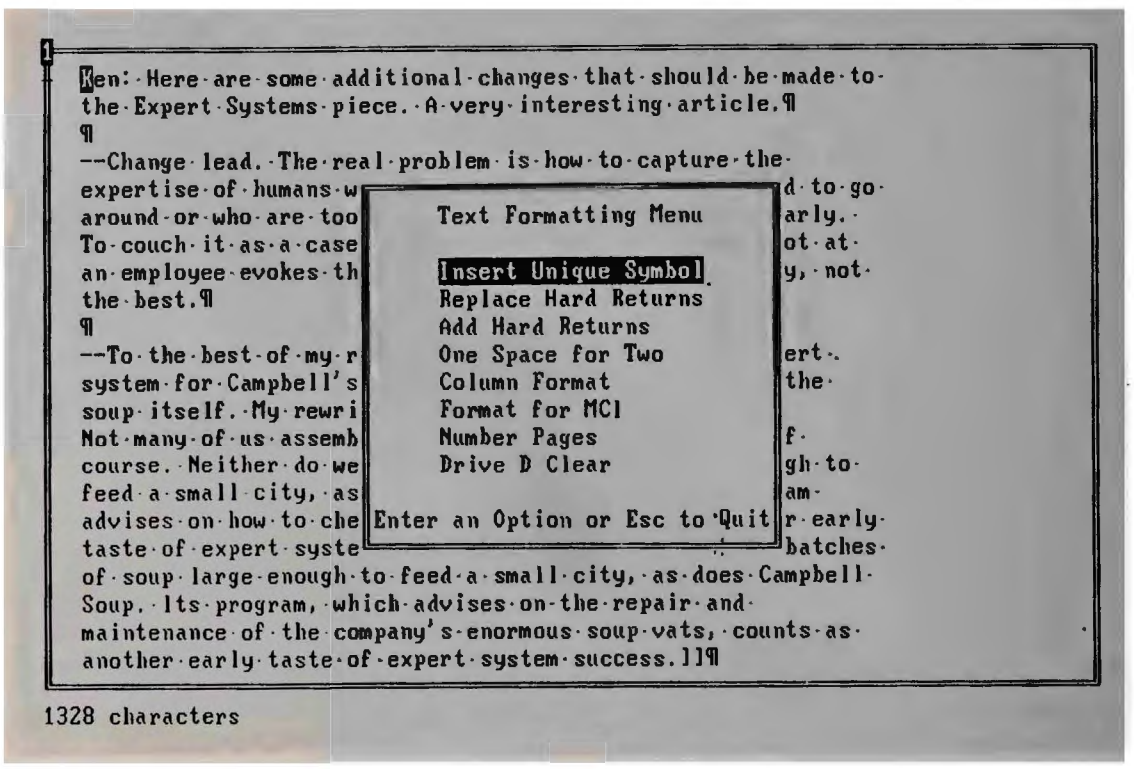
Screen 4: Microsoft Windows is fertile ground for those cultivating menu design skills. Windows partitions menu selections with horizontal lines, adds trailing ellipses to options that yield submenus, and tags current defaults with checkmarks.

Experience suggests that a combination of point-and-shoot and unique first-letter choices works best. The synonym approach is apt to slow all but the newest users. Because synonyms are not mnemonic, they're difficult to memorize. First-letter selections, by contrast, can rapidly be committed to memory. By offering multiple ways to issue commands, you can serve novice and veteran users alike.

10. Distinguish Options Visually

If all top-level menu options begin with unique first letters, you can offer users a slick way to issue menu commands with a technique called direct menu access. Rather than requiring users to call up the menu system with <F10> or the slash key, you can devise a sequence consisting of the <Ctrl> or <Alt> key and the first letter of any option in the top-level menu. <Ctrl>-G, for instance, would take you into a graph menu, <Ctrl>-C into a create menu, and so

Screen 5: This homegrown pop-up menu, built with Keyworks, clearly indicates the existence of options beyond the current display. In doing so, it encourages easy movement among menus.



on. Combining direct menu access with first-letter selection within menus opens a potent fast track for more advanced users and eliminates cursor key calisthenics.

If you can't come up with unique first letters to invoke each menu option, you'll need to designate and highlight (with color, underlining, or capitalization) the second or third letter in the option name. Select a letter apt to foster easy recall—a letter that begins a relevant syllable of the word, for example. Given the width of pulldown menus (and their capacity for multiple-word options), they offer more latitude in choosing initial words—thus you're more likely to find unique first letters.

Suppose your design called for the commands Maximize and Minimize in the same menu. To skirt the issue of colliding M's, you might decide to list the commands as maXimize and miNimize, invoking them with X and N. Why not resolve the conflict by changing one command name? Chiefly because you'd corrupt the symmetry of the interface design. If Maximize were invoked by an M and Minimize by an N, for example, the user would likely stumble trying remember which one an M did not invoke. By triggering both with the third letter of each word, the application's symmetry is maintained.

If this emphasis on menu naming and command selection seems niggling, that's by design. Menus for all applications—commercial or turnkey—must be worked and reworked until every shred of ambiguity is eradicated.

11. Make Movement Simple and Consistent

If your application contains many menus, you'll need to determine how users should be directed to move about. Your navigation aids can result in a forbidding maze or produce an inviting design. The secret is in keeping menu movements simple and consistent.

Start by providing a single way to move between menus. While such a restraint may seem to conflict with intuitive design, it's generally wiser not to permit freedom of movement. With simple up-and-down action, for example, you foster an understanding of the relationships among menus; a user moves down into a menu by choosing an option name, and up and out of a menu through an escape command (usually via the <Esc> key). Otherwise, the only way to leave a menu is to select a command. Consistency is paramount here: If a user backs out of a menu in one way, that method must work at all levels of the system.

12. Implement Lateral Movement

In addition to permitting movement through submenus along a simple up-and-down axis, menuing systems often provide the ability to move laterally—from one menu to another at the same level. Such lateral movement spares the user the trouble of having to back up one level and choose another group of options. Lateral movement is especially valuable for users who can't quite find the command they want.

Lateral movement in full-screen, pop-up, and *1-2-3*-style menus can be provided by Next Menu and

Last Menu commands, or, better yet, by commands that list the name of the next and last menus but are also followed by the words *next* and *last* in parentheses (see Screen 5).

Better still are pulldown menus, which make lateral movement second nature: <CursorRight> takes the user to the next menu to the right, <CursorLeft> to the left. With <CursorUp> and <CursorDown> moving the user vertically through the choices within the current menu, symmetry is maintained. Such an easy means of browsing the menu system is essential, especially for new users.

In other kinds of menus, however, cursor keys don't work as well. In a full-screen menu, you can introduce the new menu from left or right to give users the sense that the menu is arriving from somewhere else, but the technique is awkward at best.

Beyond lateral movement, you may well be tempted to add a goto command that enables users to jump directly from one menu to another that is not immediately adjacent. As a rule, goto commands tend to promote convolution rather than elegance.

And for Dessert

In designing menus, don't expect to get it right the first time. Even before you delve into the specifics of the system, set aside time for testing and retesting. Look for users whose expertise and sophistication match those of your intended audience. Their feedback should provide just the guidance you need to perfect the system.

In other words, plan for change. Structure your application so that modifying the menu system is easy. You can work toward that goal by separating the implementation of each option from its menu name. That way, if you want to move several commands from one menu to another, you simply need to shift the command names, not the code that implements them.

The ultimate way to plan for change is to prototype the system with a tool that permits rapid dummying of menus and screens. Although fast, interactive languages such as BASIC or Turbo Pascal can handle the job nicely, packages like *Dan Bricklin's Demo Program* and Trillian's *Demo Generator* make the prototyping process accessible to nonprogrammers.

Prototyping can point you toward the most effective menu interface--one that the user largely ignores. Such transparency requires that the user and the program interact automatically. And the application must respond quickly; delays longer than 1 or 2 seconds will likely refocus the user's attention from interaction with data to the clumsy menu design. The best menus are those that seem to melt away, enabling users to forget that a program mediates between mind and matter.

Robert Carr, chief scientist for Ashton-Tate, is the designer and principal developer of Framework *and* Framework II.

1-2-3 version 2.01
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
617/577-8500
List price: $495
Requirements: 256K, DOS 3.10 or later version
Copy protected

Dan Bricklin's Demo Program version 1a
Software Gardens, Inc.
P.O. Box 373
Newton Highlands, MA 02161
617/332-2240
List price: with 50 run-time copies $74.95, with unlimited run-time copies $195
Requirements: 256K, DOS 2.00 or later version

Dataflex version 2.2
Data Access Corp.
8525 S.W. 129th Terr.
Miami, FL 33156
305/238-0012
List price: single user version $995, multiuser version $1250; run-time copies $200 single user, $300 multiuser

Requirements: 256K; DOS 2.00 or later version single user, DOS 3.10 or later version multiuser
Not copy protected

dBASE III Plus
Ashton-Tate
20101 Hamilton Ave.
Torrance, CA 90502-1319
213/329-8000
List price: $695
Requirements: 384K for single user, 640K for LAN version; DOS 2.00 or later version for single user, DOS 3.10 or later for multiuser
Copy protected

Demo Generator
Trillian Computer Corp.
405 Alberto Way #1
Los Gatos, CA 95030
408/358-2761
List price: annual lease $6800
Requirements: 384K, DOS 2.00 or later version
Not copy protected

Enrich version 1.2
Migent Software
865 Tahoe Blvd.
P.O. Box 6062
Incline Village, NV 89450
702/832-3700
List price: $195; run-time copies $25 each (minimum of two), five for $100
Requirements: 384K, DOS 2.00 or later version
Not copy protected

Keyworks version 2.0
Alpha Software Corp.
30 B St.
Burlington, MA 01803
617/229-2924
List price: $89.95
Requirements: 90K, one disk drive, DOS 2.00 or later version
Not copy protected

Magic PC version 2.36
Aker Corp.
18007 Skypark Circle Dr.
Irvine, CA 92714
800/345-6624, 714/250-1718
List price: $695, Magic Run compiler $95 per copy (required for run-time copies)
Requirements: 512K, hard disk, DOS 2.00 or later version; Magic Run compiler required for each user application
Not copy protected

Metro version 1.0
Lotus Development Corp.
List price: $85
Requirements: 80K for RAM-resident portion of program, hard disk, DOS 2.00 or later version

Paradox version 1.1
Ansa Software
1301 Shoreway Rd. #221
Belmont, CA 94002
415/595-4469
List price: $695, 250 run-time copies $9.95; free support
Requirements: 640K, 1.8MB hard disk, DOS 2.00 or later version
Not copy protected

Polaris Rescue version 1.0
Polaris Software
613 West Valley Pkwy. #323
Escondido, CA 92025
619/743-7800
List price: $149, run-time disk $250
Requirements: 256K for editor, 33K for run mode, DOS 2.00 or later version
Not copy protected

R:base System V version 1.1
Microrim
3925 159th Ave. NE
P.O. Box 97022
Redmond, WA 98073-9722
206/885-2000
List price: $700, 5 run-time copies $250; software maintenance free for first 30 days, $175 per year thereafter
Requirements: 512K for single-user version, 640K for multiuser version; hard disk; DOS 2.00 or later version
Not copy protected

SuperKey version 1.15A
Borland Int'l
4585 Scotts Valley Dr.
Scotts Valley, CA 95066
408/438-8400
List Price: $69.95
Requirements: 128K, DOS 2.00 or later version
Not copy protected

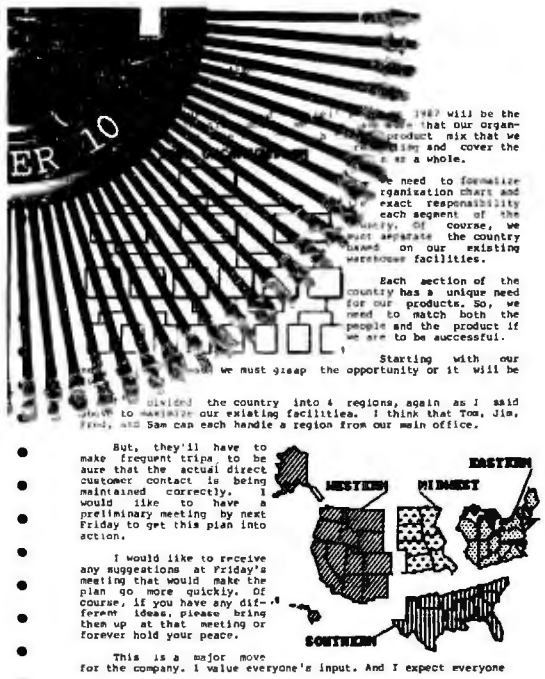
World's Best

1986 Winner—World Class Award

Word Processing Software category
as voted by *PC World* readers

WordPerfect Corporation 288 West Center Street
Orem, Utah 84057 (801) 225-5000

Circle 165 on reader service card



Each section of the country has a unique need for our products. So, we need to match both the people and the product if we are to be successful.

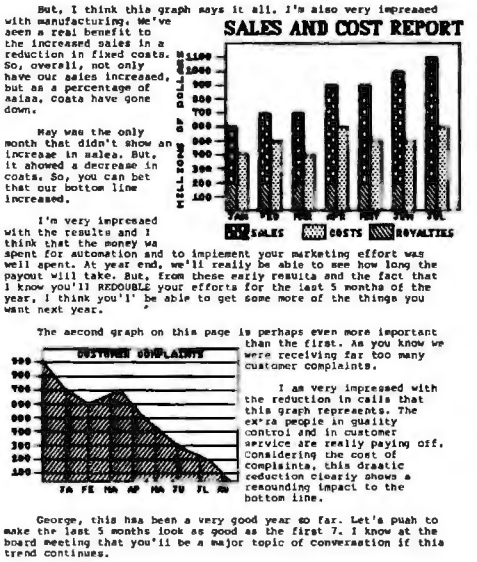
Starting with our [illegible] we must grasp the opportunity or it will be

[illegible] divided the country into 4 regions, again as I said [illegible] to maximize our existing facilities. I think that Tom, Jim, Fred, and Sam can each handle a region from our main office.

But, they'll have to make frequent trips to be sure that the actual direct customer contact is being maintained correctly. I would like to have a preliminary meeting by next Friday to get this plan into action.

I would like to receive any suggestions at Friday's meeting that would make the plan go more quickly. Of course, if you have any different ideas, please bring them up at that meeting or forever hold your peace.

This is a major move for the company. I value everyone's input. And I expect everyone



For Daisy Wheel, Dot Matrix & Ink Jet Printers

$89.90 Desktop Publishing Breakthrough

Imagine using a word processing and drawing program that lets you integrate charts and pictures that you 'paint' or 'clip' into your text. Well, if you use an IBM PC or Clone, now you can have graphically dramatic documents, from business or personal letters, to proposals, to organization charts, even with a daisy wheel printer.

By Drew Kaplan

It's easy. It's impressive. And, now your thoughts can be powerfully illustrated in both words and graphics.

After all, for illustrating abstract data and thoughts, nothing beats a dramatic chart or drawing. So, let your ideas leap off the page by using integrated text and graphics. Your thoughts are sure to make an impressive impact.

Whether you write letters, bank proposals, term papers, company manuals or news letters, you can forget complicated and expensive laser printing. And, you can forget complicated expensive desktop publishing programs.

Now for just $89.90, you can use your daisy wheel, dot matrix or ink jet printer to print normal text. Plus, you can integrate simply fabulous graphs and drawings into your creations.

INCREDIBLY EASY

Savtek, a brain trust group, has developed an easy to use yet incredibly sophisticated integrated word processing and graphics program.

Just create your letters, proposals, or reports as you would with any other word processor. In fact, if you **already** have a document created in virtually any other word processor, you can 'grab' it into Savtek's instantly.

You'll produce visually powerful technical papers and manuals with drawings and charts, and dramatic marketing reports with graphs. You'll produce sales proposals with panache.

And since there's no complicated training needed (if you can run a word processor, you can run Savtek), you'll make great impressions, fast.

Anyway, once you've created the written part of your report, using Savtek's sophisticated automatic word processing features, you're ready to add pictures, charts and graphs.

Just select from the over 100 supplied changeable pictures or draw your own, using the automated ICON based drawing program.

Later, you'll learn much more about the sophisticated drawing program that lets you draw, paint, fill, expand, reduce, copy, and move your pictures.

And, you'll form squares, circles and triangles automatically. Anyone can draw with it because it's totally automated and uses arrow keys and doesn't require a mouse. But, read on.

Once you've selected a picture, the computer will produce an automatically sized box representing it. Just position the box wherever you want the picture to be in the text.

Like magic, the actual picture will appear and the text will automatically reformat itself around it.

And, speaking of reformatting, this program will automatically make page-breaks and recalculate each page as you write or edit. If you make an addition to page 1 of a 10 page report, the effect will ripple through all 10 pages.

So, whatever length you've chosen for each page (including headers, footers and automatic page numbering), will automatically be preserved.

You'll particularly like the cut and paste features of this word processing program which allow you to copy, move or delete sections of your text.

Of course, you'll have automatic Word-wrap, Hidden Hyphenation, Justified Smooth Right or Ragged Right text. Plus, you'll have Find, Replace and Search.

And look how you can format your document. There are 5 page templates called rulers which allow you to automatically set up your page.

You can select any right and/or left margins, your tabs, one, two or three line spacing, and the number of blank lines at the top and bottom of your page.

Each of the 5 rulers comes with different default settings. But, you can adjust and save them or change them and even use several at one time on a page.

HOW DO THE PRINTERS WORK?

I use a daisy wheel printer because I like my letters to look personal. I've always had to switch to a dot matrix printer for graphs and illustrations.

Unfortunately, I couldn't have my graphics on the same page as my text.

Now, because this program can use the period on the daisy wheel to create all the charts and graphic symbols you see within this ad, I don't need to switch printers any more.

And while it doesn't create the graphics as fast as a dot matrix, the quality is superb. Now my graphics can be impressively integrated into my text.

Note: Every single sample page shown in this ad, was printed out on my EXP 400 Silver Reed daisy wheel printer.

Note: This program does not produce two column news letters in a single action. Simply create a double length column and cut it when you have it printed.

No matter what printer you use, daisy wheel, dot matrix (with or without near letter quality printing) or ink jet (color or single color), you'll have powerful looking documents to really present your ideas in the most professional manner.

DESKTOP PUBLISHING

Desktop publishing is about the hottest category of computer programming. It seems that everyone has discovered the impact of combining text and graphics.

And **very** impressive presentations are just what Savtek's ETG Desktop publishing system provides for you.

Imagine leveraging the capabilities of your own IBM or Clone, your own printer and your own keyboard to produce the documents you see on these pages, with nothing else to buy.

THE 1000 WORD PICTURE

First a confession. I can't draw. That's why you don't see drawings in DAK's catalogs. But I've been amazed at how creative I can be with this paint program.

It's easy. You do everything with the arrow keys and the return key. By using the arrow keys you can draw in any direction with a choice of 12 brush shapes.

There's an erase function to eliminate anything you don't like. And here's my favorite function. UNDO is a function that works throughout this program.

. . .Next Page Please

. . .Publishing Continued

It simply removes the last thing you did. So, no matter what you do wrong, you're a button away from removing it.

If you don't want a solid line, just spray an area. It's like using a spray can.

Let's say you want to connect two points with a straight line. Use the Angle Line. It produces a computer generated straight line between any two points.

What if you want a circle? Just touch the return key. Then use the diagonal arrow key to enlarge or reduce the circle. If you use the up/down or right/left arrows, you'll get an ellipse.

In the same way you can create squares, rectangles or triangles. And you'll be amazed how many things, from houses to technical drawings, are made up of squares, rectangles, circles and triangles.

But, that's not all. You can choose any of 32 background patterns to fill in enclosed areas or broad lines. And if 32 isn't enough, you can design your own.

There's so much more. You can juggle a picture. Imagine, turning it over or sideways with the touch of a button.

You can copy or move a picture or even part of a picture right on the screen. So, draw it once and copy it or move it.

But, here's my favorite. You can enlarge or reduce any picture or part of a picture right on the screen. So you can change its size equally, or you can stretch it out or make it tall and thin. Wow!

There are 12 included font/sizes. So you can have large or small type in your choice of styles within a picture or integrated with your text.

And, each of the 12 font/sizes can be shown on the screen and printed normally, in bold, in italic, in outline, or in shadow. Plus, you can write normally across the page, up the page, down the page or upside down.

Finally, you can zoom into any small section of the screen and edit your pictures, pixel by pixel. With this kind of power, you don't need to be an artist, just have the ability to push a button.

You can operate this Paint program independently. Or, you can access any picture from within word processing.

So, for banners and pictures, you can print directly from the Paint Program. Or, for everything previously described, simply access your pictures, captions, graphs or charts through the desktop publishing section.

This program is incredibly powerful, yet you'll be comfortable using it within just a few hours.

Every picture in this ad was created with this program. And, you haven't even seen the tip of the iceberg of its capabilities. For example, if you have a picture on the screen, you can bring a second picture up and join them together.

WHO CAN USE THE SYSTEM

All you need is an IBM PC, AT, XT or 100% compatible with standard IBM CGA or EGA graphics capability. It must have at least 256K, and either two floppy disk drives or one floppy and a hard disk.

Below is a list of some of the dot matrix, ink jet and daisy wheel printers that have been tested with this program. If your printer is compatible with any of these printers, it should work too.

Special Note: Most daisy wheel printers are Diablo 620/630 compatible, so they will work with this program.

Special Note: With a color printer you can print 3 colors plus black text.

C.Itoh 8510, **Epson** Fx-80, FX-85, FX-185, JX-80 (color), LQ-800, LQ1500, LX80, MX80 with Graftrex Plus or Graftrax, RX-80, **Hewlett Packard** 2225C Think Jet or QuietJet, LaserJet, or LaserJet Plus, **IBM** 80CPS Graphics Printer, IBM Proprinter, IBM 3852 Jetprinter (color), **Juki** 6100, **Mannesmann** Tally Spirit 80, NEC 3500, 3510, 3520, 3530, 3550, 5500 series, 8023A, NEC Pinwriter P5XL, P6, P7, (single or color), **OKIDATA** Microline 92, ML92, w/IBM Plug & Play, Microline 193, 20 (color), **Panasonic** KX-P1091, KX-P1091i, **Quadram** Quadjet (color), **Radio Shack** DMP-200, **Silver Reed** EXP 400, 600, 800 and all EXP series, **Star Micronics** SG-10, **Texas Instruments** 855, 865, **Xerox** (Diablo) 620, 630.

FINAL FACTS

There's a pop down calculator which lets you deposit your results right into your text. A clock/timer picks up the time from your computer, and there's a 7,300 year calendar. They are all available as pop-down windows. Savtek's program is backed by a standard limited software warranty /license. It comes with a superb, easy to use reference manual.

DESKTOP PUBLISHING FOR YOU RISK FREE

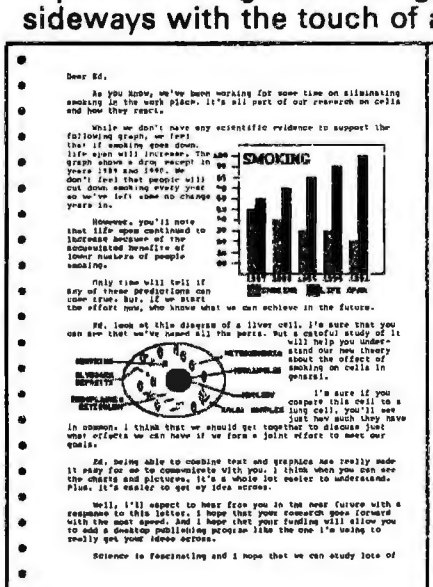
Make your ideas explode in front of your readers. When you send out a letter or proposal, let it be really dramatic. They will be your ideas, but you'll be presenting them like never before.

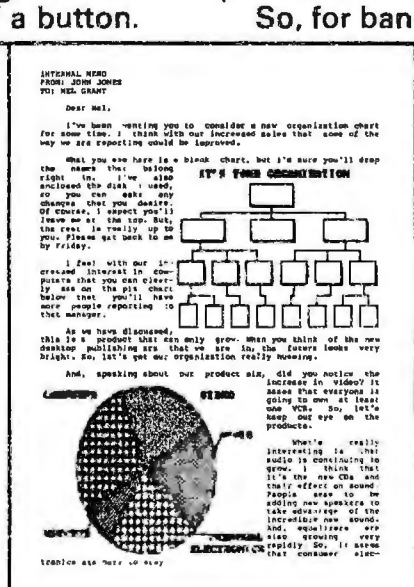
If you're not 100% satisfied, simply return it in unused condition within 30 days for a courteous refund.

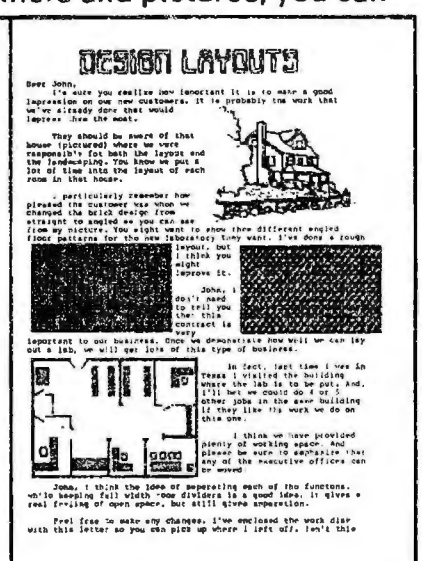
To order Savtek's ETG Integrated Word Processing and Graphics Desktop Publishing System for your IBM PC or Clone, call toll free or send your check for the breakthrough price of just **$89.90** ($4 P&H) Order No. 4801. CA add tax.

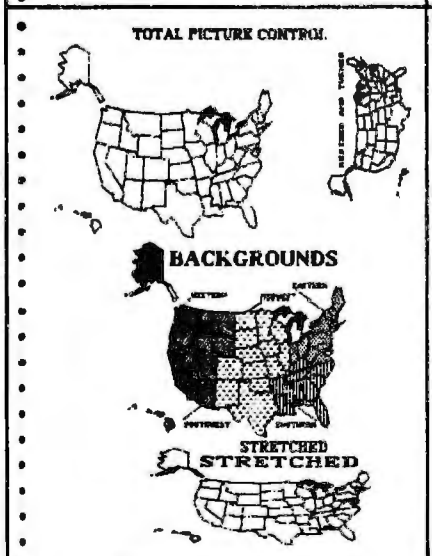
Look at the 12 sample pages I created. You'll see graphs, pictures and charts mixed into my text. I even designed a logo for my newsletter. Just think about the impact you'll make when you present your ideas with a combination of text and graphics. And oh, it's so incredibly easy to use.

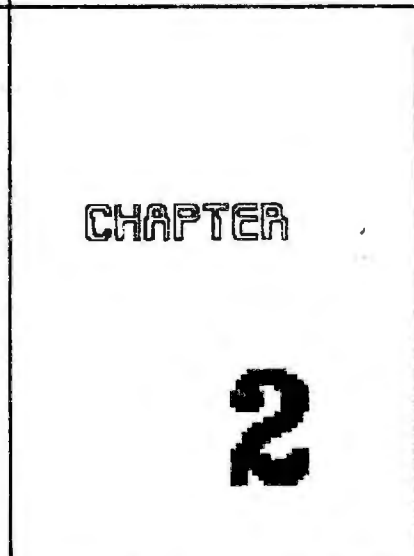
IBM is a registered trademark of International Business Machines.

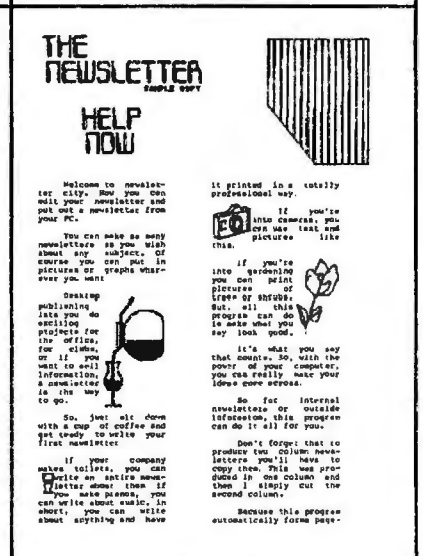


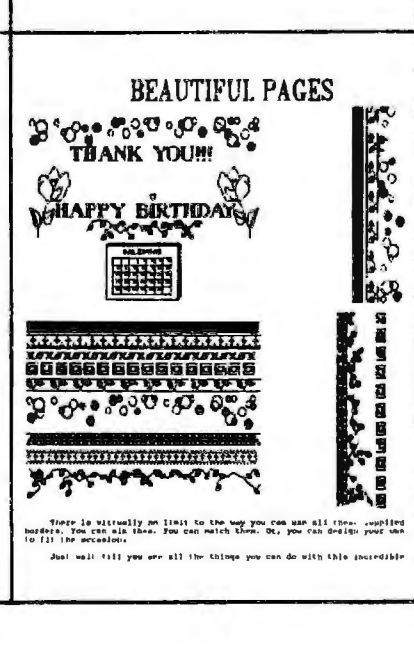












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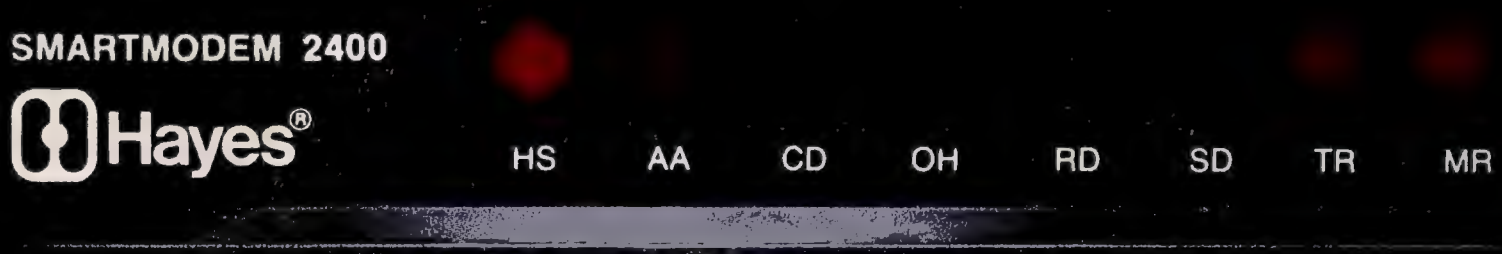

CHOOSE THE NAME THAT COMMUNICATES QUALITY.

We'd like to pass along some data on why you should insist on a Hayes Smartmodem 1200™ or Smartmodem 2400.™

First and foremost, no one knows more about building reliable, high performance modems than Hayes. And no wonder. Hayes pioneered the personal computer modem a decade ago, and today is actually the de facto standard in computer communications with the widespread adoption of the Hayes Standard "AT" Command Set.

Second, Hayes has a long-standing and unwavering commitment to customer support, not just to service its products, but to serve as a resource for information, assistance, and technical advice for everyone from the home user to the corporate communications manager. Moreover, Hayes provides more than a warranty on the material and workmanship of its products. Hayes warrants they will perform as promised, as well.

Should you need further data to help you make up your mind, we offer this reassuring statistic: Year after year, more personal computer owners buy far more Hayes modems than any other kind.

And that may be because a Hayes modem is the only modem with the ability to transmit and receive data, and at the same time convey a feeling of peace of mind.

Hayes®

SAY YES TO THE FUTURE

Circle 815 on reader service card

© 1987 Hayes Microcomputer Products Inc.

The Upgrade Path

Hands-on advice for upgrading PCs, compatibles, and peripherals

This month: Taking the upgrade path, plus the little floppy that could (do 720K), hidden storage in your XT, power supply pointers, creating the ultimate PC AT compatible, and solving the EMS conundrum

Edited by Robert Luhn

Evolution, we're told, is the natural order of things. But in the Darwinian PC world, things change far too quickly. It always seems that the latest hot machine has two times or four times the processing power, storage, and memory of the system sitting on *your* desk. Even the IBM PC AT, once the lord of desktop computing, is now but a vassal to the standard set by the Compaq Deskpro 386.

Even so, the millions of IBM PCs, XTs, ATs, and compatible systems sold over the years aren't being used as doorstops. These capable tools continue to do the job day in, day out. But when you start wrangling with 10-foot spreadsheets, or when the department manager drops a copy of *Framework* on your desk, your system may need to stretch a bit.

And stretch it can. Although you can't turn a PC into an AT (or an AT into a 386 system), you can come awfully close for a fraction of the cost of a new system. IBM didn't leave the back of the PC open by accident, and today you can take your pick of hard disks and video systems plus expansion boards offering 80286 or 80386 microprocessors, hard disks, multimegabytes of memory, and every conceivable combination of clock/calendar, memory, and serial and parallel ports. When you consider the alternative—spending $3000 or more for a new system—upgrading is not only economically prudent, it may be preferable.

Hence the genesis of *The Upgrade Path*. This column will provide hands-on advice, tips, and, occasionally, warnings on installing hardware solutions that

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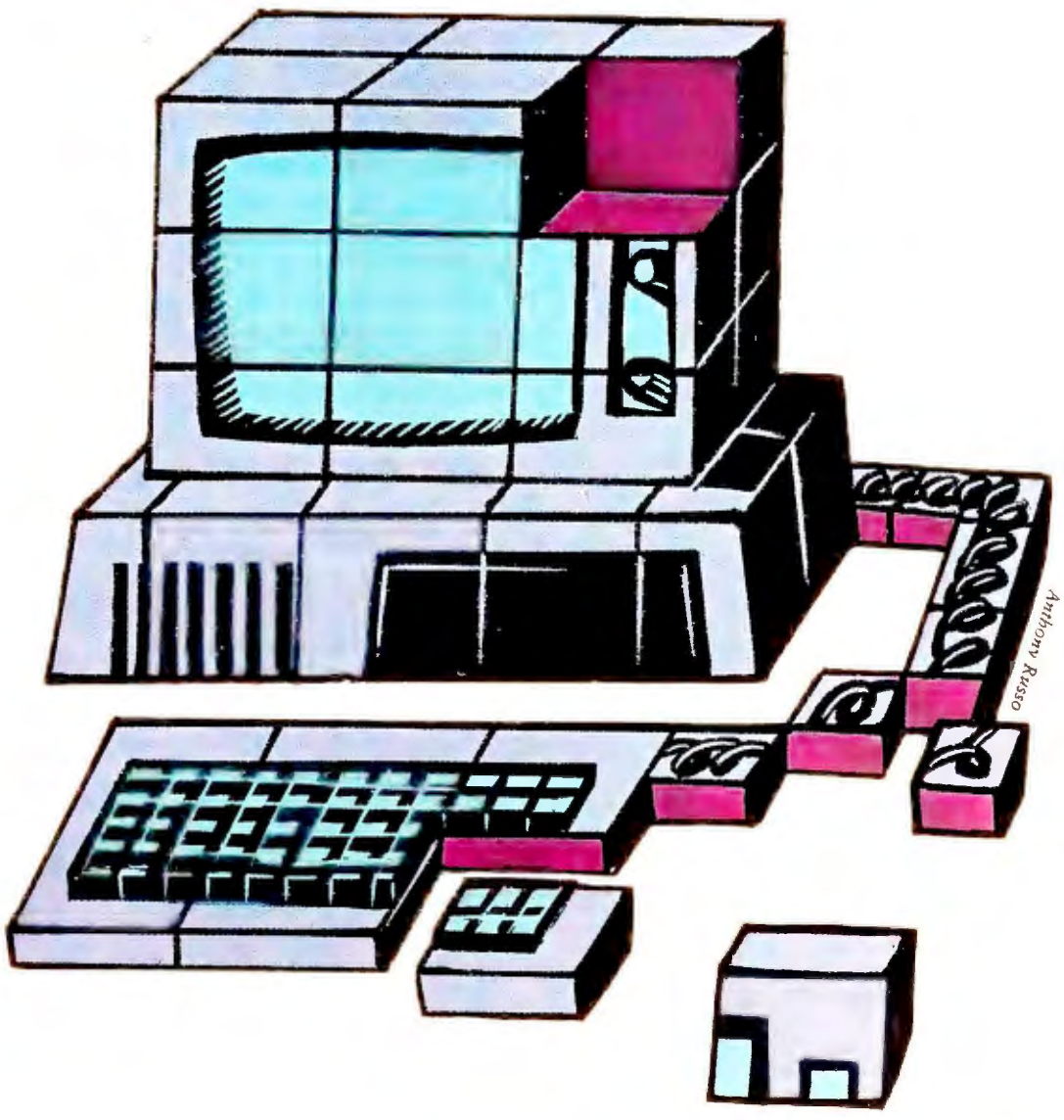

squeeze every drop of performance out of your system and peripherals.

Of course, the upgrade path branches differently depending on the applications and resources at hand. If you're a PC user wedded to *1-2-3*, additional memory and a Hercules Graphics Card may be all your system needs. If you manage a company data base on a dual-floppy PC, a hard disk is probably the most urgent upgrade. And if you're a nascent desktop publisher intent on doing it right, you'll need everything from an EGA video setup to a high-speed hard disk to buckets of RAM.

Since incremental expense is the name of the upgrade game, consider what you are willing to put up with. Those who don't mind swapping floppy disks now and then may find that adding memory to a system is just as effective and far cheaper than buying a hard disk drive. Still, no upgrade is perfect, and you can prevent the anguish by planning ahead. If you expect to use *Ready, Framework, Microsoft Windows,* and other programs that support (or will support) expanded memory, an AST SixPakPlus board may not be the best solution. On the other hand, if all you do is write newsletters with *WordStar,* a combo board with 384K could be a perfect solution.

Although *The Upgrade Path* will focus on do-it-yourself improvements, you won't always have to pop the lid off your system. At times it makes sense to pay a professional to do the dirty work. But if you're game, keep the following in mind:

Tools of the trade. You can easily reconfigure the PC and its brethren with just a handful of tools. For the purposes of this column, you can probably get by with one or two small flat-blade and Phillips screwdrivers, a chip puller (for removing microprocessors, RAM chips, and the like), and a pair of needle-nose pliers. If you expect to be constantly under the hood, 3/16- and 1/4-inch nut drivers will make life easier.

Handling hardware. Static electricity can destroy the integrated circuits that are part and parcel of all PC expansion devices. Leave the product in antistatic packaging until installation time and touch only the nonconducting edges. You can easily build up a charge by shuffling across a carpet, so ground yourself (by touching the fan grill on the back of a PC plugged into a grounded outlet, for example) before handling the device. You can minimize static buildup (and aesthetic backlash from your co-workers) by avoiding leisure suits and other polyester clothing; wear cotton duds and shoes with rubber soles. Lastly, don't handle objects made of plastic, vinyl, or plastic foam while in the throes of upgrading a system. The device you save could be your own.

Planning. This column can be a useful guide to the universe of hardware upgrades, but do some additional research before parting with any money. Contact manufacturers on both sides of the upgrade concerning the mutual compatibility of the devices being paired. Ask some hard questions: Is the hard disk compatible with the system's existing controller? Does the memory board fit in the XT 286? Will your company's internal modem fry the PC's power supply? And does the product come with a money-back guarantee?

Once the product is in hand, let the user manual and the company's technical support be your guiding stars. —*R. L.*

Double Your Storage

If you've added a 10MB or 20MB hard disk to your PC or compatible system, you may have enviously eyed the AT's 1.2MB floppy disk drive. For quick hard disk backup and for toting gobs of data around, a 1.2MB floppy can't be beat. Unfortunately, the disk controllers mated with almost all high-density floppy disk drives have AT-style double 8/16-bit tongues and can't fit into the PC's 8-bit slots.

But by slipping a 3½-inch floppy disk drive into your PC's chassis, you can step up to durable 720K disks while effortlessly linking your system to the world of PC laptop computers. The unit tested here, a Toshiba ND-354A from Robec Distributors of Montgomeryville, Pennsylvania, is representative of the growing number of half-height, double-sided 3½-inch drives for the PC: sturdy, quiet, barely bigger than a pocket pager,

(continues)

ORDER NOW!

Peachtree Complete Accounting for Just $199

Everyone's Asking How Can We Do It?

When you reduce the price of an 8-package accounting system from $4,800 (or $600 a module) to $199 for the complete set, people are bound to ask questions. Here are some of the most popular ones we're hearing at Peachtree:

Q. How can we afford to sell Peachtree Complete at such a low price?

A. We've reduced our costs without reducing product features. Peachtree Complete has been repackaged into one set that includes more thorough and better organized user instructions. We've also streamlined order processing and reduced overhead. It is faster and easier to buy our product.

Peachtree has long been the first name in accounting software, so we've had time to completely amortize our original development costs plus make over 100 major additions. These enhancements include multi-company capability, menu driven installation and removal of copy protection. Consequently, you're getting a proven product at a better price.

We also "unbundled" support (so you only pay for what you need when calling our toll-free technical support hotline) and established a network of local dealers to serve as Independent Peachtree Support Centers.

Q. What does Peachtree Complete include?

A. 1. Eight Integrated Software Modules:

- General Ledger • Accounts Receivable • Sales Invoicing • Accounts Payable
- Inventory Control • Fixed Assets • Job Cost • Payroll

2. An Installation Guide to lead you step by step through our simple installation procedure.
3. An Accounting Primer, written for Peachtree users by an industry expert, to explain accounting concepts. *New!*
4. Tutorials on each module with sample data to make learning easier.
5. A complete Reference Library with detailed instructions in plain English on all software functions.

Q. Is Peachtree Complete really the same product that used to sell for $600 per module?

A. Peachtree Complete is basically the same accounting system that both Peachtree and IBM sold for about $5,000 but with substantial improvements in function and presentation.

With more than 150,000 users to its credit, Peachtree Complete has been the PC World Class Winner in its category for two of the last three years.

Q. What's the difference between Peachtree Complete and the $69.95 systems?

A. Peachtree's system is called Complete because it contains the eight most needed accounting packages (including payroll) and all reference materials for one price. Remember, it was designed as a $4,800 accounting software system.

The $69.95 systems, on the other hand, are incomplete. They were designed to sell for $69.95 and require the purchase of additional modules to be comparable—payroll, $49.95 more; tutorials, $19.95 each; etc. Everything is a la carte.

Q. How soon will I outgrow the system?

A. Peachtree Complete handles revenues up to $21,000,000, so only the largest companies will outgrow the system. The ability to process data for an unlimited number of companies is one of the system's biggest selling points.

An optional multi-user module soon to be available allows Peachtree Complete to be installed in a Local Area Network. And Peachtree Data Query, for just $199, lets you quickly transfer your accounting data to many popular spreadsheets and databases, as well as produce custom reports.

Q. What if I'm not satisfied with Peachtree Complete?

A. When you purchase Peachtree Complete directly from Peachtree Software, you're protected with a **30-Day Money Back Guarantee*** (an option even the most expensive accounting products don't offer).

If you're not satisfied, simply return the complete product in saleable condition within 30 days and your purchase price will be promptly refunded.

InfoWorld Report Card

"Superb value, easy to use, good manuals...We rate Peachtree's Complete Business Accounting System an excellent value."

—Richard Morochove, *InfoWorld* Review Board.

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- 5 different methods of figuring depreciation

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- Compares estimated costs with actual costs for specific tasks

Payroll
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- Automatic federal, state, city and county withholding calculations
- Supports hourly, salaried, commission or draw-against-commission pay types
- Processes up to 3,900 employees
- Updates published regularly by Peachtree Software

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*A $20 restocking fee will apply if disk bag is opened.

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4355 Shackleford Road, Dept. PCW-06, Norcross, GA 30093

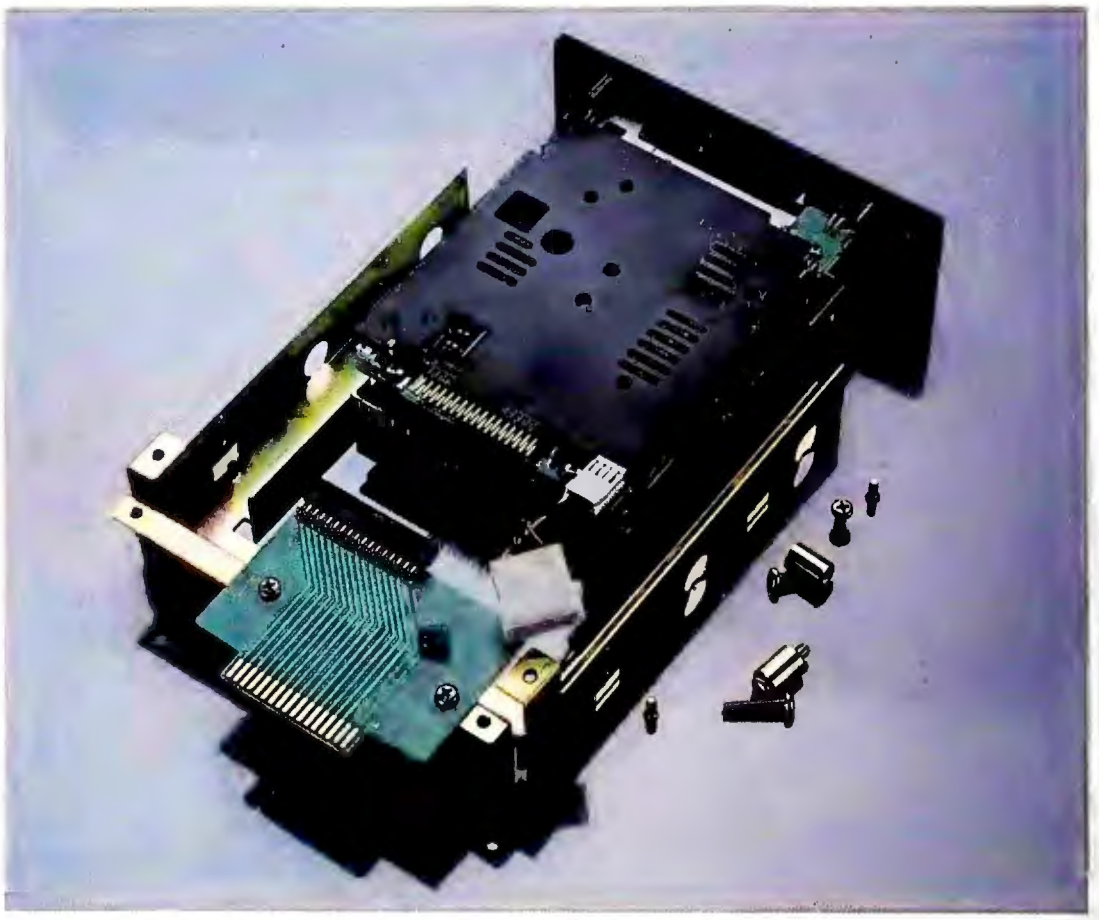
Circle 286 on reader service card

compatible with existing controllers, faster than a 5¼-inch drive and less of a watt hog, and costing little more than $100. The pint-size disks used with such drives are encased in a rugged plastic shell and, thanks to the success of the Macintosh, are cheap and plentiful.

The Toshiba drive can be installed in the PC, XT, AT, Compaq Deskpro or Portable, AT&T PC 6300, and compatible computers as either an internal or external unit. In this case, a PC's full-height floppy drive B: is replaced with a half-height Toshiba drive. (Drive A: is reserved for 5¼-inch program disks and in particular for copy-protected software.)

The universal installation kit supplied with the Toshiba makes installation a 20-minute affair. The kit includes a mounting bracket, short and long power cables, faceplates, and assorted screws. You'll need a small flat-blade screwdriver, a small Phillips screwdriver, and needle-nose pliers.

Carefully remove the drive from its plastic foam packing by holding on to the drive's frame. Don't squeeze the drive too passionately or you could damage electrical components or the drive motor. Place the drive on a table, pull off Toshiba's 3½-inch plastic faceplate, and replace it with the supplied 5¼-inch-wide faceplate. Although this piece snaps on readily, take care not to crush the read/write LED that extends from the drive. Slip the drive into the Toshiba's mounting bracket, connect the 34-pin connector at the back of the drive to the socket mounted on the bracket, and screw the drive to the bracket (see Figure 1).



Mark Farbin

Figure 1: The bracket's the thing. To keep the Toshiba from rattling around, plug the connector on the drive into the connector on the bracket, then bolt the drive in with the supplied screws.

Although Toshiba's manual is clear on most installation procedures, some points are misleading. According to the manual, the RDY and DS2 jumpers on the top of the drive are set at the factory. However, the second jumper on the tested unit was placed on the DS1 pins. If you don't move this jumper to DS2, the PC won't boot the system from either drive but instead will load ROM BASIC. So take a pair of needle-nose pliers, gently grip the jumper, slide the jumper off DS1, and shimmy it down the pins on DS2. Attach the short power cable to the drive and you're ready for the next step.

To remove the PC's full-height floppy drive, turn the machine off, ground yourself, and unplug all external cables. Remove the PC's cover and unscrew the two retaining screws on the right side of the drive chassis that attach the drive to the system unit. Slide the drive out about an inch and remove the blue floppy disk controller ribbon cable's connector and the white power connector at the left rear of the drive. The power plug and the disk drive may have formed a

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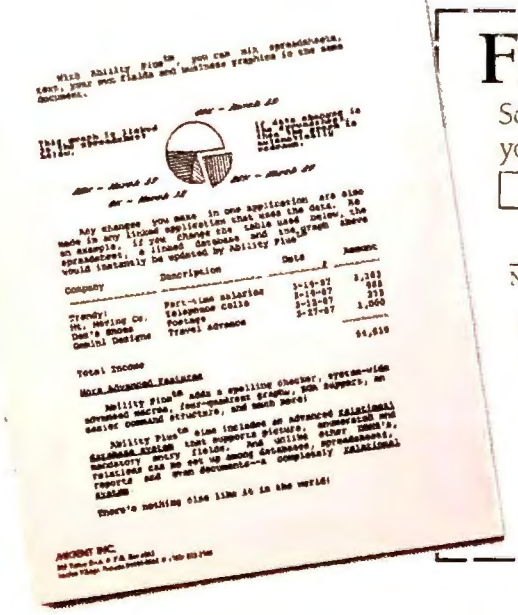

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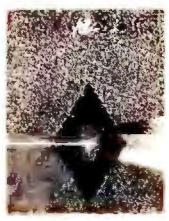

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strong bond over the years; to separate the two, judiciously wobble the plug while holding on to the drive's green integrated circuit board. Pull the drive out and push the Toshiba drive three quarters of the way in. Attach the drive controller cable and power connector to the Toshiba, push the drive in until the screw holes are visible, and secure the drive to the system unit with the small flathead screws. To cover the blank space above the half-height drive, snap in the supplied blank faceplate.

Because the 3½-inch drive in this example merely replaces another floppy drive, you needn't reset the DIP switches on the PC's motherboard. Keep in mind, however, that only DOS 3.20 supports 3½-inch disks formatted for 720K. If you use a dual-floppy PC, this merely means spending a couple of double sawbucks for DOS 3.20; if the system has a hard disk, you may want to reformat it with DOS 3.20.

However, if your hard disk was formatted with DOS 3.00 or 3.10, merely slip the DOS 3.20 disk into drive A:, restart the system, and then type **SYS C:**, which copies the relevant system files to the hard disk. Finish the job by copying DOS 3.20's COMMAND.COM to the root directory of the hard disk. Keep in mind that this procedure won't work if the hard disk was formatted with MS-DOS and you attempt this operation using PC-DOS—or, conversely, if it was formatted with PC-DOS and you try using MS-DOS.

Note that IBM's new DRIVER.SYS file needn't be present in this case, much less referenced, in the system's CONFIG.SYS file, to format 3½-inch disks at 720K. The key is an undocumented DOS command called DRIVPARM. Add the lines below to your system's existing CONFIG.SYS file, or create the file by typing the following at the DOS prompt:

COPY CON CONFIG.SYS < **Enter** >
DRIVPARM = /D:1/F:2 < **Enter** >
< **F6** > < **Enter** >

The /D:1 parameter specifies that the Toshiba is drive 1 (drive A: is 0), while /F:2 indicates the 3½-inch drive type. Restart the system with < **Ctrl** > - < **Alt** > - < **Del** >, and the hybrid system is ready to go. To format a 3½-inch disk for 720K, merely type **FORMAT B:** at the DOS prompt. Keep in mind that only /S and /V formatting options are available with the drive.

However, DRIVER.SYS can play an important day-to-day role because it allows you to assign two drive letters to the same device. Thus, the 360K A: drive could be both drive A: and drive C:, and the Toshiba unit could be both drive B: and drive D:. For example, you could copy a 360K disk to another 360K disk in drive A: by typing DISKCOPY A: C:, or you could copy files from one 720K disk to another by typing DISKCOPY B: D:. If your aging PC is limited to 640K of RAM and is thus too small for a RAM disk holding an entire floppy disk's contents, DRIVER.SYS could be handy indeed. So first add the line

DEVICE = DRIVER.SYS /D:0 /T:40 /F:0

to CONFIG.SYS, then add

DEVICE = DRIVER.SYS /D:1.

Since other DEVICE statements (such as DEVICE = VDISK.SYS) also assign drives, make these the last DEVICE statements in CONFIG.SYS. When you restart the system, the message 'External Driver Loaded for Drive *x*' appears twice. The *x* in the first message is the drive letter assigned to the drive specified by the first DEVICE = DRIVER.SYS command; the *x* in the second message, that of the second DRIVER.SYS command.

Once you go the 720K route, you can't format a 3½-inch disk for 360K. But then, why would you want to? *–Hal Nieburg*

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system's storage capacity and speed at least 50 percent by replacing the XT's original hard disk controller with a Run Length Limited (RLL) controller. (Recently released Advanced RLL controllers for the AT can double standard storage capacity and data throughput; a similar ARLL controller for the XT's hard disk is in the works.)

An RLL controller essentially encodes data in a type of shorthand—representing long strings of 1s or 0s with a short code, much in the manner of a file compression utility such as *Cubit*. As a result, an RLL controller can lay down 25 sectors per track instead of 17. Thanks to the controller's sophisticated circuitry, you can change the hard disk's original 6 to 1 interleave to a speedy 3 to 1 without incurring disk read errors, boosting the data transfer rate by half.

The RLL controller examined here—the ACB-2070A from Adaptec—plugs into an XT without modification, is compatible with all hardware drivers and PC applications (including *Cubit, SQZ*, and other file compactors), supports two hard disks, and works with many (though not all) of the hard disks IBM has sold with the XT and those used by compatibles makers (see Table 1).

Keep in mind that boosting storage from 10MB to 15MB (or 20MB to 30MB) requires reformatting the hard disk. But first take the cover off the system, jot down the hard disk manufacturer's name and the drive's model number, and confirm with the manufacturer and Adaptec that the system's hard disk works with an RLL controller. If the drive is of relatively recent vintage and the model number ends in *R*, chances are it's certified.

Table 1: Hard disk drives certified by Adaptec for the ACB-2070A RLL controller.

Vendor	Model
Lapine	Titan LT300
Microscience	HH-330 HH-738 HH-1050
Microstorage	MS212R
MiniScribe	3438 6128 8438
NEC	D5127
Okidata	OD526 OD540
Peripheral Technology	PT325R PT338R
Priam	V150 V170 V185
Ricoh	RH-5130
Rodime	R0201E R0202E R0203E R0204E R0352
Seagate	ST-238R ST-277R ST-4077R ST-4144R
Syquest	SQ319R
Tandon	TM263 TM755
Toshiba	MK56FA

Before you install an Adaptec board, back up the files on the hard disk, park the drive's heads, turn the system off, and disconnect all external cables. If the system has two hard disks or if you are installing a brand-new drive out of the box, you may have to configure the drive and the controller so that the relevant parameters—number of heads, number of cylinders, step rate, and so on—match. This information should be available from the drive manufacturer. Since the Adaptec board is factory configured for the popular Seagate ST-238R drive and the XT's hard disk is already in place, you probably won't have to set any jumpers or switches.

Replacing the XT's original disk controller is a matter of removing two connectors and pulling the board out. To install the Adaptec board, reverse the process. At this point, you must perform a low-level hard disk format. Although there is no low-level format command in DOS, you can tap the appropriate routine stored in a ROM chip on the Adaptec board using DEBUG.COM from the DOS Supplemental Programs disk.

Reassemble the XT and start the system with a DOS disk in drive A: containing a copy of DEBUG.COM. Type the boldface

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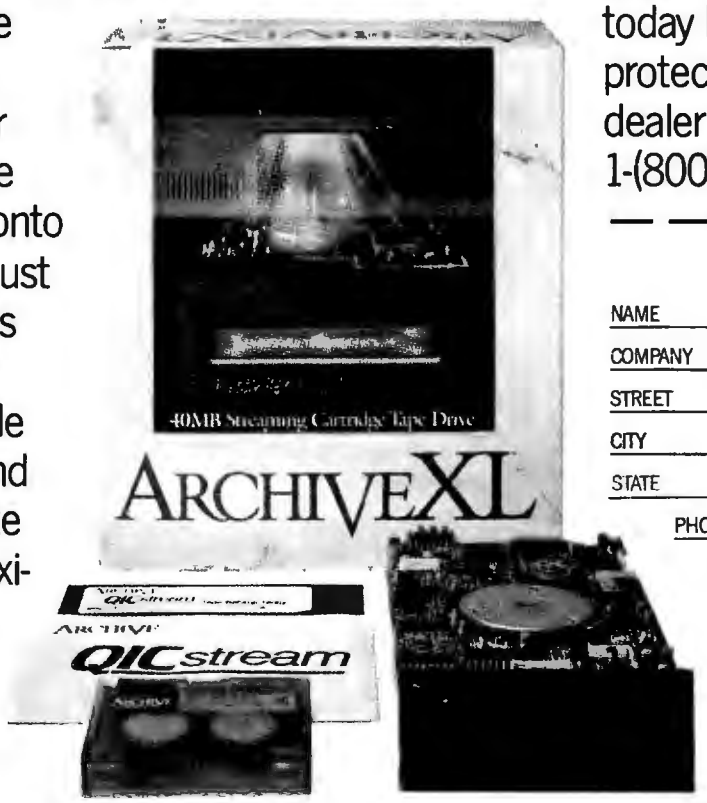

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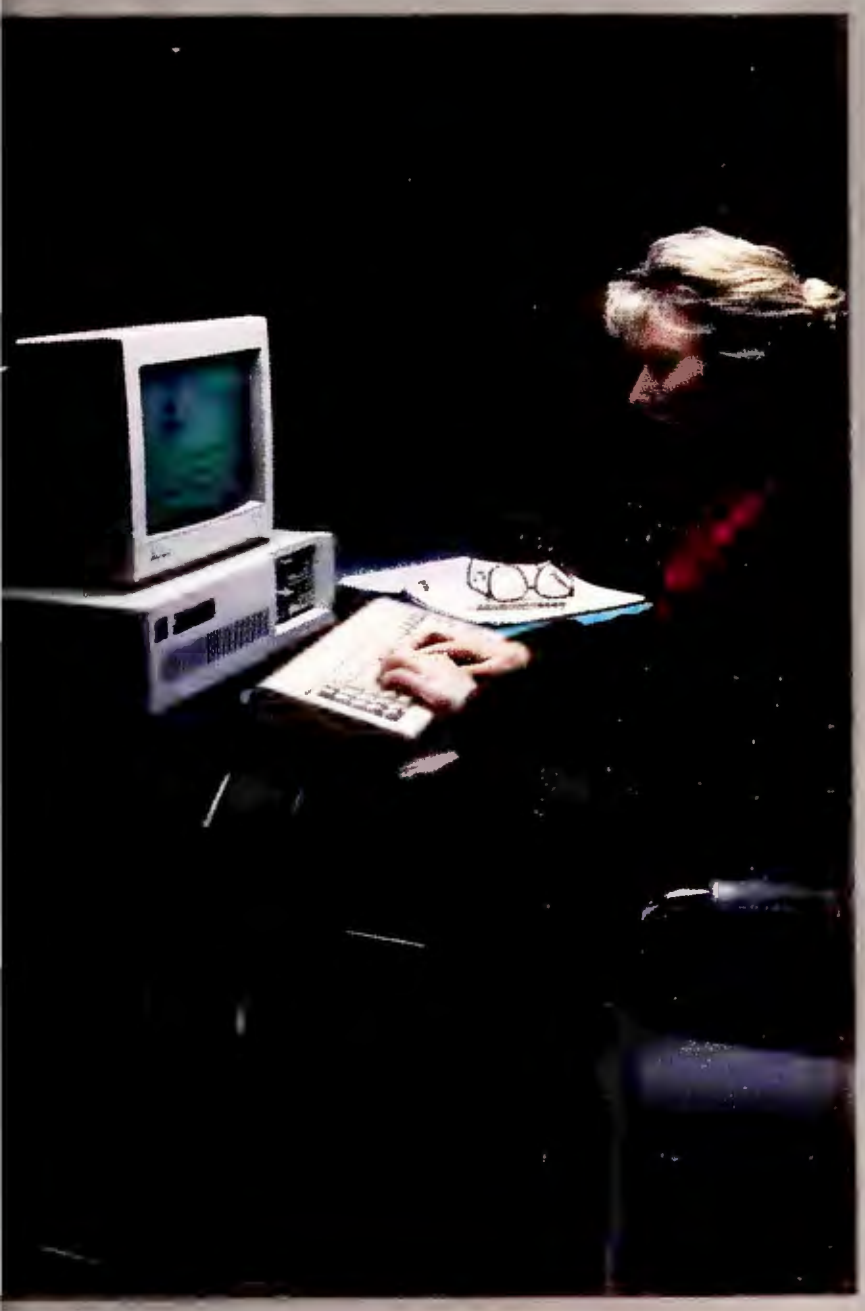

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```
A>DEBUG <Enter>
-G=C800:CCC <Enter>
3 <Enter>          [Interleave factor]
0 <Enter>          [First hard drive]
N <Enter>          [Don't use default—i.e., MFM—
                    parameters]
1 <Enter>          [Number of 32MB logical units]
3 <Enter>          [Head step rate = 13
                    microseconds]
4 <Enter>          [Number of heads]
612 <Enter>        [Number of cylinders]
M <Enter>          [MFM defect list]
C <Enter>          [Cyl/head/sector form]
  <Enter>
  <Enter>          [No defect list]
Y <Enter>          [Confirms above parameters are
                    correct. Drive will take 4 to 5
                    minutes to format.]

Wait until format and track verification completed.

N <Enter>          [Don't run routine again]
```

Listing 1: Adaptec's low-level formatting program in a ROM. Using DEBUG, you can tap this menu-driven program to uncover the hidden storage on your hard disk.

characters shown in Listing 1. Parenthetical comments about specified parameters follow the responses. Note that the 0s are zeroes, not the letter O.

When the DOS prompt reappears, insert a disk that contains FDISK.COM and FORMAT.COM in drive A:. (If you've been using an earlier version of DOS, this is your chance to upgrade your operating system and take advantage of DOS 3.20's smaller cluster size and other talents.) Type **FDISK**, press **<Enter>**, and from the menu, type **1** (Create a DOS partition) and press **<Enter>** again. When FDISK finishes, type **FORMAT C:/S/V**, press **<Enter>**, and after formatting is complete, supply a volume label when prompted. Restore your backed-up files, and you're ready to roll—with room to spare. *—Aubrey Pilgrim*

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Portables Power

In 1982, a start-up company called Compaq released the first luggable PC and helped spark a computing revolution. Three years later when another portable breakthough—the hard disk card—appeared, thousands of Compaq users hoping for a happy marriage of the two products discovered they needed yet a third: a new power supply.

Compaq later admitted that power supplies in early Portables couldn't stretch beyond their ratings to meet the demands of an awakened hard disk coming up to speed. Unfortunately, installing anything in a Compaq except an expansion board is a major undertaking. The Compaq manual is notably mum on the steps required to replace major components—and for good reason.

The Compaq's power supply is packed between the CRT and the system unit's metal frame. Replacing the power supply means dismantling the unit almost entirely. With the components elbow to elbow, putting a screwdriver in the wrong place could curl your hair permanently; dropping one could conceivably damage the video circuitry just next door. Thus, *The Upgrade Path* recommends that if your Compaq needs a new power supply, let an authorized Compaq dealer take the risk. It's money well spent.

(continues)

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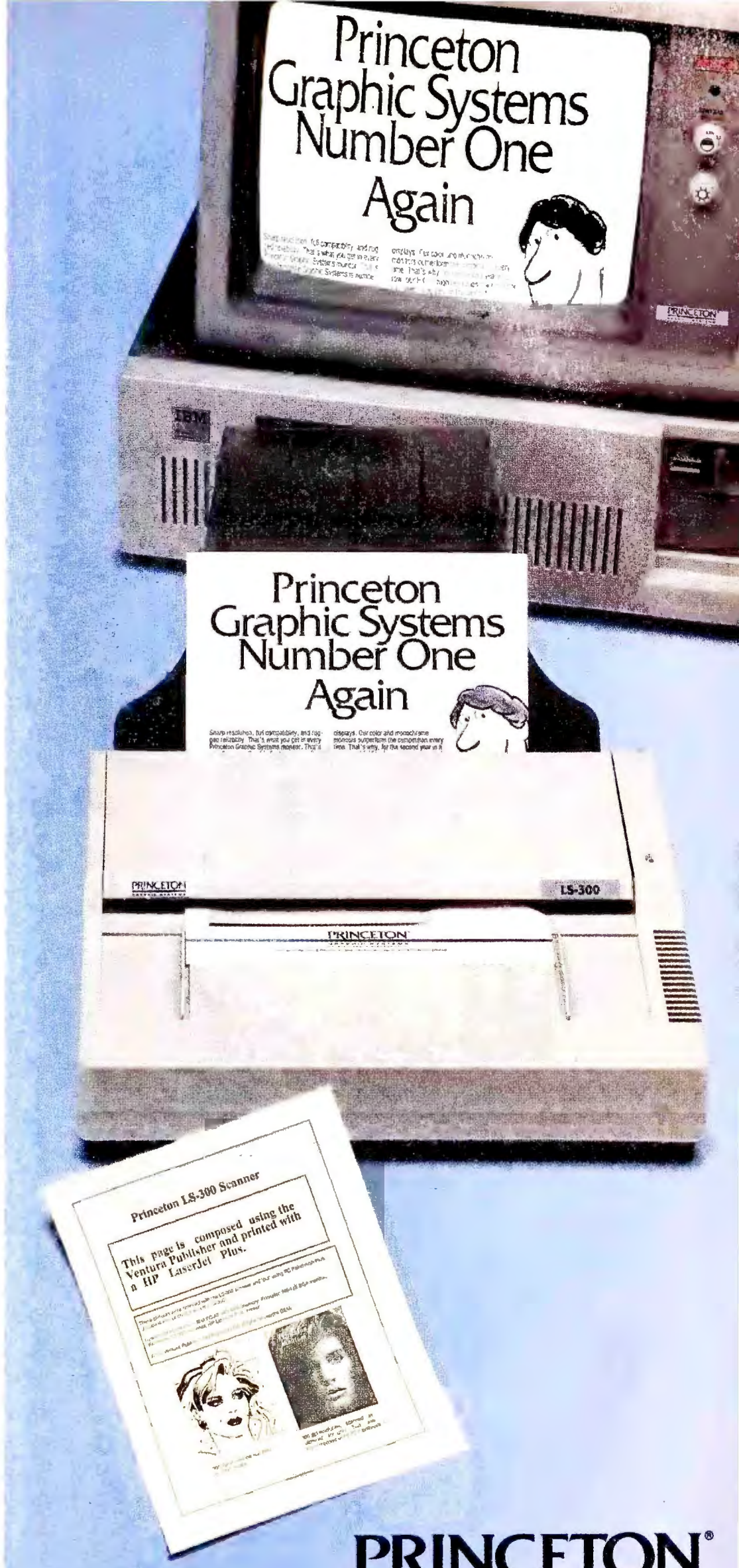

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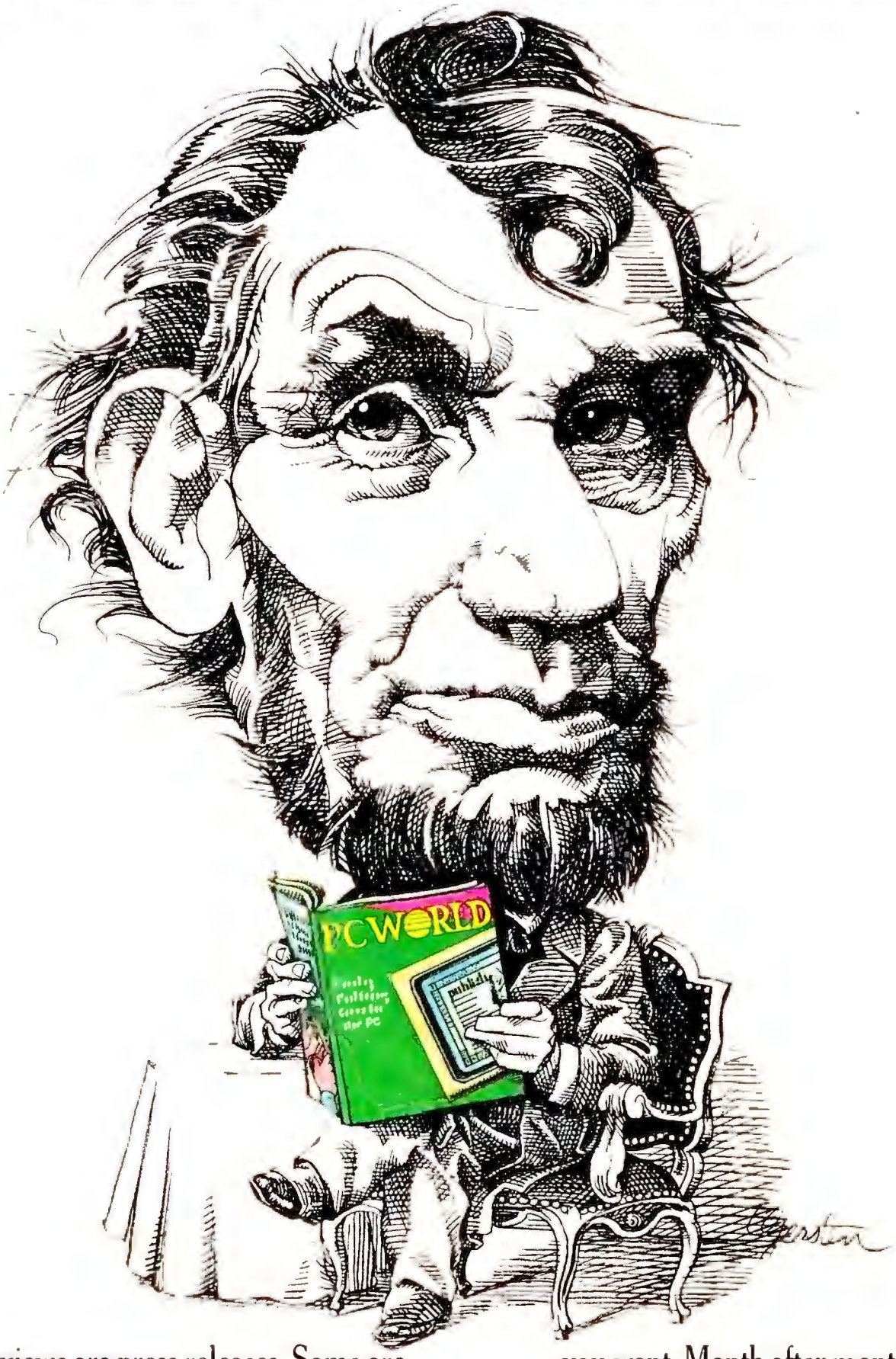

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Because Compaq has a well-established dealer network, obtaining a new Compaq power supply is no sweat (Compaq does not sell directly to individuals). A quick survey of ComputerLand, Businessland, and other retail outlets indicates that a factory-approved power supply (new or refurbished) typically costs $150 and that installation runs about $90. Some dealers offer credit for your Portable's old power supply. Keep in mind that a dealer-installed power supply is typically accompanied by a 90-day warranty; if you insist on installing the supply yourself, most dealers will not guarantee it. *–R. L.*

Power to the PC

Although the PC's faithful 63.5-watt power supply is sturdier than the Compaq Portable's, the need for extra juice is just as acute once you start adding watt-hungry hard disk cards, internal modems, EMS boards, and more. Beefier power supplies for the PC in the 130- to 150-watt range are widely available, cheap, and a snap to install. A mail-order power supply with a one-year warranty can cost as little as $69. Compare this price to the $250 some retail computer stores charge for essentially the same device (installation not included), and you can see why even novice PC users with a yen for XT wattage eagerly roll up their sleeves and get out the screwdriver.

Luckily, this is one upgrade for the rest of us. And if you've ever installed an expansion board, the entire process can take as little as five minutes. The only tool you need is a small flat-blade screwdriver or 3/16- and 1/4-inch nut drivers.

Turn off the PC, ground yourself as discussed earlier, and unplug all external cables. Remove the PC's cover and turn the unit around so the backplane faces you. Remove the four screws that form a rectangle around the PC's fan opening and drop them into a cup so they won't wander away.

The power supply fits somewhat snugly in the system unit, so rock the supply gently up from the back towards the disk drives to loosen it. Pull the drive up and to the side so you can reach into the bowels of the PC and pop off the power connectors attached to the system's disk drives and motherboard. You can now remove the power supply.

To install the new power supply, reverse the steps just described. Rest the unit partly on the edge of the chassis and reattach the power connectors. The two four-wire plugs for the disk drives fit only one way and are interchangeable. The pair of motherboard connectors are also beveled and attach only one way. For reference's sake, the leftmost motherboard power connector has six wires; the right plug has five. When you attach these plugs, don't press too forcefully–it's not hard to crack a motherboard.

Slip the power supply all the way into the system unit, insert the four screws by hand, and tighten them down. *–R. L.*

More Than Compatible?

An AT compatible may be irresistibly priced, but when it fails to run your favorite program because of a hardware incompatibility, you haven't saved anything. One suggested solution making the rounds: Do what clone vendors testing their wares have done for years–substitute true-blue IBM BIOS ROMs for the compatible's ROMs.

You must, of course, find an AT compatible that is ROM pin compatible with the PC AT and that can accept either the four 16K or the two 32K ROM chips devoted to the BIOS and BASIC software. One such AT compatible is the AT Plus 1800 from Club AT (see "An AT by Any Other Name," PCW, December 1986). We replaced the AT Plus 1800's four highly compatible ROMs with two 32K ROMs from an IBM AT, flipped a set of DIP switches on the motherboard to indicate the type of chip, and turned the system on. The unit rumbled, clanked, and a few seconds later loaded true-blue cassette BASIC.

An interesting experiment perhaps, but should you attempt this with your AT compatible? "If anything is ruined," said one PC-compatibles engineer, "it'll be the ROMs. The biggest risk is installation. The AT's ROMs are seated pretty firmly on the motherboard, and it's easy to bend or break a

(continues)

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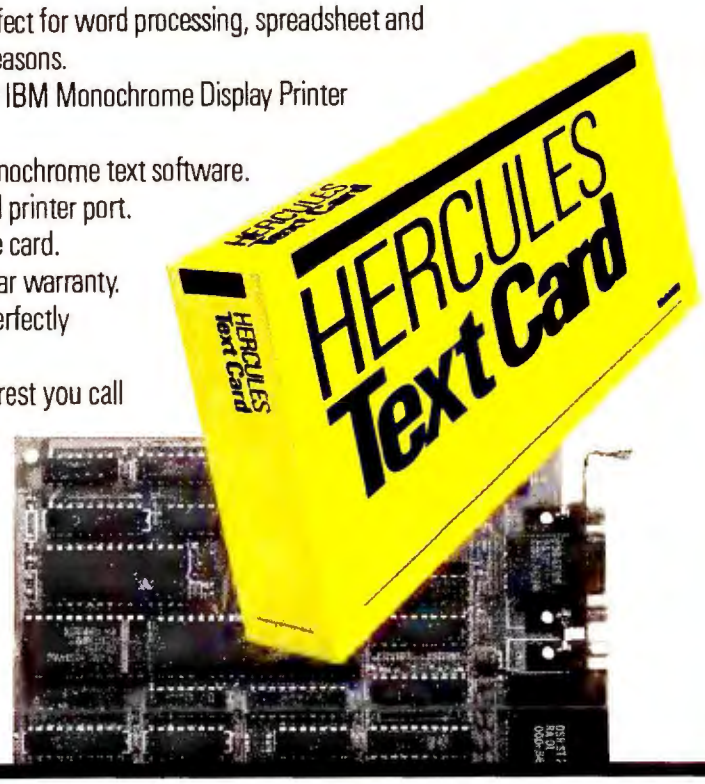

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pin while prying one out. And you can wreak havoc with the system—and the ROM—if you put them in backward or in the wrong order."

But is the gamble justified? Probably not. Besides, most AT clones are very compatible, and it's extremely difficult to get a set of AT BIOS ROMs from IBM. You might also ponder the cautionary tale of one engineer who tested a Compaq Portable—the standard benchmark for PC compatibility—with IBM PC ROMs. He ended up buying a new video board.
—R. L.

Terms of Installation

Adding an Intel AboveBoard PS/AT or compatible EMS board to an AT is a relatively simple affair—if all you're after is expanded memory. You merely set a few switches on the board and pop it into the back of the system; on an AT, you're not even compelled to use the setup program on the *Diagnostics for the IBM Personal Computer AT* disk.

But if you need to devote some RAM on the board to filling out conventional memory (such as a void between 512K and 640K), you must turn to the *Diagnostics* disk. Unfortunately, IBM's pre-EMS terminology for the different kinds of memory the AT accommodates may make upgrading

(continues)

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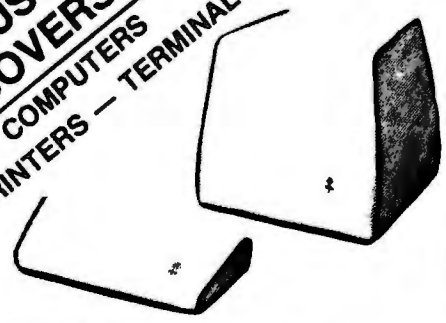

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your system frustrating indeed (for relevant information on expanded memory, see "The RAM Revolution," *PCW*, January 1986).

Let's say you've just added a 2MB AboveBoard to a 512K AT. To parcel 128K on the AboveBoard to conventional memory and the rest to expanded memory, you set the appropriate switches on the board, then run *Diagnostics*, and select 4 (Setup) from the opening menu to inform the system. After answering prompts about the correct date and time, you're presented with a list noting installed floppy and hard disk drives, base (conventional) memory, and *expansion* memory. Most users would instinctively enter 640K for base memory (the correct response) and 1920K for expansion memory. But if you give those responses and reset the system, the AT flashes the following message on the screen:

00640 KB OK
100000 FFFE 201-Memory Error
164-Memory Size Error-(Run SETUP)
(RESUME = "F1" KEY)

The mystery? *Expansion memory* is IBM's term for extended memory, the linear memory space beyond 1MB that's reserved for Xenix and VDISK.SYS. When the system resets, it searches for 1920K of extended memory—but the switches on the AboveBoard are set for something altogether different. To properly configure the AT, EMS board, run Setup again and set expansion memory size to 0. —*R. L.*

Hal Nieburg is a professor of political science at the State University of New York at Binghamton and a freelance writer specializing in computer topics. Aubrey Pilgrim is a freelance writer living in Sunnyvale, California.

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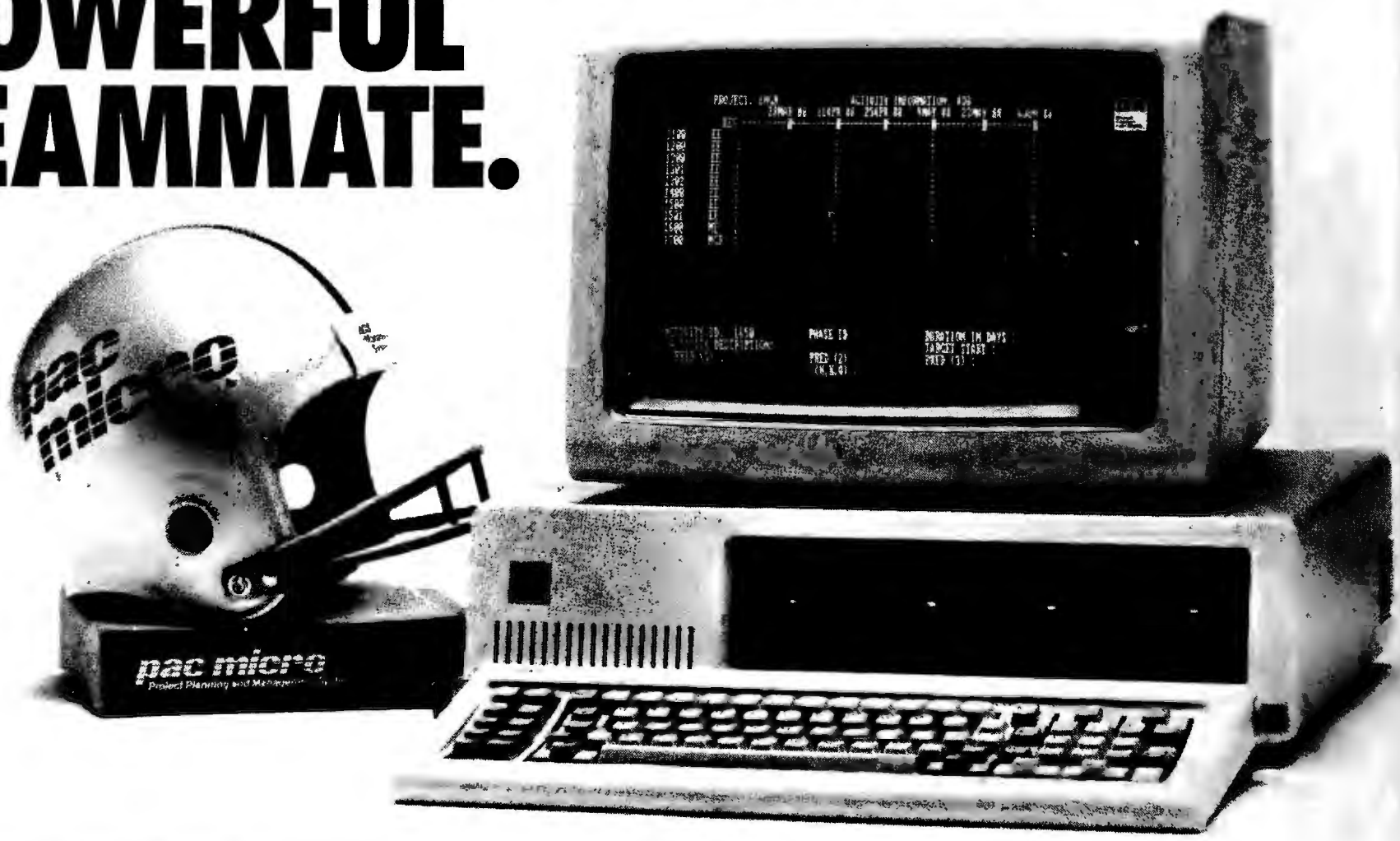

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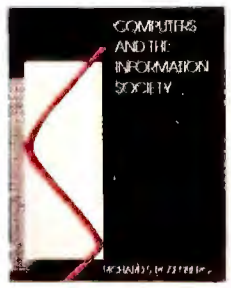
Sourcebooks

Further explorations into personal computer technology

A few scary cautions on automation, a handbook for working at home, using your computer as a broker, and the lowdown from an underground guru

Michael Harper



Muddy Goals and Murphy's Law

Computers and the Information Society
Richard S. Rosenberg
John Wiley and Sons, New York, 1986
397 pages
$24.95 softcover

In *Computers and the Information Society,* Richard Rosenberg reminds us that in 1980 a faulty chip triggered a false warning of a nuclear attack that threatened to kill 20 million Americans within 20 minutes.

If that nugget of information doesn't raise your technophobia quotient, consider the following: A real nuclear attack would be the first true test of the "Star Wars" Strategic Defense Initiative. Every bit of the software would have to work without a hitch on the first try, and as a laconic Rosenberg comments, "Anyone familiar with writing even short programs knows that such an event is almost nonexistent."

Not all of Rosenberg's examples are as dramatic as this, but they all examine issues created by the computerization of business, medicine, education, government, and the law. Determined to disentangle fact from myth, Rosenberg looks at available research, statistics, and journals, trying to assess such diverse topics as the impact of the microchip on employment, individual privacy, human imagination, and public safety.

The general public, argues Rosenberg, regards computers with a paradoxical mixture of uncritical respect and profound fear. The PC revolution has made itself felt in most businesses and some homes, but that familiarity hasn't altogether dispelled the fear. What people are afraid of is not the machine itself; they're afraid of the ways big government or business can use it to disrupt private and professional goals.

Rosenberg believes that one effect of new technology will be a net loss of jobs and a restructuring of work. Even as fears that offices will become "information sweatshops" prove largely groundless, changes in task patterns are occurring at a dizzying pace.

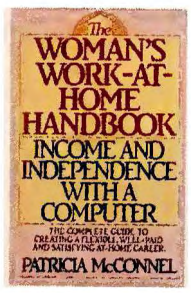
Witness the recent *Wall Street Journal* announcements of expert systems replacing loan officers in large banks. Or Digital Equipment's efforts to automate the evaluation of customer hardware needs. Or Ford Motor's new edict to its machine tool suppliers: Provide expert system diagnostics on a disk or risk losing the account. In each case, expert judgment or diagnostic services previously provided by professionals and middle management were computerized.

In *Computers and the Information Society,* however, Rosenberg moves the spotlight from the dramatic and well-publicized effects of new technology to more subtle behind-the-scenes problems besetting the computer revolution. Very often organizations contemplating computer purchases have no clear idea of what they really want or need. Rosenberg cites a survey

(continues)

showing that once they get the machines, most companies don't know how many microcomputers they have or where they are. Loose supervision and slack security make accessing sensitive information too easy and maintaining data base integrity too difficult.

As a result, office automation may ultimately raise costs instead of lowering them. In theory, electronic mail, word processing, and data base management software can save time, but long learning curves, inefficient application of software, and shaky transitions to new technology can more than offset theoretical gains. In the end, we may have less to fear from expert systems or government snooping than from muddy goals and Murphy's Law.



Not for Women Only

The Woman's Work-At-Home Handbook: Income and Independence With a Computer
Patricia McConnel Bantam Books, New York, 1986
334 pages
$9.95 softcover

Toying with the idea of operating a home-based business? Patricia McConnel might persuade you to make your move. Her mission: to inspire readers to set up their own computer-related businesses at home.

Most of the benefits McConnel cites in *The Woman's Work-At-Home Handbook* are as real for men as they are for women. Not only can you cut expenses by working at home (no special wardrobe, commute costs, or parking fees), you can determine your own working environment (nobody else's cigarette smoke!) and hours. Other advantages include potential tax savings, higher income, and greater opportunities for personal growth. Finally, because you must wear many hats and practice many skills in addition to the one you're selling, self-esteem can soar: You know your successes relate directly to your efforts.

Although some of her examples of successful computer-related home businesses feature men, McConnel addresses women specifically, because she believes their socialization makes it harder for them to muster the self-confidence needed to strike out on their own.

McConnel doesn't promote just any kind of home business. She cautions against a telecommuting setup for piecework or clerical workers, for instance. Such situations, she says, generally call for sweatshop quotas and provide no tax advantage. For special groups like the homebound or physically handicapped, however, self-employment may be the only alternative to no employment at all.

McConnel began her own home-based employment as a freelance writer and gives special attention to the quirks of that occupation. Other business possibilities she suggests include word processing, bookkeeping, income tax preparation, financial management, tutoring, programming (including creating templates that work with existing programs), desktop publishing, editing, and creating and marketing specialized data bases.

She covers the nitty-gritty of running a business as well, from the physical setup of a home office to the subtler aspects of pricing and promotion strategies. She's well aware, for instance, that individuals working out of their homes are not always considered serious businesspeople. She suggests several simple but ingenious ways of augmenting a professional image—for example, having a separate phone number that the kids are forbidden to answer.

Embedded in this savvy advice, however, McConnel's ideas about useful computer hardware stand out like an expansion board in a PCjr. She started her home business with an 8-bit CP/M machine running *WordStar* and assumes that that will be good enough for you, too.

Such a setup might be adequate for some writers—if they don't telecommunicate much and don't need to keep pace with technology. But neither is it "perfectly adequate for most business requirements," nor is it a "good investment"—especially not for most programming or data-base-intensive chores.

McConnel is a persuasive writer who makes a convincing case for home-based employment. For advice about appropriate computer tools, however, readers should seek information elsewhere.

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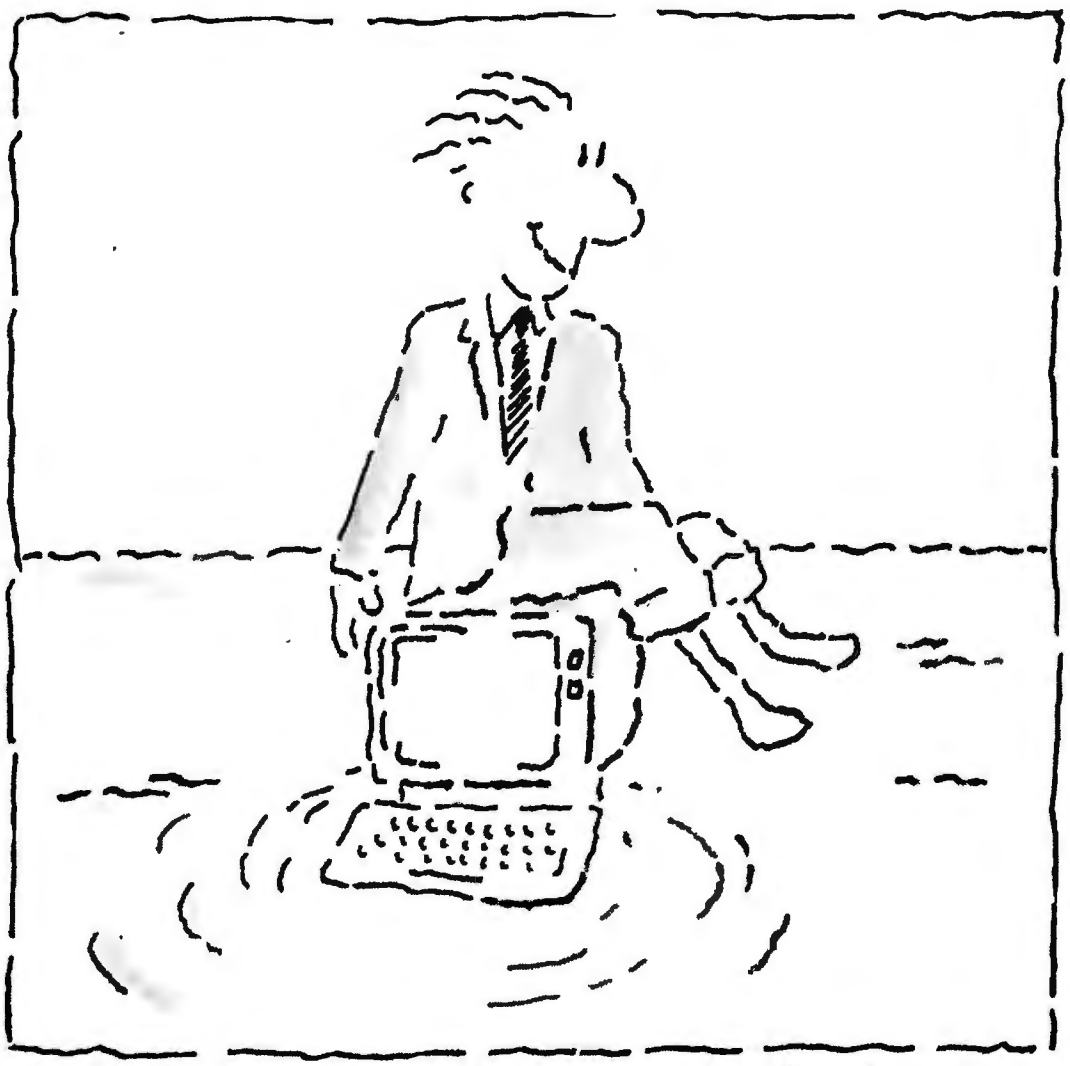

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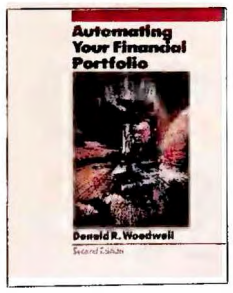

Desktop Brokering

Automating Your Financial Portfolio: An Investor's Guide to Personal Computers, second edition
Donald R. Woodwell
Dow Jones-Irwin, Homewood, Illinois, 1986
353 pages
$25 softcover

In the last few years, volatile markets and economies have created an investment roller coaster. Whether you make a profit or take a loss—and how big—often depends on having the right information at your fingertips at the right time. PCs play an increasingly important role in this equation: They connect you with electronic information services and on-line brokers, and they provide tools for analyzing new financial information.

Equipped with the right programs, a PC can give the serious investor the kind of analysis and advice that once came from a broker. But even though these programs incorporate many skills practiced by informed traders, you must understand the basics of intelligent portfolio management.

Automating Your Financial Portfolio offers clear instructions in setting up an extensive information analysis system. Largely rewritten to reflect new programs and technologies, the second edition of Donald Woodwell's book shows exactly why the PC has become a powerful investment tool.

Yet the computer, Woodwell emphasizes, can't do everything: It's up to you to set your own goals and determine an acceptable level of risk. Furthermore, Woodwell believes that a clear view of personal finances is essential for proper financial planning. He explains how to systematize household cash flow by developing a cash flow model on a spreadsheet such as *1-2-3* and how to record daily financial transactions with programs such as Scarborough Systems' *Your Personal Net Worth.*

Once you've created a solid personal financial data base, you can use a program such as Lumen Systems' *Personal Financial Planner* for investment analysis, tax planning, insurance analysis, retirement planning, estate planning, and education financing.

Then you'll be ready to learn about strategies and programs for evaluating and selecting stocks. In that regard Woodwell covers Standard & Poor's *Stockpak II,* Best Programs' *The Personal Investor,* and Dow Jones's *Market Analyzer Plus* and *Market Manager Plus.*

For those sophisticated enough to act as their own broker, Woodwell discusses several electronic investor services. Lotus's *Signal,* for instance, delivers the latest real-time market quotations via FM transmissions to your PC. On-line brokerage services such as Charles Schwab's *The Equalizer* let you connect directly with traders on the floor of the stock exchange, bypassing broker—though not software or connect-time—fees.

In addition, Woodwell covers software that analyzes fixed-income securities and several packages that assess real estate investment. He even capsulizes available software for the tricky options and futures markets.

Woodwell also discusses unusual programs that keep track of the prices of specific tangibles, such as coins and stamps. Finally, he discusses "post mortem" financial planning—taxes, insurance, retirement, and death expenses.

Woodwell's writing style is a bit dense, but his advice is reassuringly thorough and logical. For example, he explains that the pitfalls of futures trading "can cause you to lose hundreds or even thousands of dollars even faster than by setting fire to them."

Emotional involvement is particularly dangerous in futures trading, he warns, advocating a "mechanistic" approach that discourages making decisions in the heat of sharp market moves. Programs for charting and analyzing can help here; by identifying trends as early as possible, they can signal when to cut your losses and get out of the market.

Woodwell highlights off-the-shelf software, using as examples programs that are easy to learn, have proved their worth, and are representative of the market. He expounds the fundamental principles and strategies of responsible financial management in each area before showing how the computer can help with the chores. As a level-headed guide, *Automating Your Financial Portfolio* could turn out to be the best investment you make this year.

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Notes From the Underground

The Secret Guide to Computers, 12th edition; Volume 1: Secret Skills
Russ Walter, Somerville, Massachusetts, 1986
335 pages
$8 softcover (includes shipping)
Russ Walter, 22 Ashland St., Somerville, MA 02144
617/666-2666

Like the writers of the Russian *zamisdat,* or literary underground, Russ Walter voices his unorthodox views through unofficial channels. His book, *The Secret Guide to Computers,* is secret insofar as it isn't listed in *Books In Print,* and your bookstore probably won't have heard of it. But don't let its low price and underground status fool you; *The Secret Guide* isn't literary vaporware. You order it directly, can reprint it freely, and the price includes free telephone consulting 24 hours a day.

In *The Secret Guide,* computer guru Russ Walter offers a generous compendium of industry gossip, buying advice, and detailed tutorials. *The Guide* has gone through many editions and been well received by such reputable publications as the *Wall Street Journal* and *Scientific American.* The latest (12th) edition is extensively updated and will include two more volumes—covering topics in artificial intelligence and tutorials for Pascal, COBOL, C, FORTRAN, and *dBASE*—before the year is out.

Walter displays a grudging admiration for IBM, which he calls "International Big Mother." He characterizes its marketing strategy as more reactionary than innovative, but even after discussing nearly every micro that's ever been on the market, he still advises his readers to buy an IBM PC or a closely compatible clone. The range and power of its business software can't be beat, he says, backing up this statement with three chapters of comparative information on applications programs for the PC.

Two hefty chapters of the book teach programming in *Microsoft BASIC.* Four more chapters provide detailed, foolproof tutorials: on DOS; on word processing using IBM's *Writing Assistant* and the more advanced *WordPerfect;* on spreadsheets using *1-2-3;* and on data management systems using *pfs:file.*

The book's most unusual and arguably most valuable feature is its no-holds-barred advice on *how* to buy software. Walter lists the mail-order houses customers have complained about, gives specific sources for discount purchases, and offers advice on how to deal with them.

For all its scope, navigating within *The Guide* is easy. A detailed table of contents reveals overall structure, and every odd-numbered page has a footer specifying the current topic. Indexes list major subjects such as IBM and printers, as well as more specific topics like PC-DOS, *1-2-3,* and BASIC commands and expressions.

The book's low price is a result of private publication and distribution and does not indicate compromises on content or organization. While its layout and graphics don't match mainstream sophistication, the print is clear and readable laser quality.

Walter uses two effective strategies to keep his information current. He updates *The Guide* often, and he offers an up-to-the-minute analysis of the current mail-order marketplace to anyone who calls. The latter service may sound too good to be true, but even at 3 a.m. —when I tried the number—Walter answers calls promptly and courteously.

I could find only one fault with Walter's effort: a weakness for bad puns—too bad, in fact, to reprint here. Generally, though, he confines corny comments to prefatory materials and doesn't let them intrude on the clear, no-nonsense tone of his tutorials and discussions. If you count enduring the occasional lame pun as part of the total price you pay, this book is still a wonderful bargain. ●

Michael Harper teaches English literature at Scripps College in Claremont, California.

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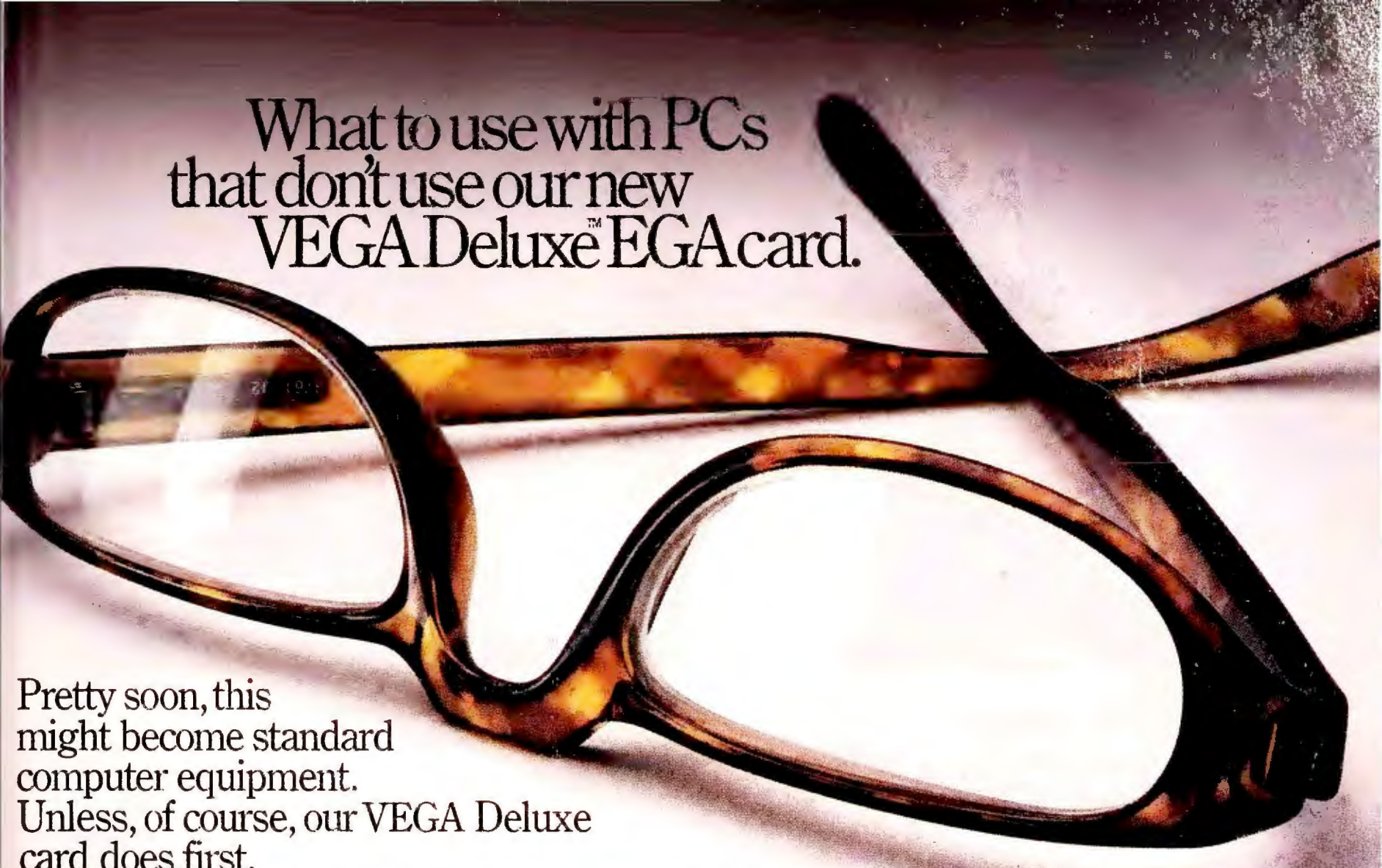

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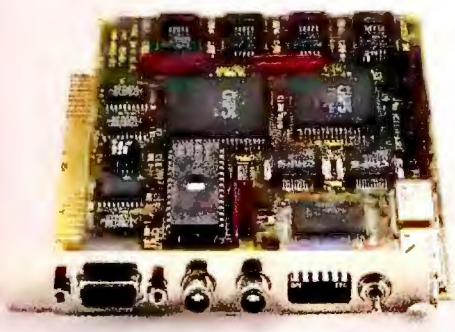

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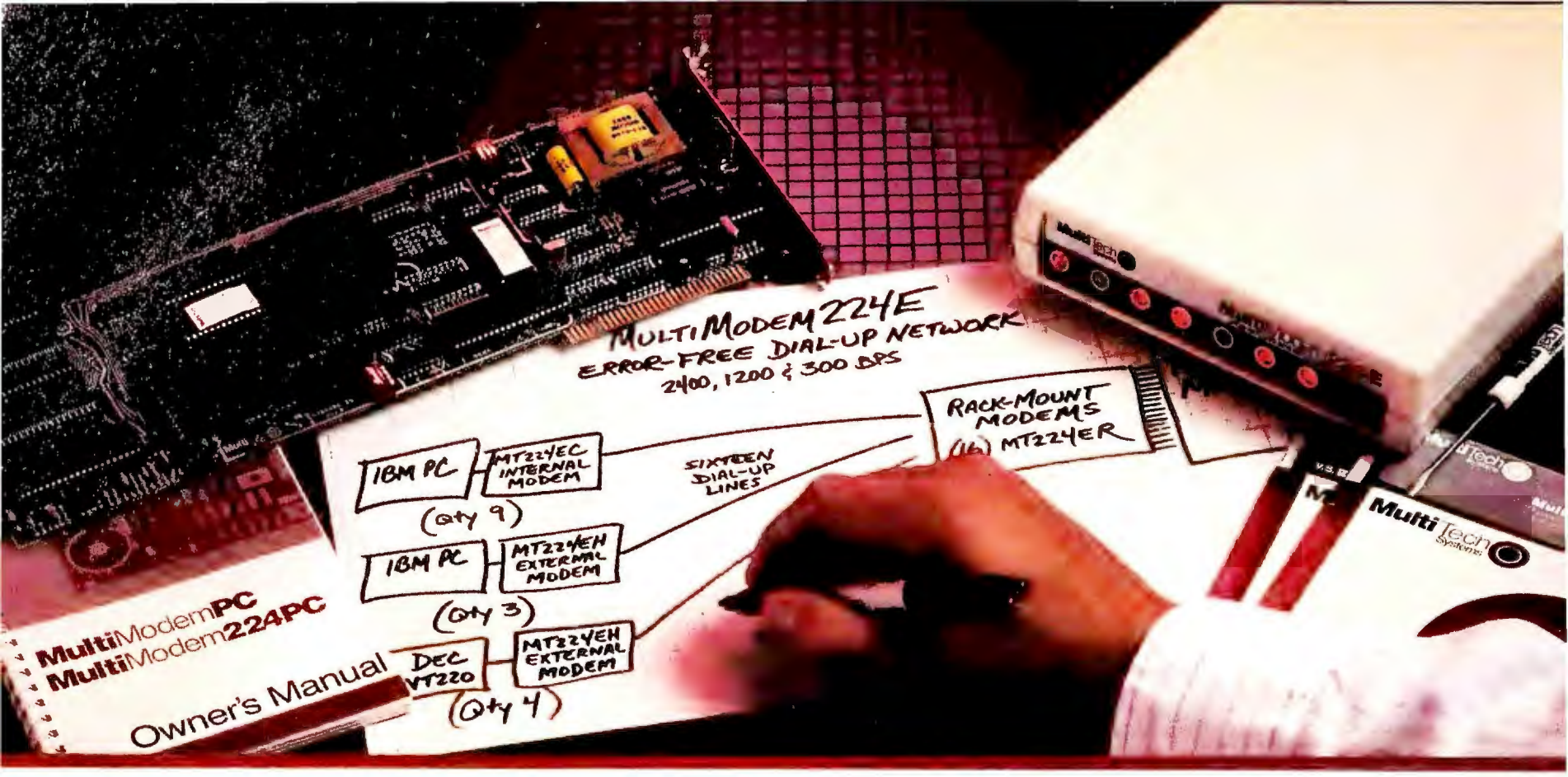

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Lewis Greenwood
La Jolla, California

A. DIR is one of those DOS commands that everyone learns right away and therefore never looks up in the DOS manual. The DIR command has two optional "switches." Each switch is simply a slash followed by one or more characters and is used to modify the action or result of a DOS command. DIR's switches are /P (for page) and /W (for wide).

Entering DIR /P causes a lengthy directory listing to pause after filling the screen. The message 'Strike a key when ready . . . ' then appears at the bottom of the screen. Pressing a key restarts the directory listing. If the continued listing fills the screen again, it pauses, and the message is redisplayed. If you see the file name that you're looking for, you can press <Ctrl>-C to return to the DOS prompt.

Using /W causes the file names to be displayed from left to right, wrapping around to the next line each time a line is filled. A DIR /W directory listing displays only file names; that is, it does not include file size or time and date last saved.

There are other tactics you can use to control directory listings. If you know the exact name and extension of the file you're seeking or just want to be sure that that name and extension combination is not already in use, type DIR *filename.ext*. Only that particular file name, if it exists, will be displayed.

You can also use global file (wild card) name characters to prune your directory listings. DIR NAME.* (or DIR NAME), for example, displays all the files in the current directory that have the name NAME and have any extension. (To check whether a file that has no extension exists, follow the file name immediately with a period.) DIR *.DOC displays all the files in the current directory that have the specified extension DOC. DIR ????.* displays all file names that are four characters or less and have any extension. DIR ????.DOC works similarly but also matches the specified extension. To find the files in the current directory that start with, for example, the letter *A*, type DIR A* or DIR A*.*. Use the same technique to find all the files that have an extension beginning with a particular character, as in DIR *.A*. You can, of course, use various combinations of file name characters, *, and ? to produce more refined listings. Look up DIR in your DOS manual for more examples.

One last tip that isn't in the DOS manual: You can stop and then restart the output generated by any DIR (or TYPE) command by pressing <Ctrl>-S.

Printer Port of Call

Q. *Reading about physically swapping a printer cable between two parallel printers in "How to Avoid Networking" [*PCW, *April 1987] compelled me to write regarding my printer problem. That article proposes using an A-B*

(continues)

switch so that selecting a printer is as simple as turning a dial. Although that solution is certainly straightforward, it means buying another cable as well as the switch box.

My PC has two parallel ports, and I would prefer to use the hardware I have rather than spend money on more. But choosing between LPT1 and LPT2 when I'm ready to print is not easy with the software I use, so to switch printers I unplug one printer's cable from the LPT1 port and plug in the other's cable, leaving my software set up to use LPT1. How can I get around this inconvenience without buying an A-B switch?

Harold Bergman
Oakland, California

A. Fortunately, there is a simple way to make DOS temporarily use LPT2 as though it were LPT1. SWAPLPTS, which swaps the port address value of LPT1 for LPT2, was first presented in two versions in November 1985's *Help Screen*. Here are the directions for creating a third version of this popular and useful program. This improved version displays a message indicating which port, LPT1 or LPT2, will receive the output sent to LPT1.

Place a copy of DEBUG.COM (from the DOS Supplemental Programs disk) in drive B: and a formatted disk for saving SWAPLPTS.COM in drive A:. At the A> prompt type the boldface characters shown in the following lines, pressing **<Enter>** at the end of each line. (DEBUG displays the other characters; the *xxxx* will be a 4-digit hexadecimal number that varies from machine to machine.)

```
A>B:DEBUG
-A
xxxx:0100 PUSH DS
xxxx:0101 MOV AX,40
xxxx:0104 MOV DS,AX
xxxx:0106 MOV BX,[8]
xxxx:010A MOV CX,[A]
xxxx:010E MOV [8],CX
xxxx:0112 MOV [A],BX
xxxx:0116 POP DS
xxxx:0117
```

After the last time you press **<Enter>**, the hyphen prompt will reappear. Type **D 40:8 L2** and press **<Enter>**. Two pairs of hexadecimal characters will appear midway across the screen. These two numbers define, with the low-order byte first, the port address of LPT1. For example, if DEBUG displays 'BC 03', the port address is 03BC.

Type **A 117** and press **<Enter>**. When the cursor appears to the right of '*xxxx*:0117', type **CMP CX,** (don't forget the trailing comma, and don't press <Enter> yet). Now type the port address, with the high-order byte first, of LPT1. (If DEBUG displayed 'BC 03' in response to the command D 40:8 L2, as in the previous example, you would enter CMP CX,03BC for line :0117.) Now press **<Enter>** and type the boldface text in the following lines, pressing **<Enter>** after each line.

```
xxxx:011B JNZ 121
xxxx:011D MOV AL,31
xxxx:011F JMP 123
xxxx:0121 MOV AL,32
xxxx:0123 MOV [147],AL
xxxx:0126 MOV DX,12F
xxxx:0129 MOV AH,9
xxxx:012B INT 21
xxxx:012D INT 20
xxxx:012F DB D,A,"LPT1 re"
xxxx:0138 DB "directed to "
xxxx:0144 DB "LPT1",D,A,24
xxxx:014B
-R CX
CX 0000
:4B
-N A:SWAPLPTS.COM
-W
Writing 4B bytes
-Q
```

That's it—SWAPLPTS.COM is now on the disk in drive A:. To switch between printers, just enter the command **A:SWAPLPTS** at the DOS prompt. To reset the printers to their original ports, you simply issue the command again.

Serial Port Interrupts à la MODE

Q. *In addition to a laser printer that I recently purchased, I own a dot matrix printer with a serial interface. I've attached the laser printer to COM1 and the dot matrix printer to COM2, but I don't have a way to switch between them. What can I do?*

Annette Fabriano
Chicago, Illinois

A. Because you have serial printers attached to COM1 and COM2, you can use the DOS MODE command to choose between them. First set the parameters (specifying the baud rate, type of parity, number of data bits, number of stop bits, and whether DOS should continuously retry printing in response to time-out errors) for each

(continues)

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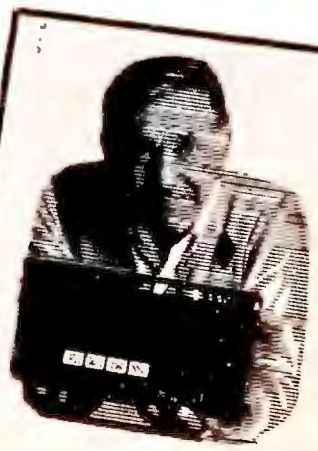

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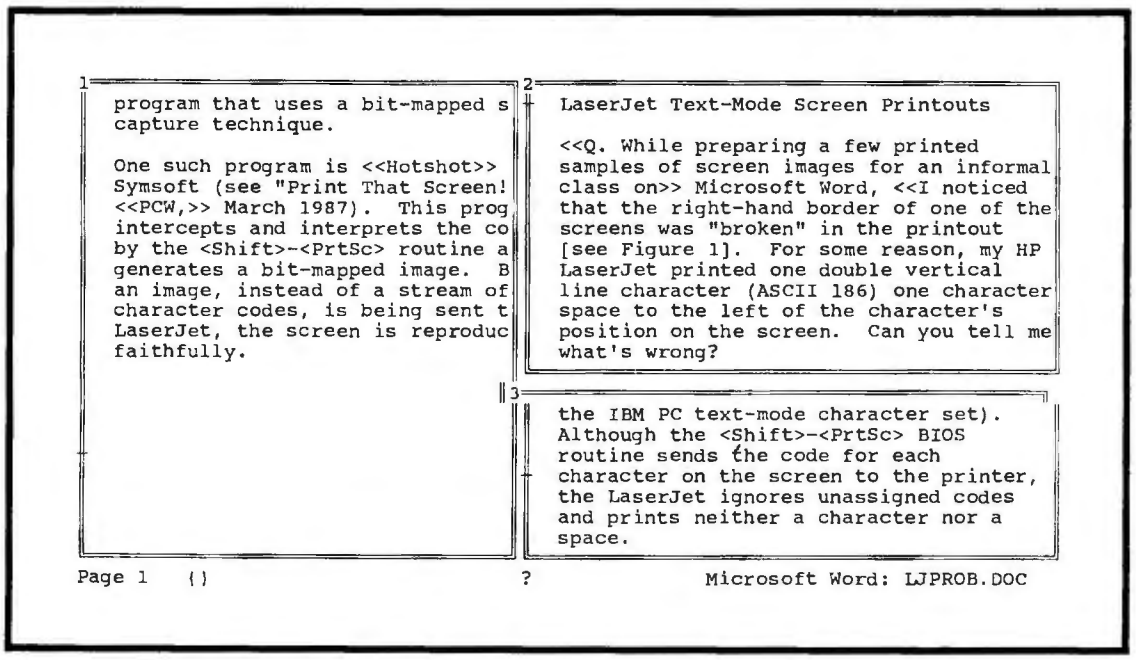


Figure 1: The HP LaserJet does not print all text-mode characters, resulting in offset characters for some screen printouts produced with <Shift>-<PrtSc>.

printer with the MODE command as usual. Then configure your programs to print to LPT1 rather than to a COM port.

When you want to print to the printer connected to COM1, place a copy of MODE.COM in the default drive and, at the DOS prompt, enter the command MODE LPT1: = COM1:. To access the other printer, use the command MODE LPT1: = COM2:.

Unfortunately, you cannot switch between other serial devices as easily; COM ports cannot be redirected to each other, and just swapping the serial port addresses (as was done for parallel ports LPT1 and LPT2 in the previous item) is insufficient. Because COM1 and COM2 are configured with different interrupts, the interrupt assignments must also be changed. That, however, generally requires changing a jumper on the serial port board.

LaserJet Text-Mode Screen Printouts

Q. While preparing a few printed samples of screen images for an informal class on Microsoft Word, *I noticed that the right-hand border of one of the screens was "broken" in the printout [see Figure 1]. For some reason, my HP LaserJet printed one double vertical line character (ASCII 186) one character space to the left of the character's position on the screen. Can you tell me what's wrong?*

Randall Mahoney
Seattle, Washington

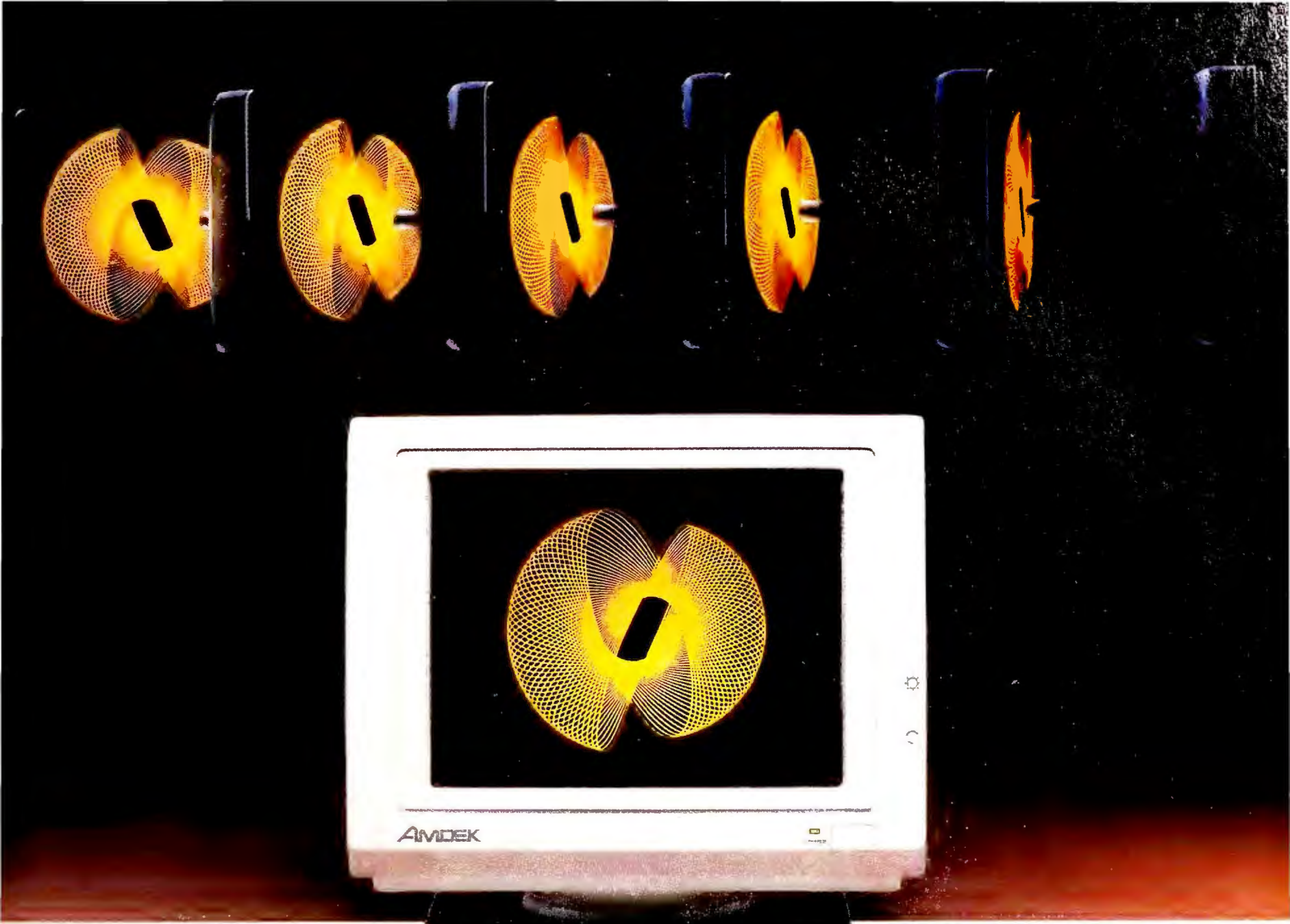
A. As the printout you sent illustrates, broken *Microsoft Word* borders are a problem when using <Shift>-<PrtSc> to create a printed screen with the HP LaserJet. The difficulty occurs because some text-mode characters are not available from any LaserJet font, including those on HP's 92286Y font cartridge and Orbit Enterprises' *Font 10* disk-based font (both of which are intended to provide the IBM PC text-mode character set). Although the <Shift>-<PrtSc> BIOS routine sends the code for each character on the screen to the printer, the LaserJet ignores unassigned codes and prints neither a character nor a space.

The screen image that you attempted to reproduce includes *Word*'s diamond end mark (ASCII 4). That character's code is not assigned to a LaserJet character. Consequently, all screen characters to the right of the diamond are offset one space to the left, resulting in the displacement of the border character. To solve the problem, you must either move the diamond off the screen before making the screen printout or produce the printout with a program that uses a bit-mapped screen-capture technique.

One such program is *Hotshot* from Symsoft (see "Print That Screen!" *PCW,* March 1987). This program intercepts and interprets the codes sent by the <Shift>-<PrtSc> routine and generates a bit-mapped image. Because an image, instead of a stream of character codes, is being sent to the LaserJet, the screen is reproduced faithfully.

Hotshot
Symsoft
P.O. Box 4477
Mountain View, CA 94040

(continues)



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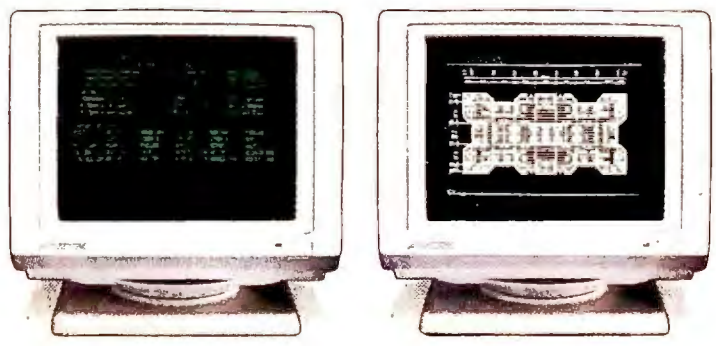

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Starflight's EGA Trek

Q. After purchasing Starflight *by Electronic Arts [see* From the Software Shelf *in this issue], I found that it will not run on my AT because the game lacks support for my system's Enhanced Graphics Adapter (EGA). Can I do something to the EGA or to* Starflight *so that it will run on my system?*

Reid Carroll
Marco, Florida

A. Another *Starflight* captain, Lee Johnson, has compiled a set of patches that will make your EGA spaceworthy. Captain Johnson has donated the patches to Electronic Arts. You implement the patches with DEBUG and can obtain them by writing to Electronic Arts' Customer Service Department at 1820 Gateway Dr., San Mateo, CA 94404. Note that because *Starflight* was not written for the EGA, this patch runs the program in CGA-emulation mode.

Do you have any questions concerning the IBM PC or compatibles? Send them to The Help Screen, PC World, *501 Second St., San Francisco, CA 94107, or electronically to MCI Mail PCWORLD, CompuServe 74055,412, or The Source STE908.*

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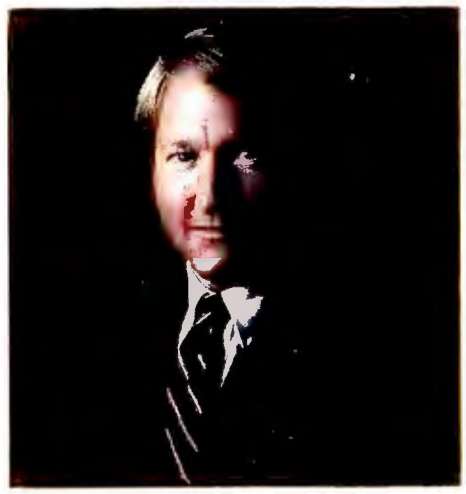

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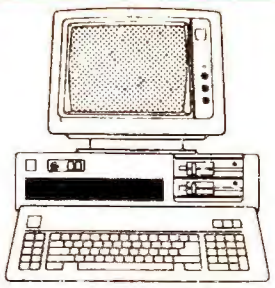

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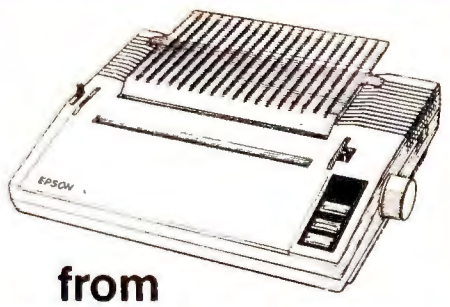

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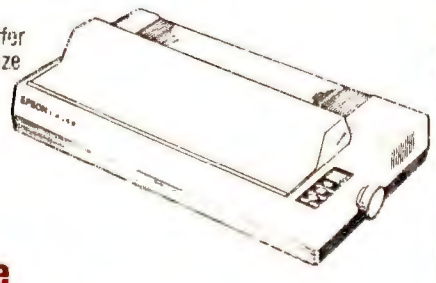
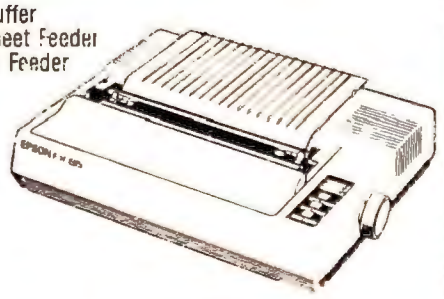
Options
- 32K buffer
- Customize for special tasks



FX-86e
- 240 cps in draft elite mode
- 48 cps in Near Letter Quality mode
- 8K buffer
- Front panel selectable
- IBM Pro Printer character set

Options
- 32K buffer
- Cut Sheet Feeder
- Tractor Feeder



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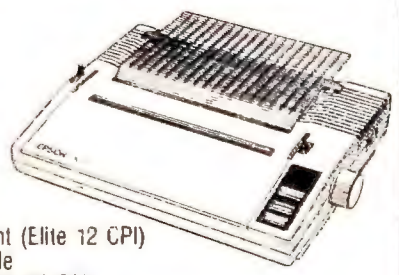
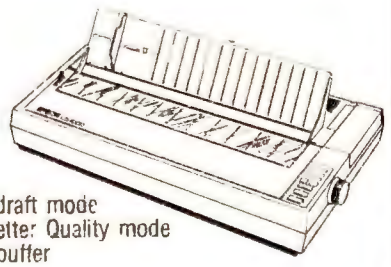


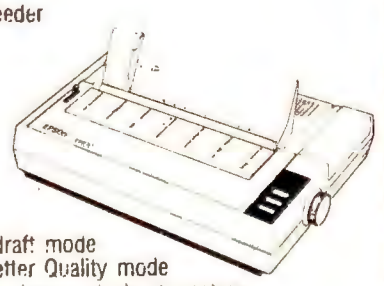
LQ-2500
- 324 cps print (Elite 12 CPI) in draft mode
- 405 cps (Elite 15 CPI) in ultra-high speed mode
- 108 cps (Elite 12 CPI) in Letter Quality mode
- 8K internal buffer

Options
- Single and Dual Bin Cut-Sheet Feeders
- 32K buffer



LQ-1000
- 180 cps in draft mode
- 60 cps in Letter Quality mode
- 7K internal buffer

Options
- Tractor Feed
- Cut Sheet Feeder



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- Tractor Feed
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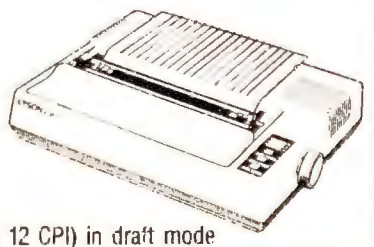

EX-1000
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- Paper up to 16-inches wide

Options
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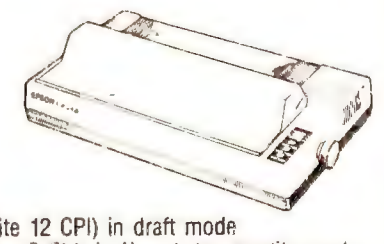
- Single and Double Bin Cut Sheet Feeders
- 32K buffer

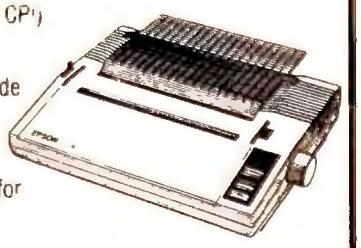


EX-800
- 300 cps (Elite 12 CPI) in draft mode
- 54 cps (Elite 12 CPI) in Near Letter Quality mode
- 8K internal buffer

Options
- Color enhancement
- 32K buffer

***LX-86**
- 120 cps (Pica 10 CPI) in draft mode
- 16 cps in Near Letter Quality mode

Options
- Cut Sheet Feeder
- Tractor Feed
- interface boards for additional buffer



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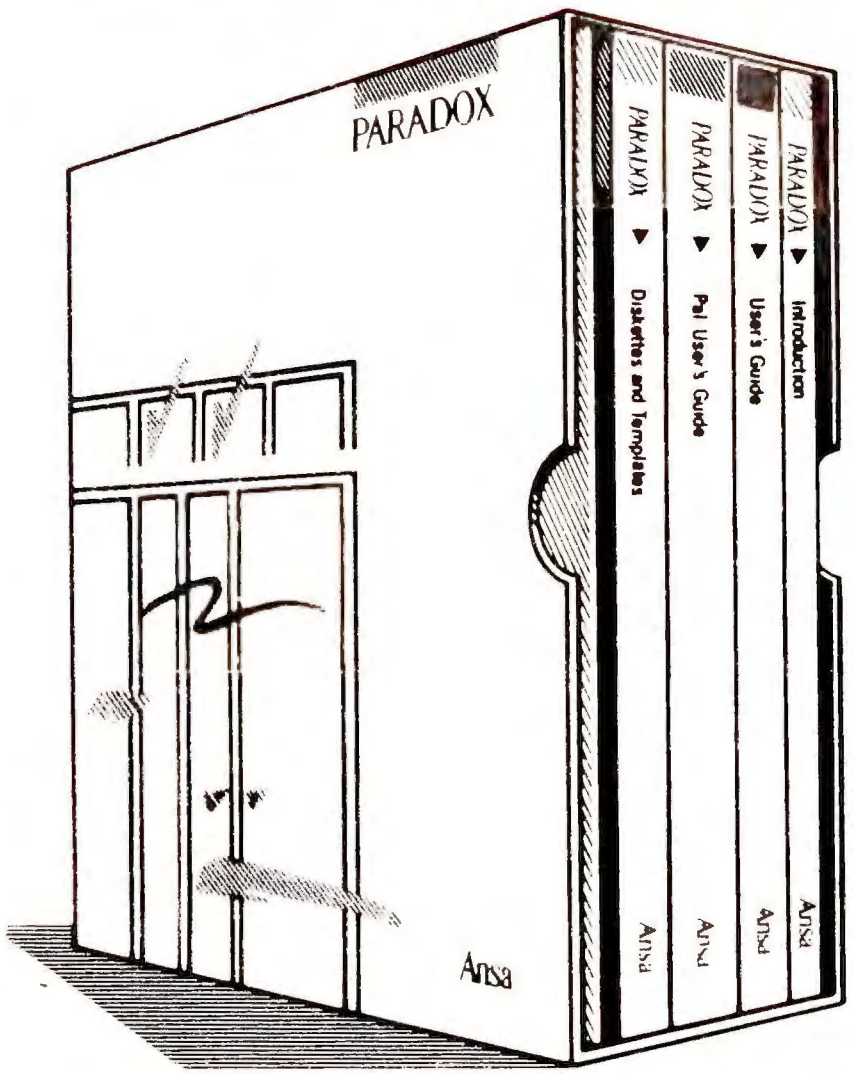

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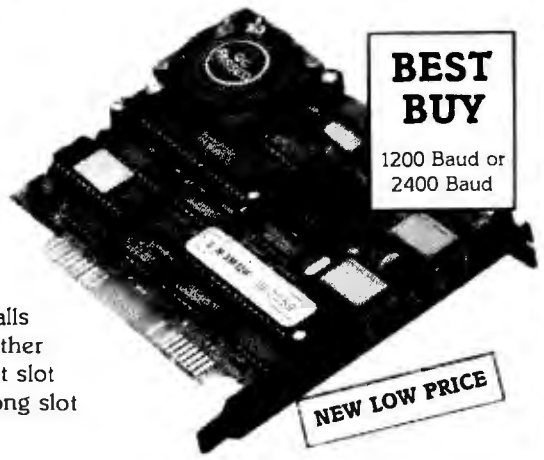

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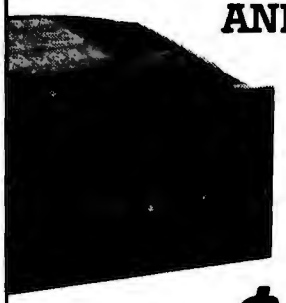

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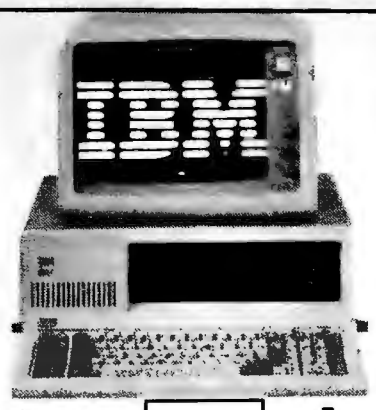

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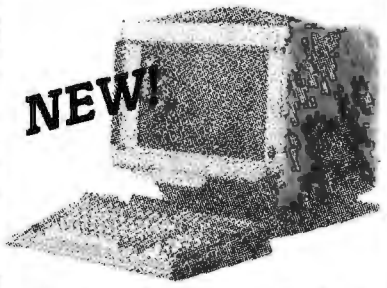

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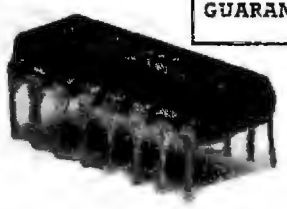

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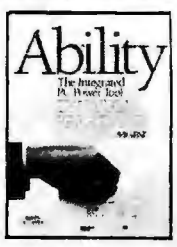

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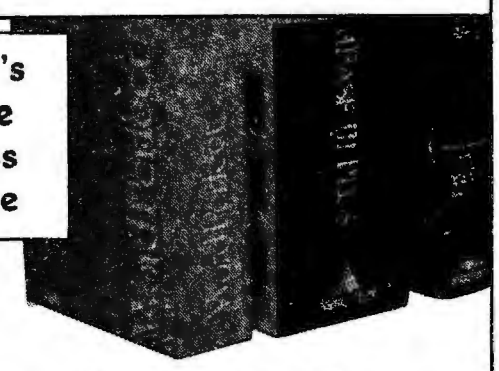

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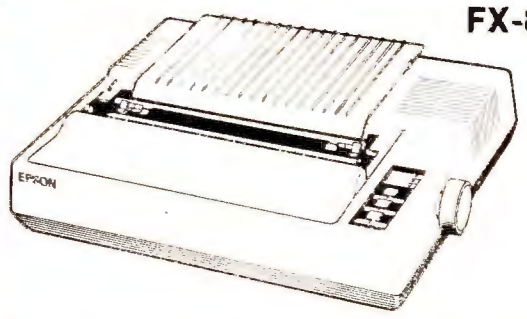

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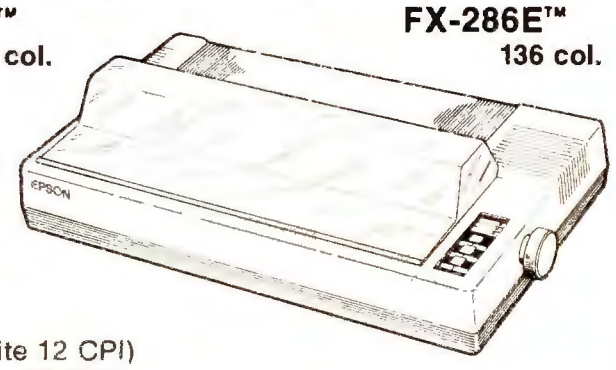

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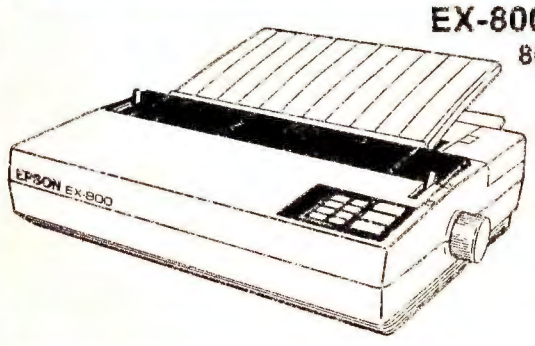

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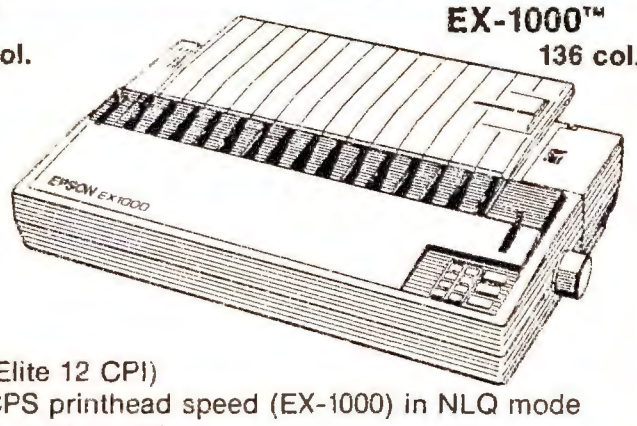

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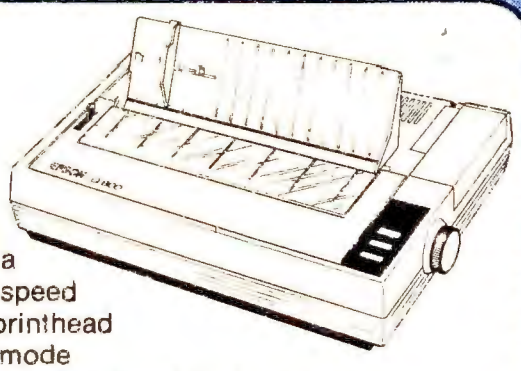

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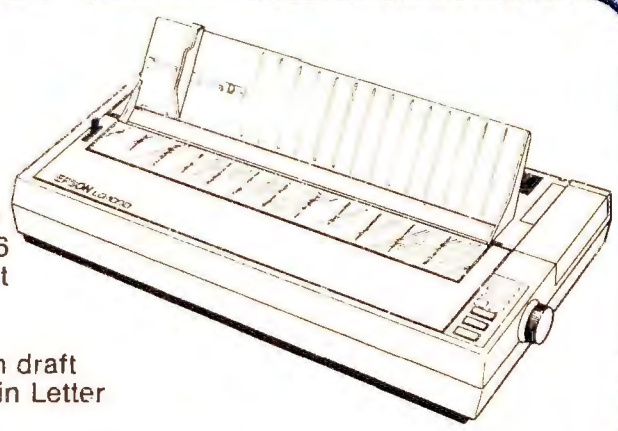

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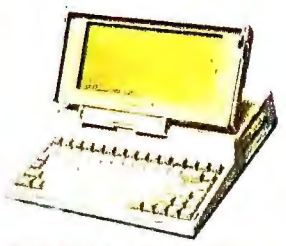

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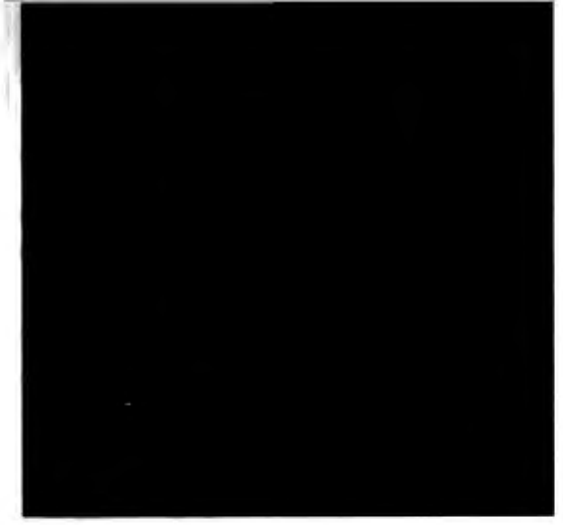

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Relate a dBASE III data base to more than one file, perform fast system-memory checks, start your PC using COMMAND.COM from any drive or directory, and put North Carolina's flag in your DOS prompt.

Edited by Mike Cushman

More Relations in dBASE III

The *dBASE III* manual states that the SET RELATION command links two open data base files and that only one relation can be set from any work area. I assumed this meant that each relation could link only the same two files. However, I discovered that I could simultaneously relate a data base file to more than one lookup file.

To illustrate, assume that you are working with three data base files with fields and related index files as shown in Table 1. Each USE command in Listing 1 opens a file in the work area chosen with the preceding SELECT command. The latter two files each use an index created on a field it has in common with the first file. After moving back to work area 1, SET RELATION is used to link the Employee file to the Division file, using the common field Div_code. Then in work area 2, the second SET RELATION command relates the Employee file in work area 1 to the Departmt file, using the common field Dep_code. Note that the Dep_code field of the Employee file is referenced by prefixing the field name with 'A', the default reserved alias name for the file open in work area 1, and '->', *dBASE III*'s "pointer." Although it seems odd, a given work area's single relationship need not include the file open in that work area.

As the last line demonstrates, with the Employee file as the active file, fields can be listed or used from any of the three files. This technique can also be used with report formats to print fields from the three files.

Rafael Q. Montemayor
Mandaluyong, Metro Manila
Phillipines

Faster Memory Check

With numerous memory-resident programs in my AUTOEXEC.BAT file, I was curious to know how much memory each was using. However, I didn't want to run CHKDSK after loading each program. Even when performed on a floppy disk, CHKDSK takes too long, and I surely didn't want to wait for it to check 30MB of hard disk space each time. So, I wrote a Turbo Pascal program called MEMCHK.PAS [see Listing 2] to do the job instead.

MEMCHK.PAS reports the total memory installed, the percentage and amount used, and the memory available. The values it returns are exactly the same as those given by CHKDSK but are obtained much faster.

Jeffrey Ellis
Grandview, Missouri

Don't Clear the Keyboard Buffer

After issuing the command to quit a Turbo Pascal program, I often want to immediately type my next DOS command. But compiled Turbo Pascal programs clear the keyboard buffer as they return control to DOS, so when I type ahead it's for naught.

After some struggle, I discovered the location of the routine that clears the buffer in a compiled (.COM) Turbo Pascal program. I then used DEBUG to take the routine out of the compiled program.

You can do the same. Place a copy of DEBUG in drive A: and the compiled Turbo Pascal program in drive B:. At the DOS

(continues)

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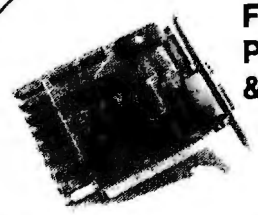

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Table 1: Listing 1 uses these dBASE III file structures.

Data base file	Fields	Index file
Employee.dbf	Name Div_code Dep_code	none
Division.dbf	Div_code Div_desc	Bydiv.ndx (Key = Div_code)
Departmt.dbf	Dep_code Dep_desc	Bydep.ndx (Key = Dep_code)

```
SELECT 1
USE Employee
SELECT 2
USE Division INDEX Bydiv
SELECT 3
USE Departmt INDEX Bydep

SELECT 1
SET RELATION TO Div_code INTO Division
SELECT 2
SET RELATION TO A->Dep_code INTO Departmt
SELECT 1
LIST Name, B->Div_desc, C->Dep_desc
```

Listing 1: These dBASE III commands create more than one relation for the files shown in Table 1.

prompt, type **A:DEBUG B:***filename*.**COM** and press **< Enter >**. Now type **U 85C L4 < Enter >** to ensure that the buffer-clearing routine begins at offset 85C. DEBUG should display the following:

xxxx:085C B401 MOV AH,01
xxxx:085E CD16 INT 16

If that sequence is not returned, do not continue, because you will not be changing the right routine. Just enter **Q** to quit DEBUG.

To remove the clear-keyboard routine, type the boldface characters in the following text, pressing **< Enter >** at the end of each line:

-A 85C
xxxx:085C **NOP**
xxxx:085D **NOP**
xxxx:085E **NOP**
xxxx:085F **NOP**
xxxx:0860
-W
Writing *xxxx* bytes
-Q

Alroger Gomes, Jr.
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Put COMMAND.COM Anywhere

I have discovered a way to start the PC without having COMMAND.COM in the root directory of the boot disk. This can be

(continues)

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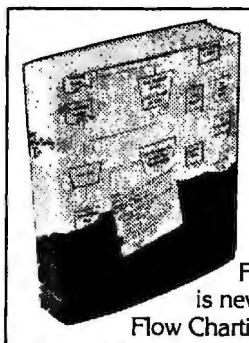

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```
program MemoryCheck;

procedure ShowStatus;
var
   UsedMem, SysMem,
   CodeSeg, FreeMem,
   PercentUsed              : real;
   TotalMem                 : integer absolute CSeg:$02;
                              {PSP address of memory size (in paragraphs)}

begin
   CodeSeg := CSeg;                        {Address of beginning of Code Segment}
   if CodeSeg < 0 then                     {If address is 8000H or above}
      CodeSeg := CodeSeg + 65536.0;        {Turbo will return a negative value,
                                            so convert to a real number}
   SysMem := TotalMem;
   if SysMem < 0 then                      {Again, convert negative values}
      SysMem := SysMem + 65536.0;
   UsedMem := CodeSeg * 16.0 / 1024.0; {Get amount of memory already in use}
   SysMem := SysMem * 16.0 / 1024.0;   {Convert SysMem to KB}
   FreeMem := SysMem - UsedMem;        {Memory left for use}
   PercentUsed := ((SysMem - FreeMem) / SysMem) * 100;

   writeln;
   write('This machine is equipped with ');
   writeln(SysMem:3:0,' K.');
   write('It is using ');
   write(PercentUsed:3:1,'%');
   write(' or ');
   writeln(UsedMem:3:0,' K.');
   write('There are ');
   write(FreeMem:2:0,' K');
   writeln(' bytes of memory free.');
end;

BEGIN {main program}
  ShowStatus;
END.
```

Listing 2: MEMCHK.PAS, a Turbo Pascal program for fast memory checking

handy for starting your system with various floppy disks containing AUTOEXEC.BAT and/or CONFIG.SYS files that differ from those on the hard disk. This method instructs DOS to reload, when necessary, the transient portion of COMMAND.COM from the hard disk rather than from the floppy boot disk, so you don't need to leave the boot disk in the drive once you've started the PC. Of course, this technique requires the DOS system version loaded onto the floppy to be the same as that on the hard disk.

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(continues)

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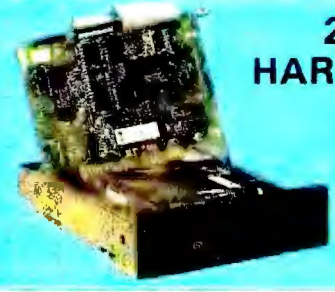

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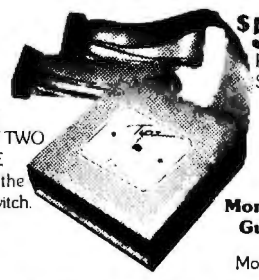

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```
prompt $e[1;37;40m
prompt $e[s$e[1;70H$e[1m$e[44m^^^$e[41m^^^^^$e[2;70H$e[44m^*^
$e[47;41m!!!!!$e[3;70H$e[44m^^^$e[47m?????$e[40m$e[u$p$g$e[1m
```

Listing 3: NCFLAG.BAT, a North Carolina flag prompt

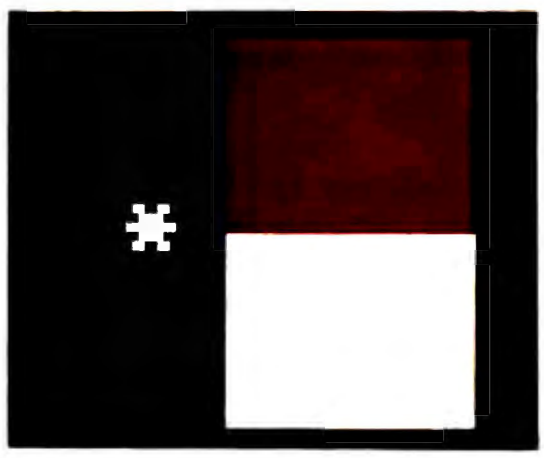
tell DOS where to find COMMAND.COM by putting the command **SET COMSPEC** = *d:path* \ **COMMAND.COM** in the floppy's AUTOEXEC.BAT file.

Note that any COMMAND.COM switches (such as /E, which expands the environment) must be included in the CONFIG.SYS and AUTOEXEC.BAT file commands.

Guy Metrocavich
Morris Plains, New Jersey

Now for North Carolina

Not to be outdone by those Texans and their Texas flag prompt ["Lone Star Look," *.*, *PCW*, September 1986, and "Trouble in Texas," *.*, *PCW*, January 1987], I offer NCFLAG.BAT [see Listing 3]. This batch file creates a DOS prompt for the great state of North Carolina [see Screen 1].



Tar Heels, where DOS your flag file?

The North Carolina flag is similar to the Texas flag, but the red and white fields are interchanged. However, this prompt places the flag in the upper-right corner of the screen and returns the cursor to its proper place.

Incidentally, the peculiar second DOS prompt that is displayed after a batch file finishes executing can be eliminated by including an ASCII 26 (Control Z) at the end of the batch file's last line.

Z Z. Hugus, Jr.
Raleigh, North Carolina

Editor's note: The extended screen driver ANSI.SYS must first be loaded by CONFIG.SYS. When creating NCFLAG.BAT, replace each caret (^) with a space, each exclamation mark with <Alt>-220, and each question mark with <Alt>-219. To create the <Alt> characters, hold down the <Alt> key, type the three-digit number on the numeric keypad, and then release the <Alt> key.

Still More Primes?

I almost hate to bring up the subject again, but after a little genetic engineering on Thomas Myers's PRIMES2.BAS [see "Turbo Primes," *.*, *PCW*, August 1986], it now produces primes more than

(continues)

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```
100 CLS: KEY OFF: DEFINT A-Z: DEFSNG T
110 INPUT "Find primes to: ",N
120 IF N<2 THEN PRINT "Must be greater than 1": GOTO 110 ELSE PRINT
130 DIM M(N): T1$=TIME$: PU$=STRING$(LEN(STR$(N)),"#")
140 PRINT USING PU$; 2;
150 FOR C=3 TO N STEP 2
160   IF M(C) THEN 210
170   PRINT USING PU$;C;
180   FOR L=C*3 TO N STEP 2*C
190     M(L)=1
200   NEXT
210 NEXT
220 T2$=TIME$: PRINT: PRINT
230 T1=3600*VAL(MID$(T1$,1,2))+60*VAL(MID$(T1$,4,2))+VAL(MID$(T1$,7,2))
240 T2=3600*VAL(MID$(T2$,1,2))+60*VAL(MID$(T2$,4,2))+VAL(MID$(T2$,7,2))
250 PRINT "Elapsed time of";T2-T1;"seconds to find";: L=1
260 FOR C=3 TO N STEP 2
270   IF M(C) THEN 280 ELSE L=L+1
280 NEXT
290 PRINT L;"primes to";N
300 END
```

Listing 4: PRIMES3.BAS a faster prime-number generator

four times faster than the original version. Naturally, I call my version PRIMES3.BAS [see Listing 4].

The secret to making the program really hum relies on one simple fact: No even number except 2 is a prime number. Therefore, the two main FOR . . . NEXT loops of PRIMES3.BAS each use a STEP value twice as large as in PRIMES2.BAS. Also, starting the loops with odd numbers and using a step value that is twice the odd starting number of the outer loop ensures that the program checks only odd numbers. In other words, the program always adds an even number to the odd starting number.

I also added a loop at the end of PRIMES3.BAS to count the number of primes found. The count begins at 1, for the first prime number (2), and then increases by one for each array variable that has an odd subscript above 2 and a value not equal to 1.

Perfectionists should note that neither PRIMES2.BAS nor PRIMES3.BAS finds primes much above 10,000. The fastest-executing modification for PRIMES3.BAS to find primes to 32,767 is a single-precision FOR variable and a subscript name for the main inner loop (lines 180 and 190).

John H. Kelly, Jr.
Roanoke, Virginia

Editor's note: To implement the single-precision modification, change the L's *to* T's *in lines 180 and 190. Note, however, that unless the version of BASIC that you use leaves more than 61,450 bytes free, you can find primes only to 30,407 due to the memory required for the program and its array and string variables.*

(continues)

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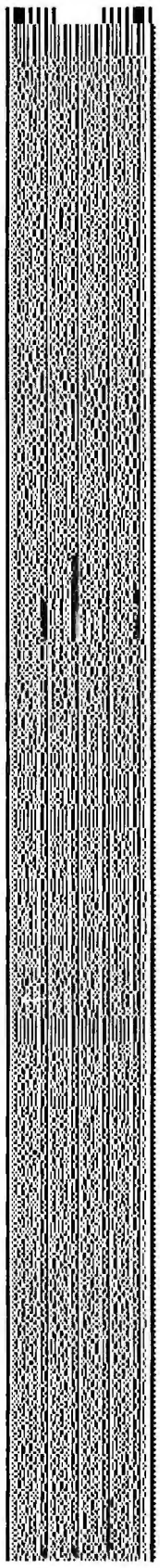

This Softstrip contains *.*'s May program listings. It can be read by Cauzin's Softstrip System Reader.

FAST!.BAS Fixed

John D. Pace's FAST!.BAS program [see "Fastest Primes," *.*, *PCW*, January 1987] makes an incorrect assumption and has a small bug. The program assumes that 1 is a prime number. Because 1 is not considered a prime number, the statement 'PRINT 1,' should be omitted from line 220.

Also, whether or not 1 is counted, line 190 should end with 'ARRAY(0) = N' rather than 'ARRAY(0) = N + 1'. Otherwise, the number of primes listed is one too many whenever N + 1 is a prime.

George Long
Miami, Florida

Correction to An Even Faster Sort

My letter providing a two-part assembly language Quicksort subroutine [see "An Even Faster Sort," *.*, *PCW*, January 1987] picked up a couple of errors in publication. Line 10530 of QUICKC.BAS [January's Listing 3] should say that line 10600, not line 10710, is optional. Likewise, line 10580 in QUICKI.BAS [January's Listing 6] should say that line 10650, not line 10710, is optional. Too bad BASIC's RENUM command doesn't renumber line numbers that are in comments.

The second correction also concerns comments. Somehow my point was lost that all of the comments should be removed from QUICKI.BAS. (QUICKI.BAS is an interpreted BASIC program that demonstrates the Quicksort subroutine.) Comments retard the execution of interpreted BASIC programs. Because the intent is to provide a faster sort, removing the comments is vital.

Andrew Thorson
Irvine, California

BANNER.BAS Bug Corrected

When I tried David Minster's BANNER.BAS program [see "Banner Performance," *.*, *PCW*, January 1987], I got the banner on the screen but not on the printer. Inserting the device name LPT1: in line 170 didn't help. Furthermore, a directory listing showed that the BANNER.DAT file contained 0 bytes.

A simple modification to line 380 corrects everything. That line should read

380 PRINT #1,Z$

The program then functions as intended.

Bob Thompson
Marietta, Georgia

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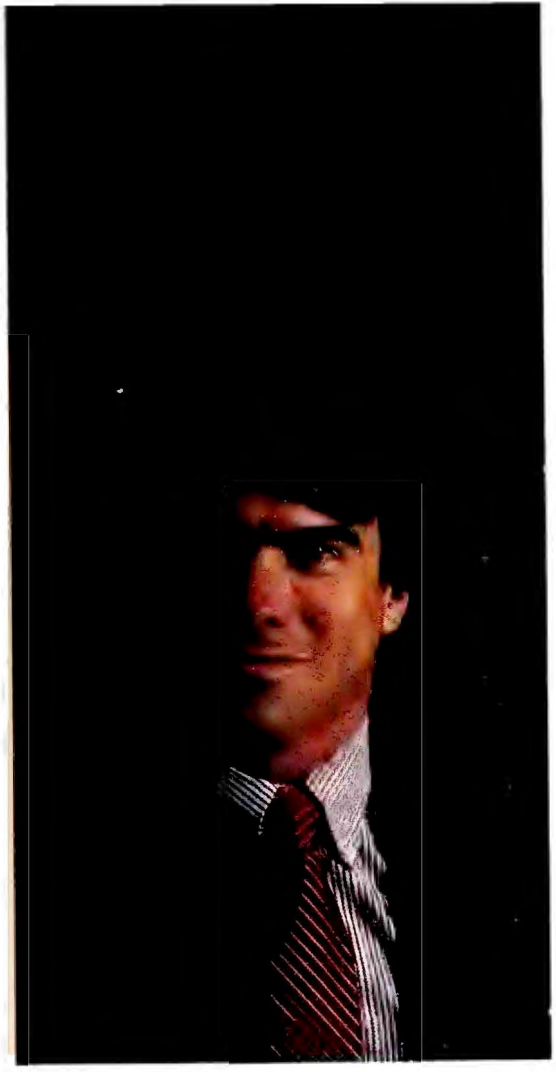

Kevin Strehlo

Anchors OA

A giant Navy aircraft-repair facility braces for an office automation onslaught spearheaded by a thousand PCs.

So far, PCs have reached 150 desks at the Naval Air Rework Facility (NARF) in Alameda, California. The early adopters—engineers, computer professionals, and financial analysts—were motivated enough to push their own PC requisitions through the Navy's creaky purchasing channels. But Dave Hall's new Office Automation Project will place 1000 more PCs with people who didn't ask for them.

The huge repair shop that maintains the Navy's antisubmarine aircraft deals routinely with sophisticated equipment, like infrared scanners that pick up a Soviet nuclear submarine's distinctive heat signature and magnetic sensors that detect the tiny disturbances in the earth's magnetic field caused by the submarine's steel hull. It seems odd, then, that NARF is bracing for turmoil when personal computers are introduced.

But Hall predicts considerable shock. "We'll be putting these things down in production shop areas. We're going to get sheet metal workers and shop foremen at the keyboard." Joining them will be clerical workers who've never done word processing and financial analysts who currently work over numbers from a mainframe report with paper and a pencil.

"It takes a long time to convince the old hands that the new way is better," says Hall, NARF's head of computing. "A lot of people are hesitant to make changes."

Hall has cleaned up his cubicle in the office mezzanine of an enormous aircraft hangar for the interview. But he's still sitting amid piles of printouts and software packages that have no place else to go. In the common office space outside Hall's cubicle, desks are jammed together almost as tightly as in a classroom.

Although the antisubmarine-warfare aircraft coming through NARF contain increasingly sophisticated electronic gear, much of the basic maintenance work remains unchanged since the Korean War. The airframe of the turboprop P3 Orion is riveted, and the

(continues)

P3's 9200-gallon fuel cells are still made of rubber.

"When I first came to work here, we put a major new workload control system in," Hall continues. "We changed the way we did business on the floor—how to transact it and how to track hours. Some people just refused to go along."

To people who had been doing the same job for years, the appearance of a new timekeeping system was an unwelcome intrusion. "They said things like, 'I'm not going to learn that, I'm retiring next year,'" Hall recalls. "We just had to wait for those people to retire before we could get on with it."

Although there is bound to be some resistance and confusion among the crowd of computer novices, Hall claims not to be overly concerned that the 1000 PCs may cause a repeat performance. "We've been doing so much with so little for so long that we think we can do anything with nothing," he jokes.

He admits, though, that if he doesn't get a staff increase he won't be able to effectively support the new PCs in addition to the half-dozen large computers, 300 terminals, and 150 PCs already in his charge. "We've been running 10 to 15 percent overtime the past year," Hall says. The first batch of Zenith Z-248 PCs to arrive has almost tripled the number of PCs he must support, yet he has added no one to his current staff of 10.

"I'm trying to expand staff, but it's a long-drawn-out process," Hall says. "It's hard to tell what's going to happen. There are a lot of organizational changes going on now that don't have anything to do with micros."

The Office Automation Project was launched in the early eighties to solve NARF's typing pool problem. Originally, the idea was to connect 75 to 100 dedicated word processing machines via a mainframe. But Hall discovered personal computing when he added a CP/M card to his DEC VT-100 terminal. He told his bosses they were "spending megabucks to do only half the job." PCs could handle not only word processing but spreadsheet analysis and a host of other jobs as well.

After looking at mainframes, minicomputers, and distributed networks, NARF went with PCs connected to a mainframe via a local area network for functions such as electronic mail. "So we've gone the gamut in the last five years from a plan to replace typewriters with dedicated word processors to a full-blown office automation system with something in the neighborhood of 1000 workstations," Hall points out.

Although NARF's original specification asked for the equivalent of an IBM PC XT, the Zenith Z-248s are AT-class machines. "The Z-248 met our requirements for a workstation, and it was available on an existing contract. We could go right out and procure those, saving the extra year a bid solicitation would take."

Hall knows he may get stung by the project because the benefits will be difficult to quantify, but still he's optimistic. "I think we'll see a 25 percent productivity increase—better than that once people have climbed the learning curve. But how do you quantify it? Take my example. I'm taking on and performing tasks I wouldn't even have attempted five years ago without a personal computer."

Hall expects that the improvement will be obvious in financial analysis and the typing pool. But the biggest payoff, he says, will be harder to measure: Shop floor managers will start using data bases and spreadsheets to manage their people, parts, supplies, and work flow instead of vainly trying to keep every last detail in their heads.

However, there is one big roadblock: All those PC users may be forced to become self-sufficient rather abruptly. "Right now, when someone calls and says, 'I need help on my PC,' I send one of my people there to help them," Hall says. "But when we have 1200 devices to support, I won't be able to do that any more. We'll have to try to answer questions on the phone. If we can't, we may have to direct them to someone else in their department we know is pretty knowledgeable."

Thus does the burden fall to the local gurus like Brian Vita of the engineering support office.

(continues)

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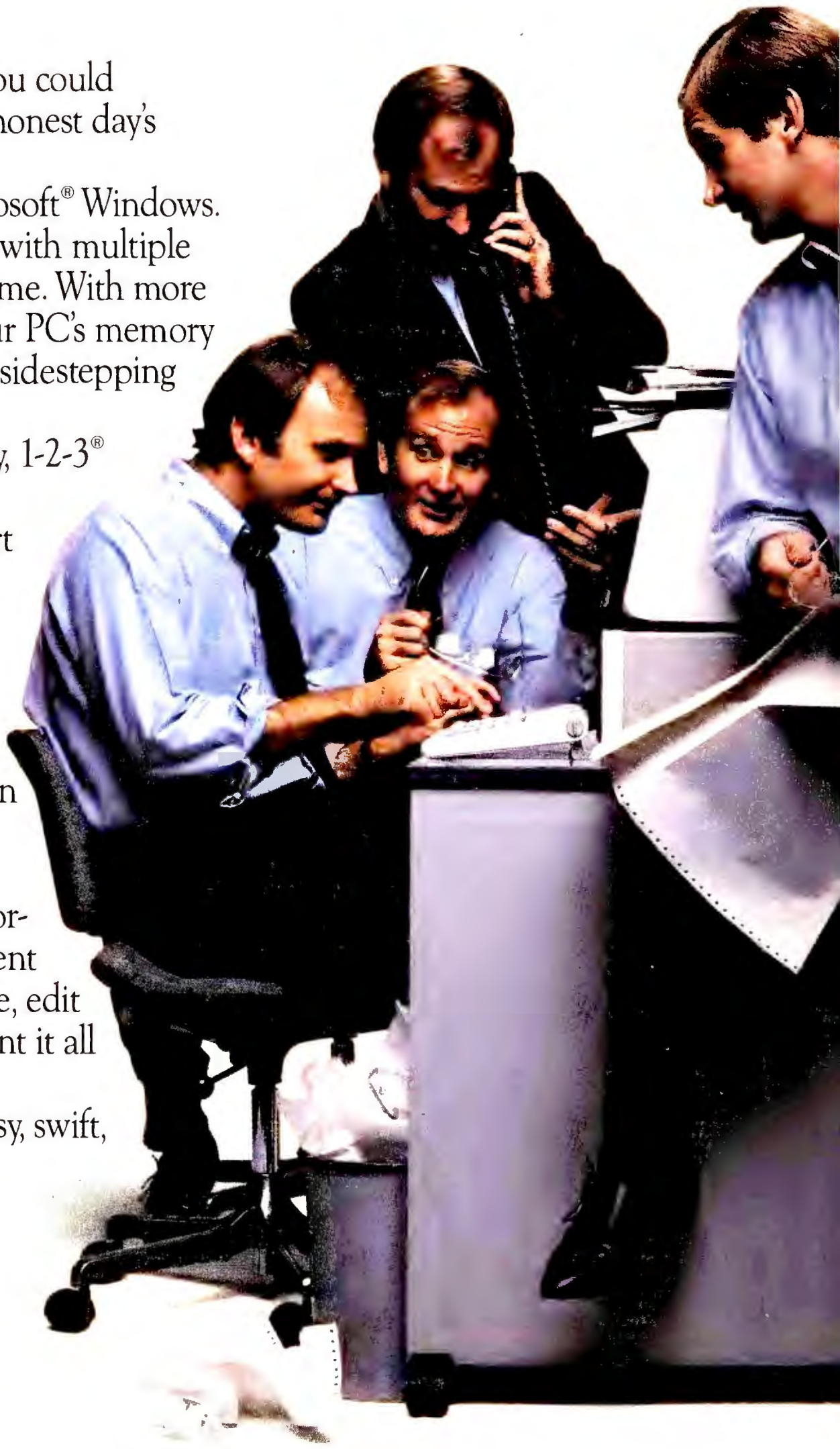

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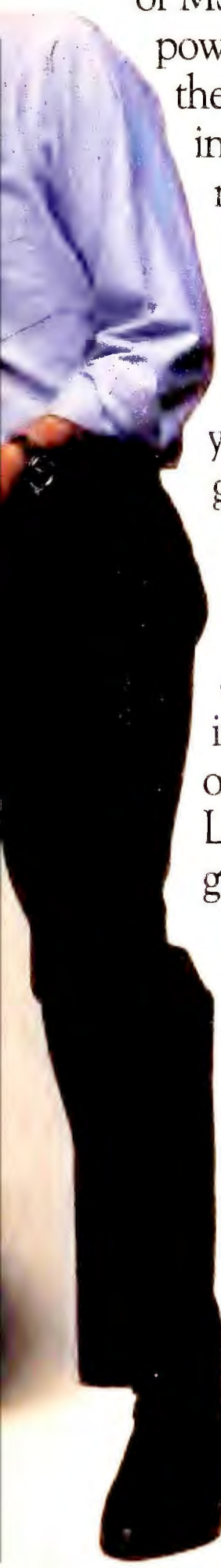

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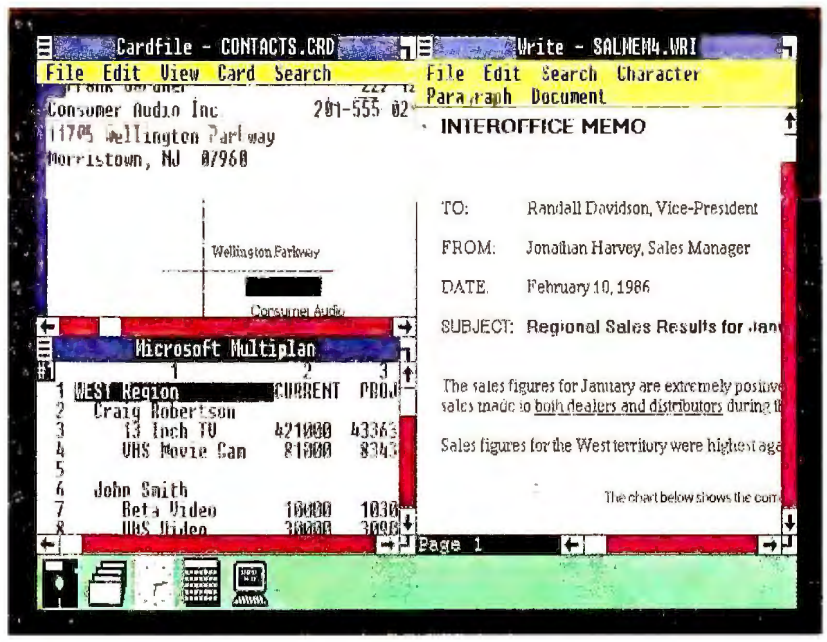

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From Vita's small cubicle in the crowded World War II vintage wooden building, you can see the glass room that contains the mainframe and minicomputers at the heart of the fleet's automatic test equipment system.

Whenever an engineer updates the software that tracks the performance of a particular component on the P3 aircraft—say, the direction-sensing sonobuoys the P3 drops in a pattern around a potentially hostile submarine—he or she sends the program on tape or over the local area network to that glass room. Vita's department compiles it on the appropriate computer, keeps an archival copy, and distributes the software to the fleet.

Vita himself is responsible for the 15,000 feet of coaxial cable that encompasses the facility's Ungermann-Bass local area network and the Perkin-Elmer super-minicomputer at the heart of the glass room. He also supports the department's 19 PC-compatible machines—his favorite part of the job.

Representing his department at planning meetings for the Office Automation Project, he polled the department's managers and helped them decide they needed about 100 PCs to fully automate their office functions.

Vita told them not to hold their breath—it would take two years, minimum, to fill their requests. Although only a year later 241 Zenith Z-248 machines were sitting in a NARF warehouse, with more on the way, he may not be far off the mark.

A turf battle has begun over who will install the machines. The production engineering department, which is in charge of NARF facilities, insists it should do the job. Dave Hall argues that the group doing the unboxing, setup, and testing of the Z-248s can place the machines on a desk and plug them in just fine, thank you.

It is likely that production engineering will prevail, and that may slow the dispersal of the machines considerably. In addition, the office automation plan calls for most PCs to be shared by four or more people. But NARF is a crowded place. As Hall puts it, "There's not enough floor space to set up stations for shared PCs—they tend to end up on somebody's desk, and that person ends up with sole access." Installation must include establishing workstations that will make a 4-to-1 user/PC ratio feasible.

To date, the Zenith PCs have languished in the warehouse for six weeks. Hall and NARF's computer maintenance crew have begun unboxing the machines, testing them, and putting them back in their boxes, for fear the warranties will expire before they ever run. Hall is thankful the machines came completely configured—if they had to be built up the way an IBM PC does, the staff might not have enough time to find the inevitable defective machines and return them under warranty.

Despite the inconvenience of the delay, however, Brian Vita is relieved that the Z-248s will trickle out slowly.

His department's current PCs mostly run *WordStar,* which motivated users have picked up largely on their own. He has given occasional training sessions for *1-2-3,* and a few engineers have called him with *dBASE* problems. The load hasn't been too bad yet, but what happens when 100 PCs land in the hands of novice users? The machines don't come with the software he knows—*WordStar* or *1-2-3* or *dBASE.* Users will get *Microsoft Windows,* which is bundled with the machine, along with a Zenith terminal emulation program and the *Enable* integrated package.

Vita and Hall both expect to see many software requisitions cross their desks once the machines are distributed. Vita also expects that relatively unsophisticated users will probably need programming and spreadsheet-building help. "I'm not *that* worried," he says, but he anticipates more demands on his time. "And there's too much demand already," he admits.

It's past quitting time, but Vita is working late to refine a new report requested for a labor-tracking application. He enjoys the work, using Word Tech's *Quicksilver* compiler for *dBASE III.* The labor-tracking tool is part of the Office Automation Project. Vita will be writing a number of such applications, each designed for use by clerical personnel.

(continues)

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

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

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

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

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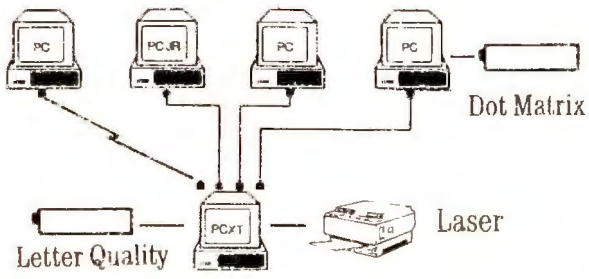

***EasyLAN* Office Network**

EasyLAN SPECIFICATIONS

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

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

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Good morning, your worl

8:30 A.M. • TOKYO, JAPAN

IDG's International Data Corporation managing director **Yugi Ogino** is stopped in his tracks by a flash report on the company's International News Service. *Digital News* has just spotted a potential challenge to IBM's grip on the professional PC market: DEC has announced their Local Area VAX Cluster. Ogino sets up a conference call with *Computerworld Japan* editors to brief them on his analysis.

8:40 A.M. • SYDNEY, AUSTRALIA

At almost the same moment 4,300 miles to the south. *Computerworld Australia* publisher **Susan Coleman** sees the DEC story on her news wire. She calls in **Peter Scott**, her editor, to plan editorial coverage for their market.

11:00 A.M. • HELSINKI, FINLAND

Halfway around the world, **Timo Tolsa**, editor of IDG's Finnish computer newspaper *Tietoviikko Ky*, faxes his comments on the pending story to **Dieter Echbauer**, editor of *Computerwoche* in Germany, who appoints an editorial team to file a comprehensive story for use by all five IDG publications in Germany.

10:10 A.M. • BUENOS AIRES, ARGENTINA

Ruben Argento, the head of IDG's *Computerworld* newspaper in Argentina, uncovers a new wrinkle in the rapidly unfolding story—and alerts **Doane Perry**, senior market consultant at IDC in Framingham, Massachusetts: a DEC competitor in South America is developing a similar cluster product.

has just changed again.

10:30 A.M. • BOSTON, MASSACHUSETTS

IDG reporter **Kathryn Esplin** files a VAX Cluster story for *Digital News*. Her back-up analysis is sent to all publication offices around the world on the company's news wire.

2:00 P.M. • FRAMINGHAM, MASSACHUSETTS

Doane Perry meets with **Bill Ford**, IDC Information Industry Services Chief, to plan a global research report on computer clusters and their potential impact on business users.

4:45 P.M. • PALO ALTO, CALIFORNIA

IDC Research Director **Jean Yates** faxes detailed schedules of the report requirements to IDC research centers in 16 other countries. Deadline: 1 week. Overnight mail announcements of the pending report are mailed to IDC's top 1,000 customers around the world.

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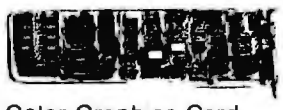

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"Today when the department head asks for a report about how much of the budget has gone into fleet support, the division heads go to the staff for the information and then pass it along," Vita explains. "Some of the reports the department head gets are typewritten and some are handwritten, and the department head may or may not have time to assimilate what they're all trying to say."

In the best of all possible worlds, each division will maintain the appropriate labor-tracking data base and report on a Z-248. Each of those machines will be equipped with network cards, allowing a clerical worker to sign onto the network, collect all the reports, and coalesce them into one.

Those clerical people will turn to Vita for help, and he in turn expects to get help eventually from any number of places. "But nothing will happen before the wheel starts to squeak," he says.

Unfortunately, in the Navy, it can take a long time for a grease gun requisition to find its way through channels.

NARF employees know how to make do. A good example is the 20-year-old Sperry Univac mainframe sitting in the air-conditioned room across from Vita. Although permission has been gained to replace the old Univac with a new DEC VAX 11/785, no one can say when it will actually happen. The need is clear: The machine dates back two vendor mergers, and the company now called Unisys no longer makes parts for it.

Unfortunately, programs compiled on the Univac must be written to 7-track tape machines. Although money has been allocated to buy the VAX, nothing was budgeted to replace the fleet's millions of dollars' worth of 7-track machines that read programs into the automated test equipment. Every modern computer uses 9-track tape machines. Apparently no one in the world manufactures a 7-track controller for the VAX.

Faced with continual breakdowns and long down times, someone in engineering support tracked down the only supplier that could help. The firm specializes in the old mainframes, buying each obsolete Univac it can find for spare parts. This should keep the Univac going long enough, the support office hopes, to find a firm that can build a custom controller to interface the VAX with the obsolete tape machines.

They hold tightly to this thread of hope, just as a handful of hard-working people at NARF like Brian Vita and Dave Hall hope they can support eight times as many PCs as they've had before with no increase in staff, and just as NARF hopes it can keep the Navy's planes patrolling the world's oceans around the clock.

Kevin Strehlo hunts for PC tales from an office overlooking Silicon Valley.

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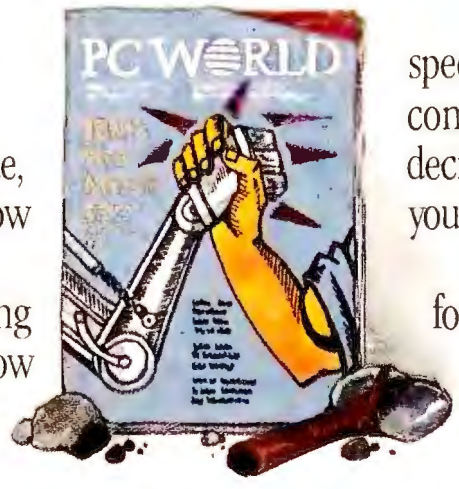

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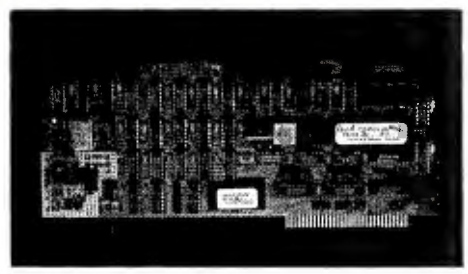

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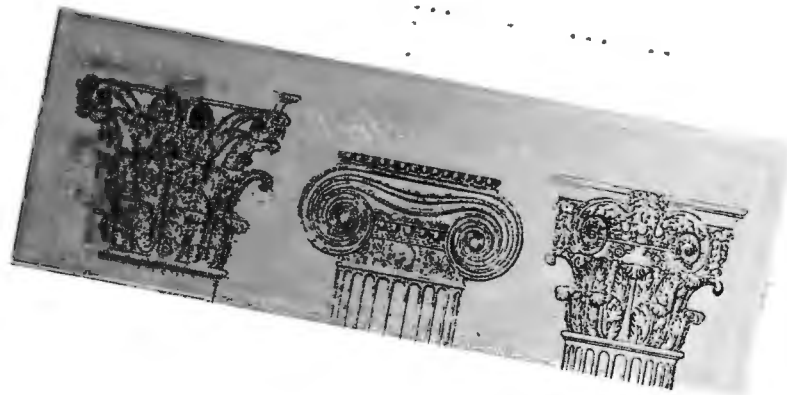

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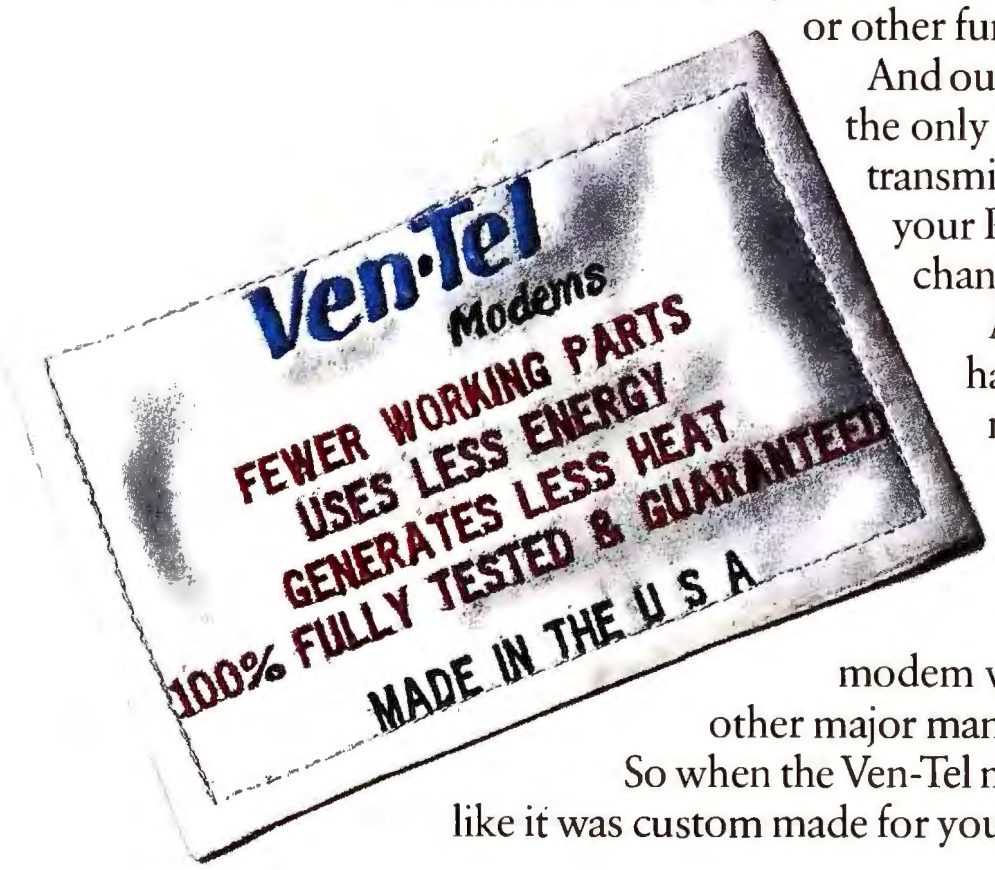

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