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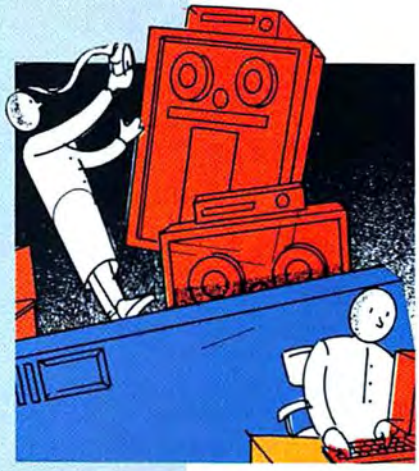

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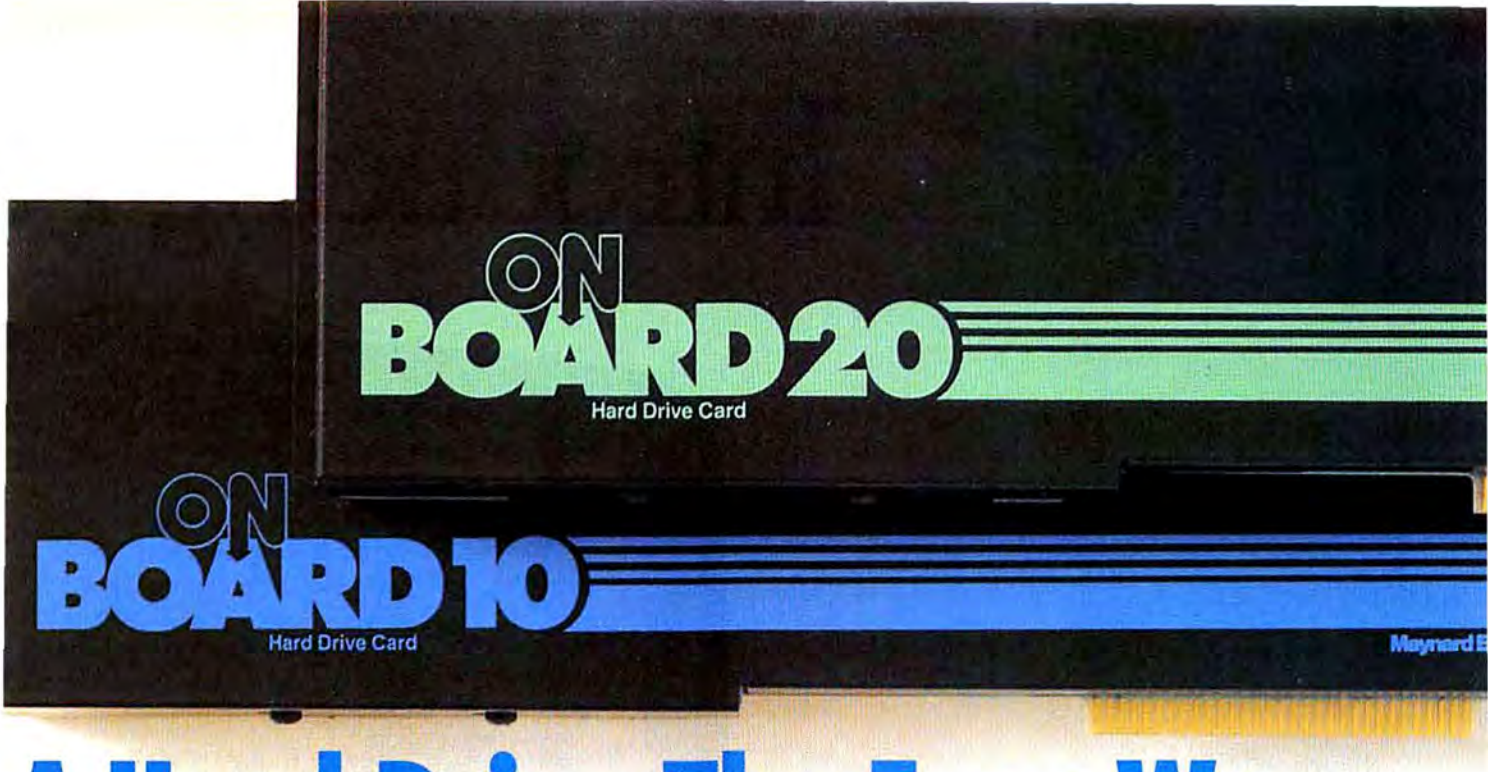

A Hard Drive The Easy Way.

Turn your PC into an XT in seconds with OnBoard, Maynard's new hard drive card!

So your PC needs a hard drive...

When you bought your PC, you never dreamed you'd need more than floppy drive performance. But now, both you and your PC are ready for more. In fact, there's just one reason you've been putting off getting a hard drive. Admit it. It's the installation. Cables and controller and all that.

Well, relax. OnBoard is here. The hard drive card that boosts your PC's storage capacity to rival any XT or AT* on the block! OnBoard snaps easily into one of your IBM PC's expansion slots! Open your PC, plug in OnBoard, and close your PC. Just like that. Your PC will boot directly to OnBoard when you power up — no more floppy disk maneuvering.

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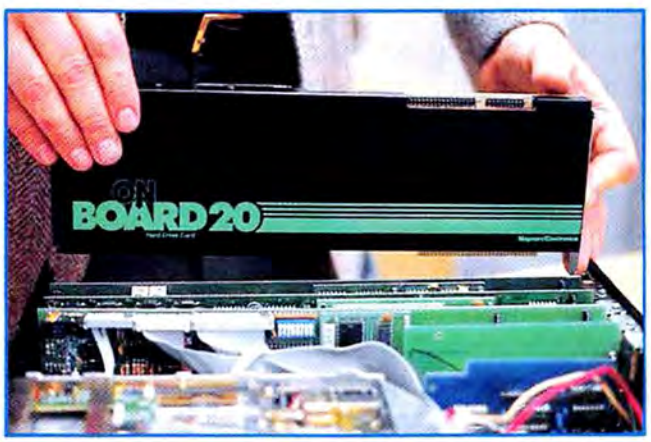
Lots of Head Room, Lots of Desk Room.

OnBoard puts up to 20MB of power into your PC, turning it into a hard drive heavyweight in seconds! If you need less storage but the same speed and fine performance, you can install OnBoard 10.



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Simply snap OnBoard into expansion slot 1 of your IBM PC* or XT, leaving all your other slots free for additional boards.

OnBoard is designed to work in today's leading PCs and is available at the finest computer stores. Contact your local dealer or call us today for more information.

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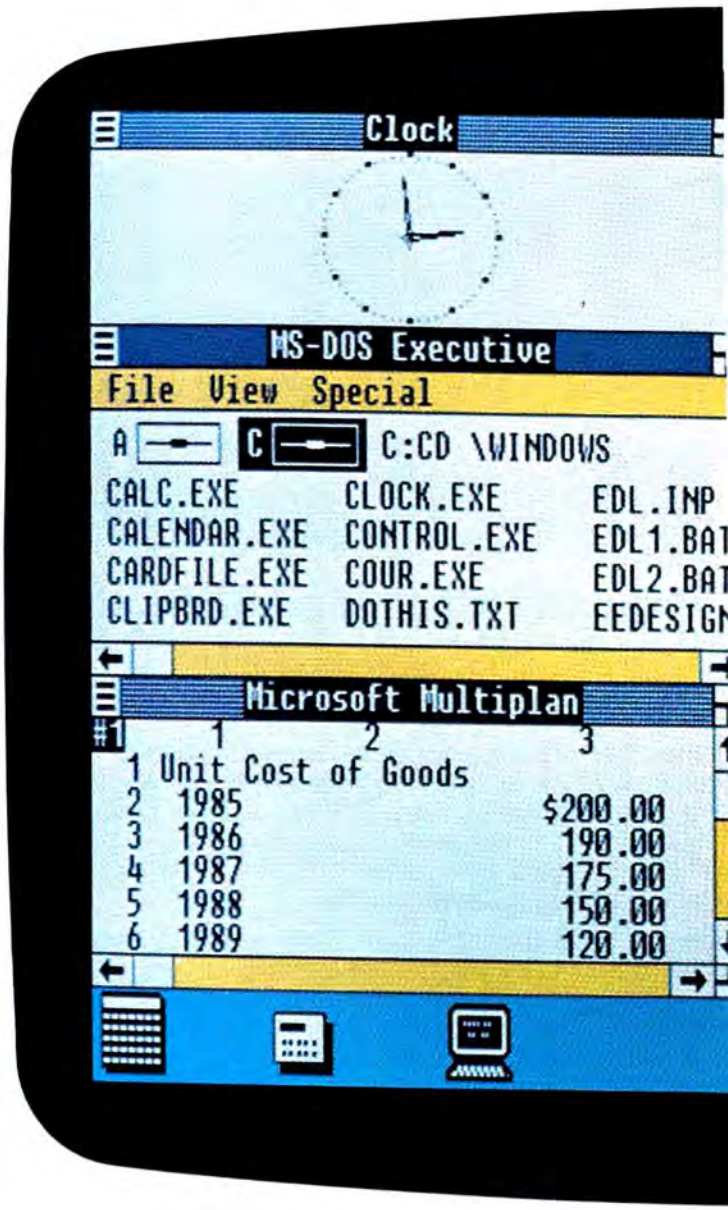


Microsoft® Windows has arrived.

For anyone who uses a computer in earnest, that is extremely good news.

Windows gives you a practical way to integrate programs. It radically decreases the time it takes to move from one application to another. Dramatically simplifies the means of consolidating data from many different programs.

And as a graphical extension of the MS-DOS® operating system, it gives you a highly visual way to work and to organize your work.

In short, Windows brings efficiency to all those processes of personal computing which have till now been awkward, unwieldy, inconvenient.

The joys of job hopping.

With the advent of Windows, you can work with multiple applications. And switch from program to program with ease.

Start up with one application, then another, and another. Leap back and forth between applications as your work routine dictates. Then pick up right where you left off.

The ability of Windows to change quickly from program to program logically and naturally magnifies the utility and productivity of the personal computer. And is a recognition of the way people who exploit the power of PCs really do their jobs.

Breaking the 640K barrier.

Just like you, Microsoft Windows can handle several projects at the same time. Juggle assignments. Deal with frequent interruptions.

And Windows will ignore the 640K limit of the PC, especially if you have a hard disk, the Intel® Above™ Board, or expanded memory. It will execute the rather neat trick of working with more programs than memory can hold at one time.

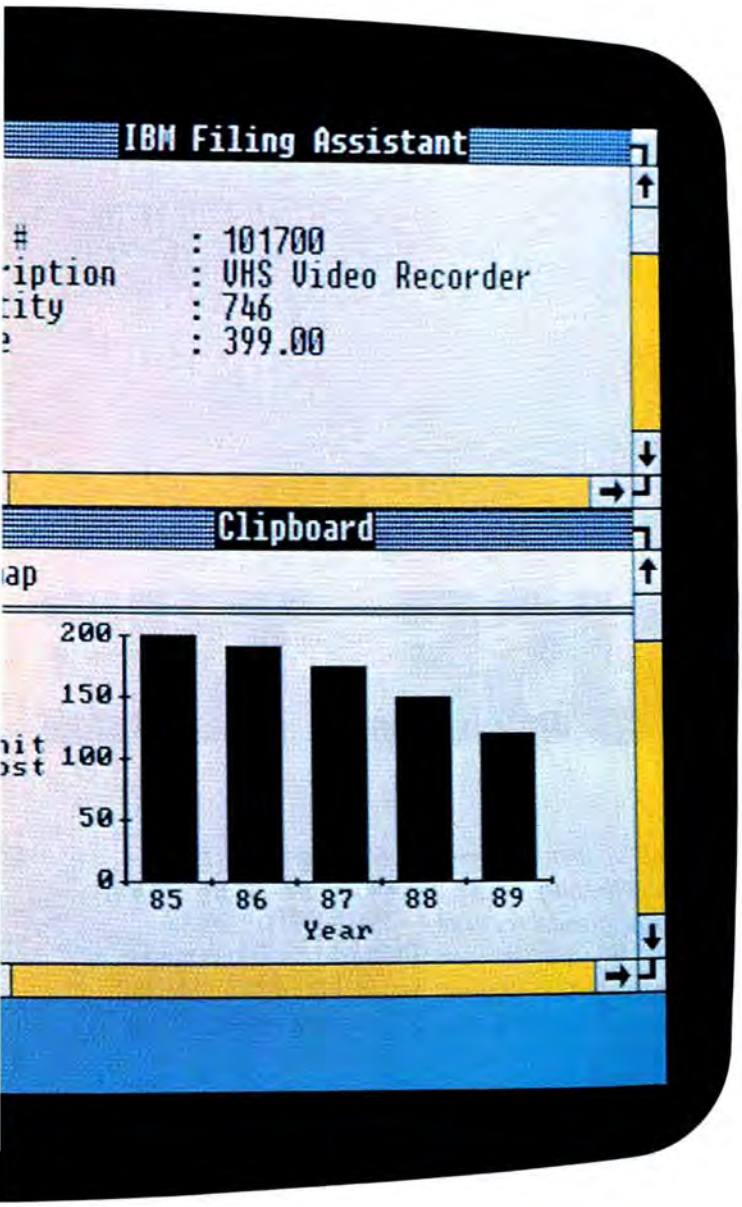
Spreading knowledge.

Another significant service Windows performs is accelerating the movement of information from on program to another.

Collecting and combining that information is as simple as taking a "snapshot" of data in one program Editing it. Then consolidating it with data from other programs.

With Windows, you can enjoy the advantages of conventional integrated programs without their compromises. Because Windows lets you put togethe the applications that you know, and that get a job

wer Windows.



done for you.

Choose your best word processor, spreadsheet, database—you name it. They're all there for you at a keystroke.

Common ground.

Finally, Windows is not only an immensely powerful tool for today, it's also a solid base for a new generation of Windows Applications.

As an introductory offer, two of these—Microsoft Windows Write and Windows Paint—are included in the Windows package. Along with more than a dozen other Windows desktop applications. Including a DOS file management program, calendar, cardfile, notepad, calculator, and a telecommunications program.

In Windows Applications you have a common interface which includes drop-down menus, dialog boxes, icons. Along with a richer environment that allows you to mix pictures and text. And to summon different type faces and styles at a keystroke.

Windows is a bridge between today's applications and the graphics based software now evolving. A way to work interchangeably with today's programs. And tomorrow's.

Of course, all this is going to cost you: $99.

A price that makes Windows the most startling value ever offered in software. A comparable collection of programs—a switching program, a graphic interface, desktop applications, a word processor, a drawing program—could easily cost hundreds of dollars more.

If you're someone who uses personal computing as a natural part of your work life, who capitalizes on the productive powers of sophisticated applications, look into Windows.

It offers a new vision of what a computer can do.

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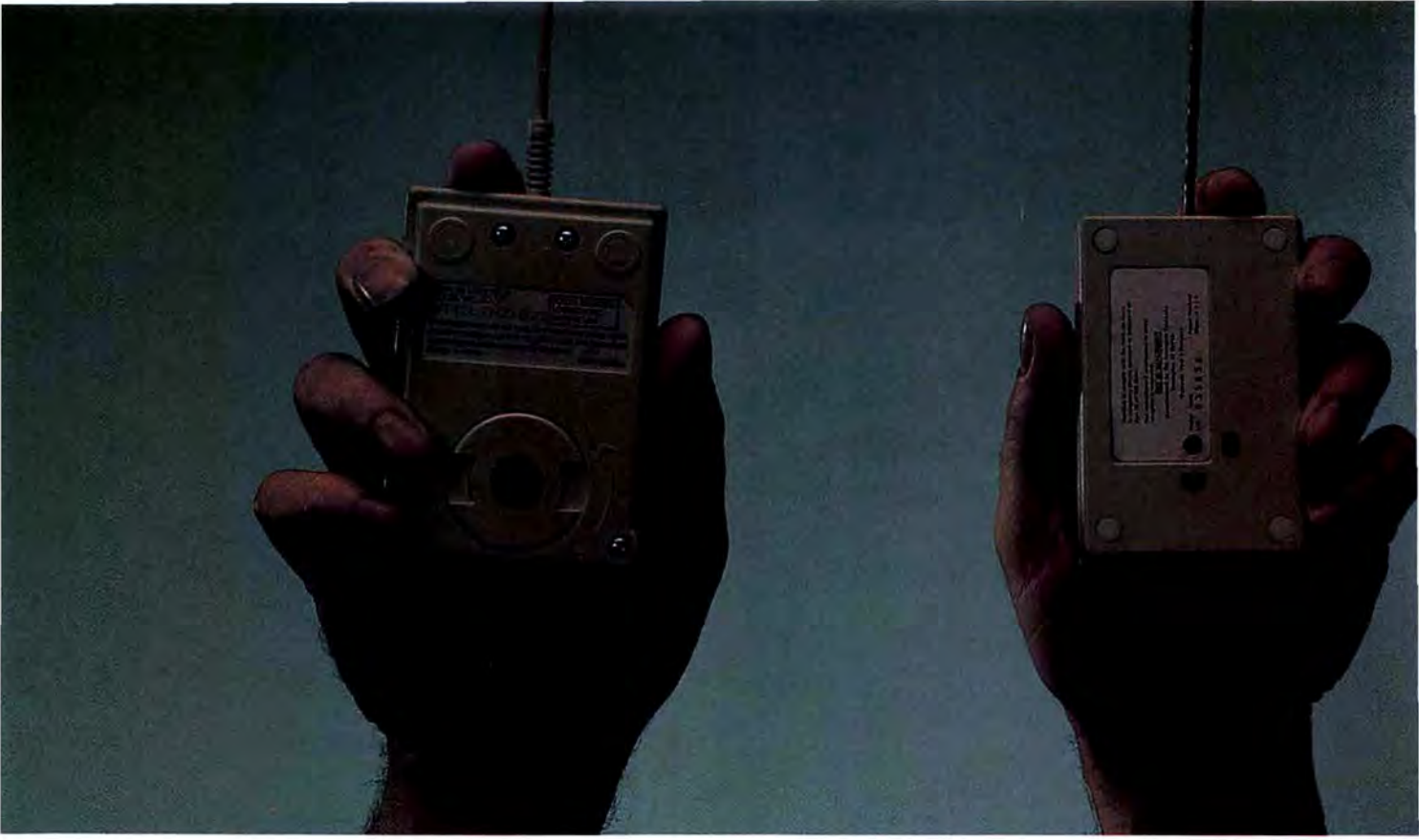

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It's the most accurate. It's the easiest to use. It works with the most software. It works best with your favorite software. It's the most trouble-free. And it's backed by the longest warranty.

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Turn over a mechanical mouse, and you'll see a rubber tracking ball. Unfortunately, it's also a dust and debris-attracting ball, which can gum up its own inner works.

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Works hardest.

"Unlike Microsoft...the PC Mouse performs well with both mouse-based and keyboard-based software. The pop-up menus...are especially useful, and the PC Mouse is the only mouse we have found that satisfactorily supports spreadsheet work." — INFOWORLD 2-24-86

PC Mouse makes any software designed for a mouse perform at peak — from our own PC Paint Plus business graphics software to Microsoft™ programs like Word™ and Windows.™

As for popular programs that were designed to work without a mouse, you'll wonder why they were.

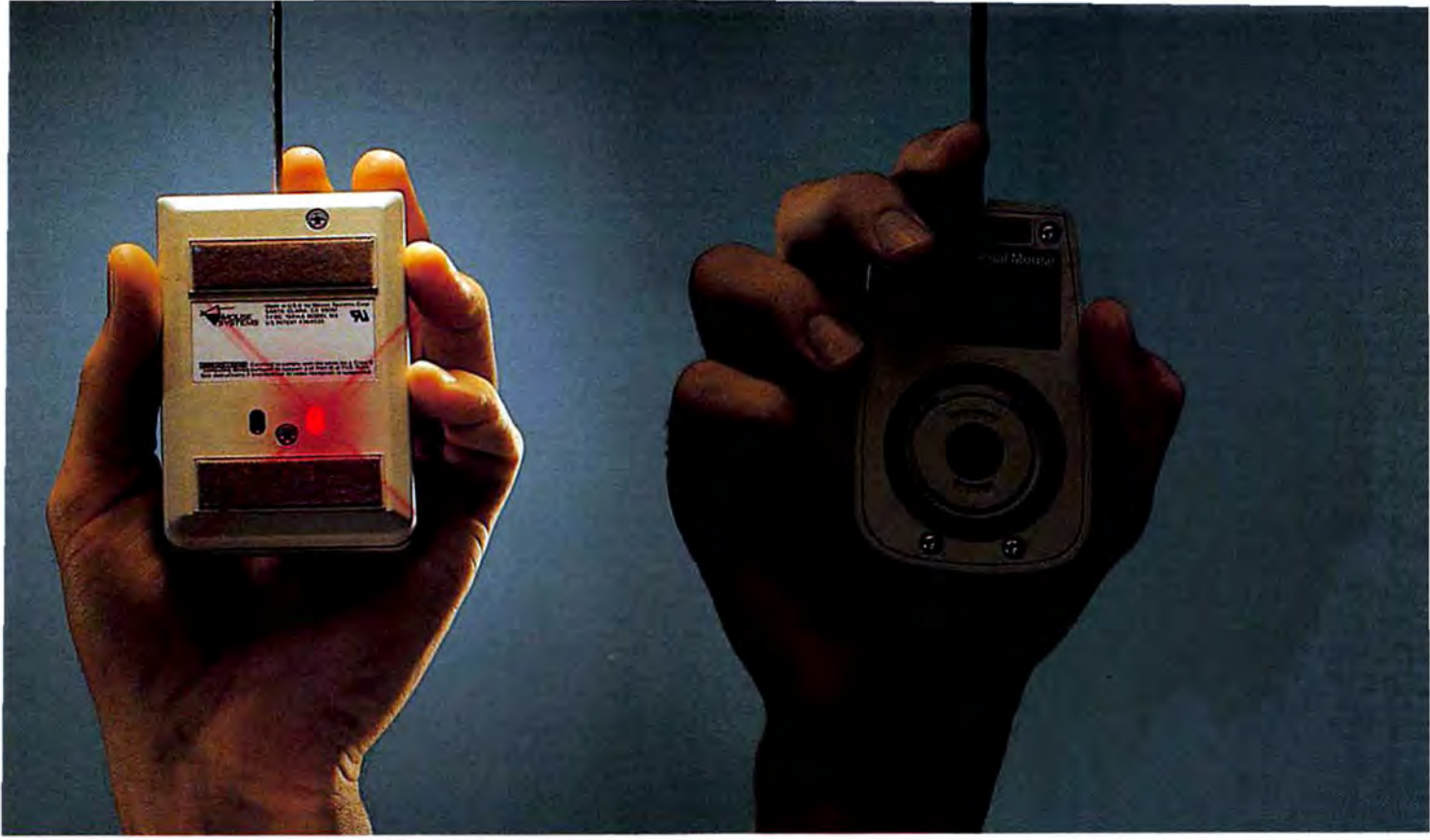
Using Lotus 1-2-3™ with PC Mouse and our Pop-up

"...the only mouse we have found that satisfactorily supports spreadsheet work."
— INFOWORLD

Lotus 1-2-3

Microsoft Windows

PC Paint Plus



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Display: 80 x 25, IBM PC character set, PC look-a-like attributes, 14" green or amber
Keyboard: AT style std. IBM scan/ASCII codes. 5161/AT and RT style opt.
Pages of memory: 1 std. 2 or 4 opt.
Communications: 2 bi-directional RS-232C serial (data & printer) ports
Operating systems: works with PC-DOS[1], MS-DOS[5], QNX[6], UNIX[7], XENIX[5], THEOS[8], PICK[9], and Concurrent DOS[10].
Retail price: $695.00

QUARTET[2] 4-port I/O card, RS-232C
Retail price: $299.00

LAN

K-Net[2] Local Area Network
Compatibility: NETBIOS, Token-Ring[1] software, (Advanced Netware[11] 8/86)
Data Rate: 1 million bps
Cable: Twisted-pair/phone wire
Distance: Up to 4000 ft.
Addressable users: Up to 255
Physical: Half-sized card
Operating systems: PC-DOS[1]/MS-DOS[5] 2.0 or later
Dedicated file server: Not needed
Message communication: Interactive
Multiuser solutions supported: Multilink Advanced[3] PC-Slave/16[4]
Other features: electronic mail, network data management, and print spooling
Retail price: $395.00

WORKSTATIONS

KW-1 8088, 4.77 MHz, 512 Kbytes
Retail price: $995.00

KW-2 8088-2, 8 MHz, 512 Kbytes
Retail price $1,195.00

KW-3 80286, 6 or 8 MHz, 640 Kbytes
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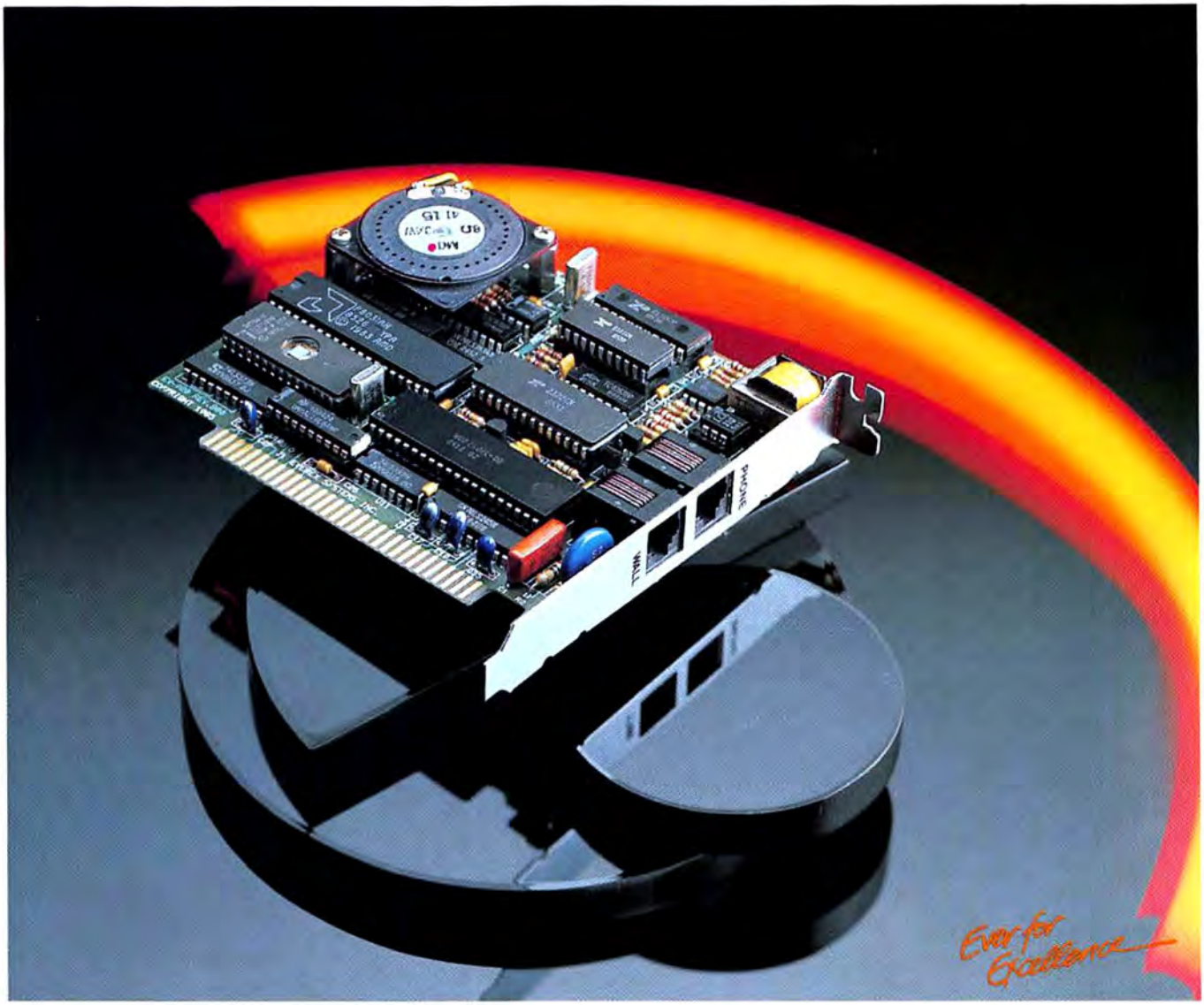

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David Bunnell

The Challenge of CD ROM

Multimedia memory is the promise of CD ROM. Will it change the world? Will it change the way we think about how we think? Only time will tell.

I recently attended Microsoft's First International Conference on CD ROM (compact disk read-only memory) in Seattle, Washington. It was an event that was described by some as the Woodstock of CD ROM—and indeed, it had that air of being a Magical Mystery Tour of the future of information technology.

I was scratching my head and wondering if all this was really possible when I bumped into Barry Richman, CEO of Dynatext Company, a CD ROM production company in Berkeley, California, specializing in medical information.

Barry assured me that CD ROMs—those optical, or laser, disks that in their typical 5¼-inch form can store 550 megabytes of multimedia memory—are definitely going to prevail. He believes they're going to become the de facto standard for data storage using laser technology.

When Barry speaks, Bunnell listens.

Let me tell you about Barry. Barry has become my personal barometer for monitoring technological trends, a high-tech groundhog who pops up from time to time to let me know when spring will come.

In the summer of 1981, Barry had become general manager of Osborne/McGraw-Hill publishing, where I was working as a computer editor. Adam Osborne had just left to start a computer company, and Barry was the new boss.

That August, IBM announced its personal computer. Osborne, along with most people in the computer industry and a majority of the computer press, was very skeptical about IBM. Everyone maintained that IBM would never be successful because it didn't understand the personal computer market. They were convinced that the PC itself was no big deal. And they noted that there was no real software for it.

I must confess that I was, at least in the very beginning, one of those doubting Thomases.

Until Barry returned from an IBM press conference. Laden with press releases and photos and bubbling with enthusiasm, he was

(continues)

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3) get yourself a world class headache (or a stroke) by dropping into assembler.

Whatever you choose, by now you feel the language is out to get you—because it is.

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Pretty dismal, huh?

We thought so, too.

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With CLARION you can write, compile, run and debug complex applications in a New York afternoon.

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With CLARION you simply design the screens using our SCREENER utility and then CLARION writes the source code AND compiles it for you.

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Like SCREENER and REPORTER, CLARION's FILER utility also has a piece of the CLARION COMPILER. To create a new file, you name the Source Module. Then you name the Statement Label of a file structure within it.

FILER will also automatically rebuild existing files to match a changed file structure. It creates a new record for every existing record, copying the existing fields and initializing new ones.

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crazed with ideas for books about the IBM PC that he thought Osborne/McGraw-Hill should publish.

That was the catalyst I needed to emerge from my skepticism and separate myself from my colleagues in the computer industry. I took a second look at the PC. I read the releases, studied the machine, and concluded that Barry was right.

Then I took a fortuitous personal step: I left Osborne/McGraw-Hill to start *PC Magazine*. The rest is personal computing history. Look what's happened to the world since then!

And it was because of Barry that I had been able to see the light.

So when I ran into him at the Microsoft CD ROM conference, I had a flash of déjà vu. He was full of wild-eyed optimism and—gadzooks!—he had that crazed look in his eye again.

Now, this man is an eminently practical thinker, not some starry-eyed prophet. He believes CD ROM is going to succeed because of economics, pure and simple.

"Despite the utility of extraordinary increases in density, the future of CD ROM as a publishing medium is only partly related to how much information can be packed per unit volume," Barry says in an article called "Dense Media and the Future of Publishing." It's published in *The New Papyrus* ($34.95), a book released by Microsoft Press to coincide with the Seattle conference. This

(continues)

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619-page compendium, with contributions from more than 30 optical-memory specialists, promises to become the bible of CD ROM.

"If it were enough for media simply to be denser, we would have Bibles written on the heads of pins and books like this printed on microfiche," Barry says. "The underlying reason that CD ROMs are likely to replace traditional print is, as usual, economic.

"Dense media have the inherent characteristics necessary to cure some of publishing's greatest problems—excess inventory, short product life, high distribution costs, wasteful product returns, and insufficient shelf space to give new products a chance to thrive. These are chronic, suffocating problems for which no solution can be found in traditional print forms."

Barry builds a compelling argument in his article, so once again I find I'm on his bandwagon.

CD ROM publishing unquestionably will emerge as a major medium. CD ROM interfaces to personal computers will be able to store a tremendous number of programs, not to mention tons of data bases that can be linked together.

Although CD ROMs are still in a read-only format, the day is steadily drawing near when you'll be able to write to optical disks as well. That will open up CD ROMs to a whole new era of possibilities.

So far, so good.

But—shades of the past!—two distinct CD ROM standards have

(continues)

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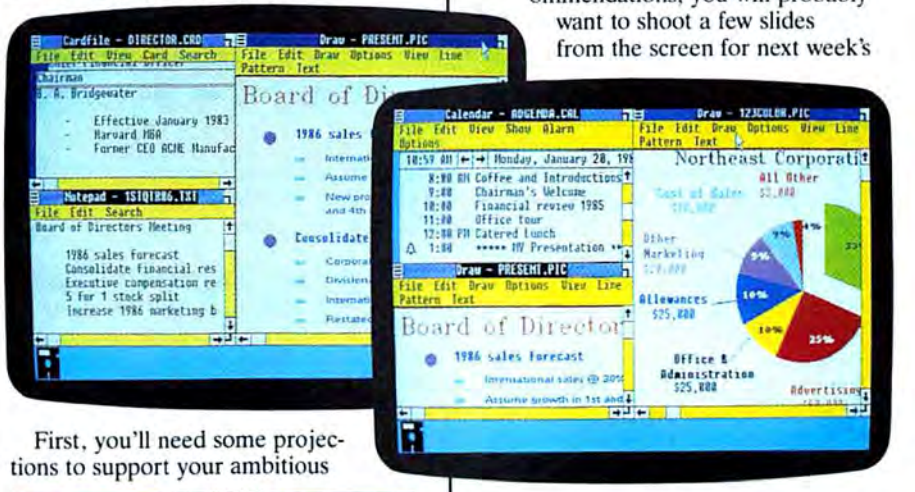
Windows and *"DRAW!"* — a winning combination.

Missing some names? Remember, you're in the Microsoft Windows operating environment. Two more clicks and your list of corporate directors, stored in another file, appears in the corner of your screen. Now you can edit your presentation and refer to the list simultaneously.

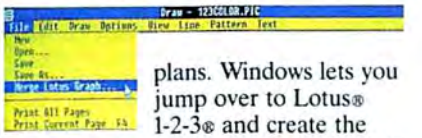
That takes care of the text chart.

Now what about your ideas for the future?

Add some brilliance to your Lotus® 1-2-3® or Symphony™ graph.



First, you'll need some projections to support your ambitious



plans. Windows lets you jump over to Lotus® 1-2-3® and create the charts you'll need. With *"DRAW!"* you pull them right from the Lotus file and place them squarely in your presentation.

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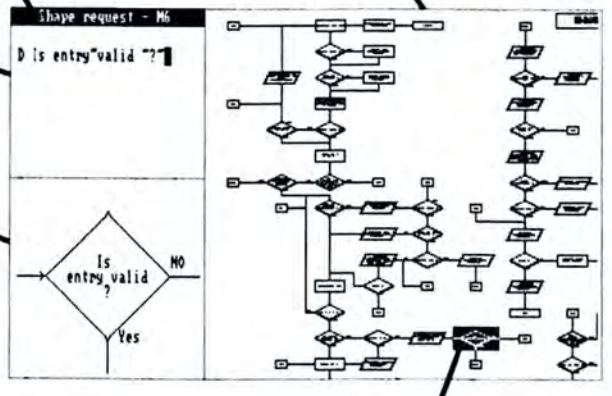
Requires at least 256K memory, DOS-2 or higher and an IBM or Hercules compatible graphics card.

Order direct for only **$149.95** + $2.00 S&H (USA/Canada), $10.00 (foreign). Payment by MO, check, VISA, COD or Company PO. Rush orders accepted ($15.00 S&H; USA/Canada only). Rush orders received by noon will be delivered the next business day (to most locations).

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



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emerged. One is the CD-I (Compact Disk Interactive) standard announced by Philips-Sony during the conference. The other is the CD ROM standard backed by Microsoft.

As of now, the avowed intention is to build a bridge between CD-I and CD ROM, although it isn't clear just how. Where do we go from here? Is CD ROM going to be just another wrinkle in ROM? Or are we going to witness yet another split in technological standards and be forced to choose between them?

I have my own vision of the future of this new medium.

I think the greatest challenge of CD ROM is to build something more exciting than television–and to capture some of that "mind share" from the TV audience.

We now have a society that watches an amazing amount of TV–more than 7 hours a day per home. That's really a waste of vital mental creativity.

CD ROM stands a good chance of reclaiming some of that lost mental ground.

What makes CD ROM really exciting is that, for the first time, it brings together computers, entertainment, and publishing in a way that allows you to create an interactive medium.

As a brand-new medium–really, a technological hybrid–CD ROM requires a new set of tools and rules for crafting the final multimedia product. Creators and producers will need to know how to mix graphics, animation, sound, and text; how to interconnect

(continues)

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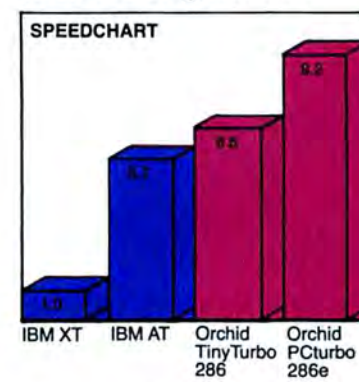

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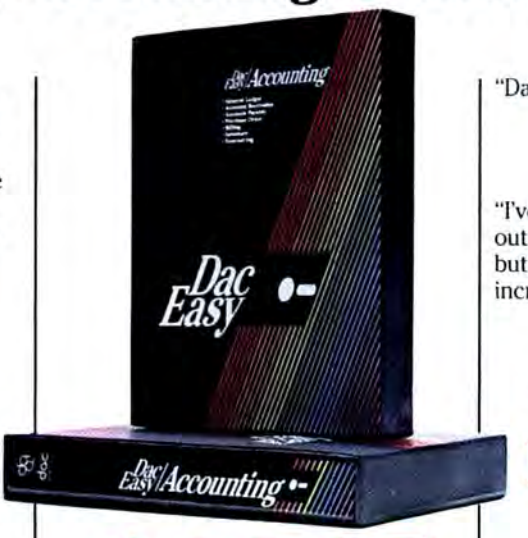

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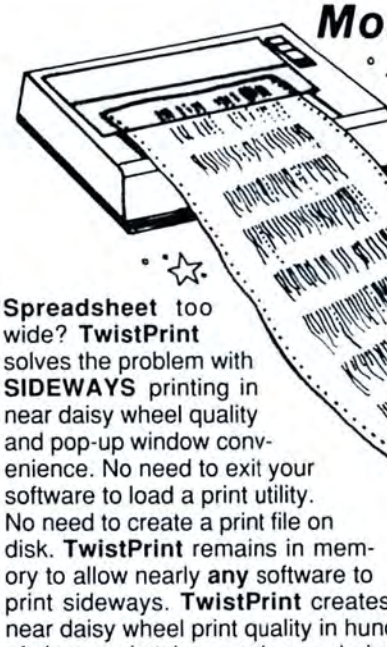

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multiple layers of information—how to make it all work.

That's why the basic issues of CD ROM are much more difficult to resolve than any problems we have ever had to face with the personal computer. After all, PCs were designed to let you create information, not read it. As interfaces, personal computers are simple, whereas CD ROMs are complex—light-years ahead of personal computers in their interactive possibilities.

To really make CD ROM work, the next generation of great American artists must become adept at its uses and techniques. We're going to need a Herman Melville and a Hemingway, a D. W. Griffith and a John Huston, a Georgia O'Keeffe and a Jackson Pollock, a George Gershwin and a Bruce Springsteen of CD ROM—to make this new medium truly soar.

If CD ROM stays in the hands of software and hardware companies, it's going to be boring fare indeed. It will be Mutual of Omaha's "Dull Kingdom of CD ROM" as opposed to "Masterpiece Theatre."

The creative media geniuses of the new age will have to be CD ROM literate.

Even though CD ROM is not here today—and my guess is that it will be a year or two before it becomes a substantial presence, when everyone has CD ROM drives attached to PCs—the potential of CD ROM to expand our universe could be enormous.

Great CD ROM products could be incredibly elaborate affairs,

(continues)

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filled with images and maps and animation and narration and music to enhance the written word.

Just think of the incredible interactive games that could be played on a level beyond anything that exists now. Games could become the new literature of the day. In fact, literature should be the driving force of this new medium. We need great words and concepts, not just gimmicks.

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CD ROM may also prove to be an ideal tool for learning languages. Language systems would record your voice and compare your pronunciation to that of the ROM instructor, pointing out the differences so you could hear them. Lessons would begin at your present level of proficiency and grow continually more complex, keeping track of your improvement and growing vocabulary.

I believe that we should become aware of all this potential. We should actively influence the new medium so that compromises are not made.

So get behind CD ROM! Personal computer users have the power to prevent it from becoming just another passive medium like the television. Who needs an encyclopedic boob tube that plays Muzak? We want the technology to fulfill its original vision, instead of CD ROM becoming just another home computer flop.

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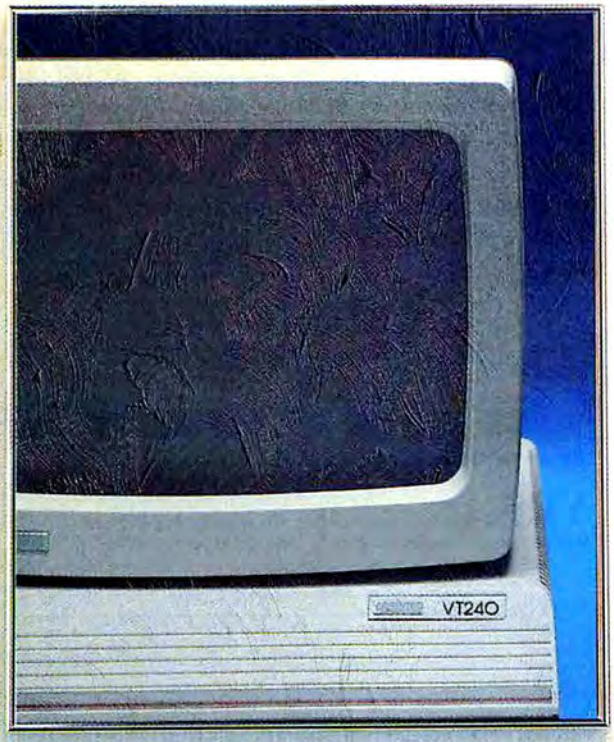

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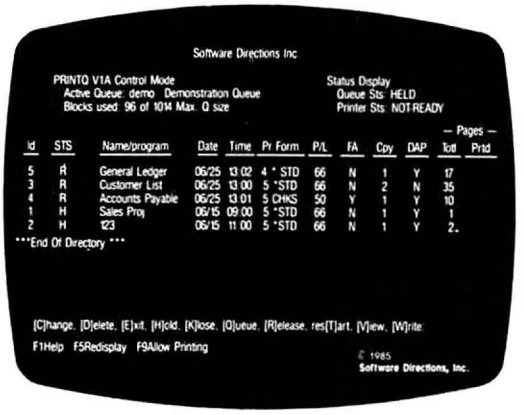

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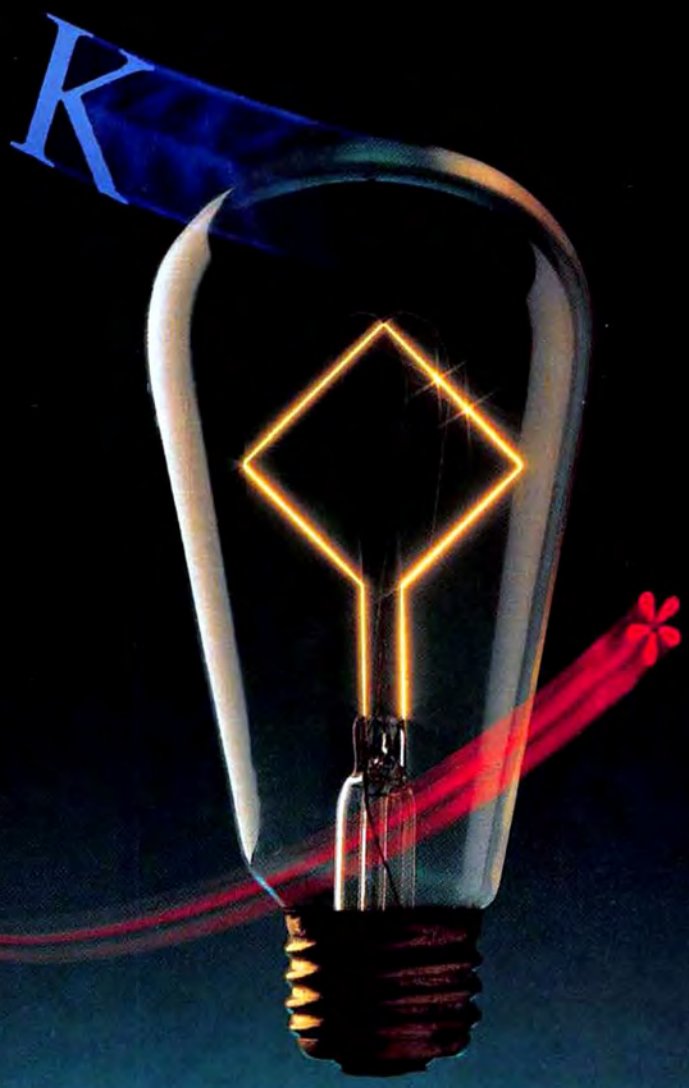

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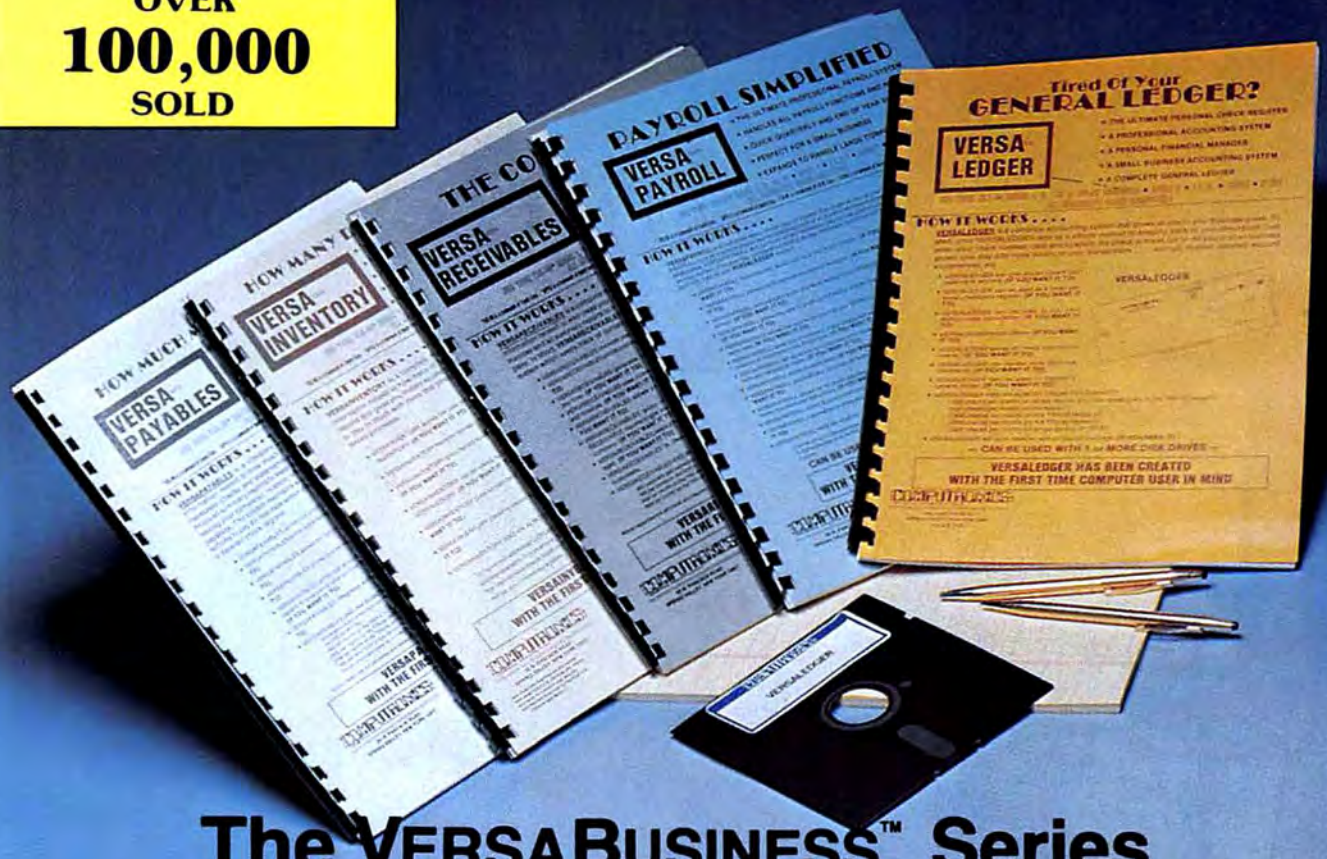

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Letters

Reactions and responses from the PC World community

Graphic Paranoia

In "Brave New Reality" [*PCW*, February 1986] John Dvorak envisions unethical uses of the marvelous graphics capability of the AT&T Image Capture Board that make his "skin crawl." Ridiculous! Assess past technological breakthroughs from his paranoiac perspective and you'll recognize that the real dangers are erasers and pencils. A demented bank clerk armed with enough erasers could make thousands of savings accounts disappear. With a few pencil strokes, unscrupulous corporations could add trillions to their net worth. Dvorak would have us abandon any attempt to use technology to traverse life's lingering limitations. So what's the difference between a Dvorak and a Luddite?

John Semski
Marina Del Rey, California

The Luddites never wrote computer columns. –John Dvorak

Big-League Javelin

As a financial analyst, I've had the opportunity to work with *Javelin* using models much larger than those constructed for "Javelin: Beyond Rows and Columns" [*PCW*, March 1986]. I'd like to clarify some misunderstandings the review may cause. Although small models require more memory with *Javelin* than with *1-2-3*, *Javelin* makes larger models much more compact. Depending on the worksheets, in 640K *Javelin* accommodates models that are two to five times larger than *1-2-3* can fit in the same space. These larger models also occupy about one third the disk space of their *1-2-3* counterparts.

Furthermore, *Javelin* is at least as fast as either release of *1-2-3* on an 80287-equipped AT. In some cases it's significantly faster since it recalculates only variables whose values have changed. Screen refresh speed is not an issue with an AT. For example, *Javelin* recalculates a fairly complex 500-variable model with 18 columns in 25 seconds on an AT 80287. This is almost as fast as *1-2-3* and an order of magnitude faster than the PC version of *Interactive Financial Planning System*, which shares *Javelin*'s ability to specify model logic in equation form.

Unfortunately, the current version of *Javelin* cannot present the logic for large models in a form that can be documented. *Javelin*'s alphabetical ordering is not much use in this regard, and the Roots option of the Formulas view is too cluttered with repeated variables. To resolve your criticism that it's hard to see the overall structure and flow of data among the variables in a model, the program should be able to display equations ordered according to the model logic. To *Javelin*'s credit, a macro can be written to simulate this procedure.

While *Javelin*'s current release has a few rough edges (many of which are noted in your review), I find it a significant improvement over other financial analysis software.

Ralph Zimmerman
San Francisco, California

(continues)

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When you put Princeton Graphic Systems Monitors to work with IBM's new graphics cards, you step up to a new class of performance. Exciting RGB color, sharp, crisp graphics and text and Princeton's quality and dependability...all at a great price!

Our full line of monitors clearly demonstrates why Princeton is an industry leader in high-resolution technology.

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The *first* IBM compatible monitor available for the IBM Professional Graphics Controller.*

COMPARE:	Princeton SR-12P	IBM 5175
Dot Pitch (The lower, the better.)	.26 mm	.31 mm
Sugg. Retail Price (The lower, the better too!)	$999	$1295
Warranty	1 Year	90 Days

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COMPARE:	Princeton HX-12E	IBM 5154
Dot Pitch	.28 mm	.31 mm
Sugg. Retail Price	$785	$849
Tinted Black Matrix Tube	Yes	No
Warranty	1 Year	90 Days

Ideal for most computing applications, the HX-12E offers 64 high-resolution colors and easy-to-read text. It gives you sharp colors, crisp characters...for less eye strain and easier viewing, hour after hour. Built-in versatility also allows you to display 16 colors with the IBM Color Graphics Adapter* automatically.

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Nobody else—not even IBM—offers a 9", high-resolution RGB color display. The HX-9 and HX-9E feature a super-sharp .28mm dot pitch tube for crisp, clear text and graphics. Nonglare screens for less eye strain. The built-in tilt-and-swivel base allows you to adjust the screen to a comfortable viewing angle. Select green or amber display modes with built-in green/amber switch.

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Princeton HX-12

IBM 5153

COMPARE:	**Princeton HX-12**	**IBM 5153**
Dot Pitch	**.31 mm**	**.43 mm**
Nonglare Screen	**Yes**	**No**
Warranty	**1 Year**	**90 Days**

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Not America's Cup AT

"The America's Cup AT" [*PCW*, February 1986] was both fascinating and informative. But as a sailor, and as a computer user both on the water and in the office, I would caution John Faulkner against downplaying the role of solid seamanship in the last Cup defense.

In his book *Born to Win* (Hearst Marine Books, New York, 1985), John Bertrand, skipper of the *Australia II*, makes it clear that the yachtsmen from Down Under believe smart sailing tactics and superior boat handling–and not the computer-designed wonders described in Faulkner's article–were the keys to their victory. In fact, Bertrand raises serious doubts about the competitiveness of the *Australia II*. Many yachting authorities also contend that the Australians' success was due at least in part to the "psych job" they did on the American team. The Americans, convinced that they had a slower boat, were thoroughly distracted from the task at hand.

Dr. Owen R. Mathieu
Swampscott, Massachusetts

Four Billion and Counting

"For Your Craze Only" [*PC World View*, *PCW*, February 1986] was based solely on the first line of a sales brochure and ignored other, more salient information about our product *For Your Eyes Only*.

(continues)

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NEW! Amazing value! Turbo Editor Toolbox includes MicroStar,™ a full-blown editor that also does windows! **Turbo Editor Toolbox** not only gives you ready-to-compile source code and a 200-page manual that tells you how to integrate the editor procedures and functions into your programs, but also includes MicroStar, a complete editor with full windowing capabilities. (You could pay $100.00 or more for a program like MicroStar, but you get it free as part of our Turbo Editor Toolbox.) You can also use Turbo Editor (which of course integrates with Turbo Lightning™) to build your own word processor!

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†IBM PC, PCjr, AT, XT, and true compatibles.
††16-bit only.

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We still claim that 1000 Cray-1 super computers will take 4 billion years to generate all the possible passwords. But since the 560-bit encrypting key creates 2^{560} power possible password combinations, a few minutes with a calculator should reveal that 4 billion years is a conservative estimate. This isn't meant to imply, however, that purchasing 1000 Cray-1's is the only way to crack the code. We merely wanted to quantify our algorithm in terms of an attack by a brute-force technique. By comparison, the 56-bit DES algorithm would last 20 minutes under similar circumstances.

Of course, as stated in the manual, a large encrypting key doesn't guarantee total security. We spent more than two years developing the Advanced Data Encryption Algorithm (ADEA) contained in *For Your Eyes Only,* and despite what you allude to as "the customary modus operandi in cryptography," we don't want to release the design. However, several features make the program unique.

Five different algorithms alter each byte in the file at least five times. To break one algorithm, you must break four others as well. A user can reencrypt a file up to 98 times by creating another password, which can range in length from 2 characters to a page from a book. All five encrypting keys change for every 512 bytes in a file. To read the entire file, you would have to break dozens or

(continues)

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Both SuperKey and SideKick work with your existing software, like Reflex,™ 1-2-3,® MultiMate,™ Wordstar,® Turbo Pascal,® and dBase.®

SuperKey "macros" are electronic shortcuts to success

You avoid repetition like getting out of bed 47 times every morning, or cooking dinner 93 times every night—when once is obviously enough. But if you haven't yet discovered the time-saving power of SuperKey, you'll find yourself typing the same set of keystrokes over and over again. Which makes no sense when a SuperKey macro cuts all that out. Macros are electronic shortcuts that can turn 1000 keystrokes into 1.

Aside from macros, SuperKey also gives you powerful encryption technology that scrambles your files and keeps confidential files confidential. It also lets you lock your keyboard, and foils would-be intruders with secret password protection.

Traveling SideKick gets personal organizers out of the Stone Age into the Computer Age

If you have SideKick, you need Traveling SideKick—and if you don't have SideKick, you need them both! Traveling SideKick is a revolutionary new combination of binder and software, making a completely new category in personal organizers: BinderWare.™ It prints out information that's already in your SideKick files, produces it in convenient familiar forms, then lets you gather it all together into your Traveling SideKick binder and hit the road.

Traveling SideKick includes report-generating software which produces up-to-the-minute telephone lists, address lists, meeting schedules, travel itineraries, calendars, and much much more. It also includes instant reference maps, airline and hotel reservation numbers, international telephone codes, and currency units. You get preprinted daily/weekly/monthly/yearly calendar forms, alphabetized address book forms, and even a receipt envelope that clips inside your binder. You can order refills at any time.

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Buy one, buy two, or all three at spectacular savings

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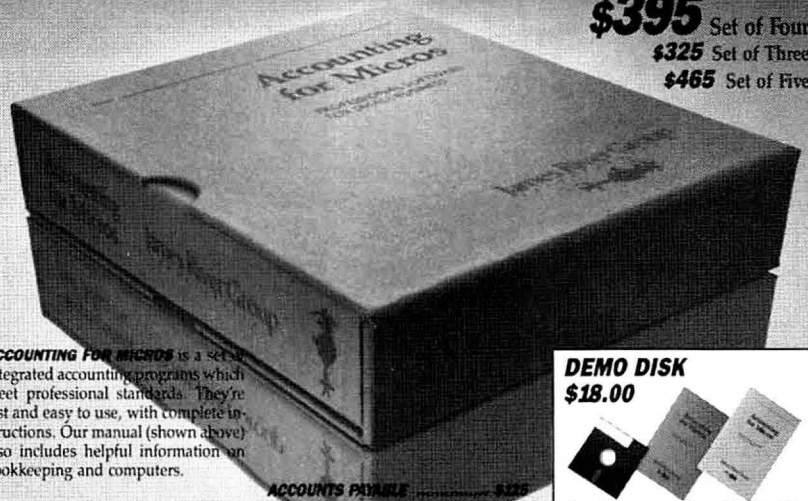

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400p Manual (w/slip case) & disk $75, or just Shareware disk $25. As described in *PC-World* February 86, pg. 282 and in *Lotus* June 85, pg. 8.

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even hundreds of keys, with each key controlled by five algorithms.

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Barry McClure
President, Grebar
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Eagle Watch

Has anyone seen an Eagle lately? Two years ago I purchased an Eagle PC. The machine performed flawlessly, handling PC-compatible science programs and utility software with ease. Despite the mediocre documentation, I've had no problems with it—until now. As luck would have it, however, the dealer I purchased the machine from no longer carries Eagle products and can't tell me where to find support. Is Eagle Computer still around, and if not, how can I get technical assistance?

L. A. Corkan
Carlisle, Pennsylvania

The Eagles have gathered in Garden Grove, California. Eagle Computer is located there along with K.E.&C., America, the company that as of February 1986 markets the PC Plus, the Turbo, and the Spirit (formerly the Eagle PC-compatible line). K.E.&C.'s sister company in Korea originally manufactured the machines for

(continues)

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Reflex makes graphic leaps far beyond 1-2-3. With Reflex, when you look, you see.

Reflex gives you five new and different views of what's hidden in your 1-2-3 worksheets

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Eagle. Both companies assure us that the Eagle PC is not an endangered species and that support will continue for the 45,000 machines sold by Eagle. The technical support hot line is 714/895-1759. –Ed.

The Rest of the Story

Gordon Slack's "inside" look at Harvard Business School students using PCs to plumb the mysteries of spreadsheets ["The Paperless Chase," *PCW*, January 1986] was interesting, but he overlooked some relevant history. *VisiCalc*, the first electronic spreadsheet, was invented by a Harvard Business School graduate, Dan Bricklin. He realized that a personal computer could easily handle the tedious spreadsheet calculations assigned by his professors. *VisiCalc* then enabled Apple Computer to write a chapter of Silicon Valley history. Perhaps the famous Harvard case-study method should include the *VisiCalc* story among its paradigms.

Mark Heyman
Springfield, Illinois

Mention should also be made of VisiCalc's *M.I.T. connection. The program's coauthor, Bob Frankston, holds a graduate degree from M.I.T.'s Department of Electrical Engineering and Computer Science. Both he and Bricklin completed undergraduate work there. –Ed.*

(continues)

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You could be running Lotus 1-2-3,® MultiMate,™ MicroStar,™ Reflex,™ SideKick,® WordStar,® or WhatEver,* it doesn't matter which one, because as you write, Turbo Lightning watches how you spell every word, and is ready to alert you to any mistakes.

So let's say your neighbor, who already has 23 unmatched sets of plastic flamingos on his front lawn, a broken boat trailer, and a mattress, has now brought back a coyote from a hunting trip. It howls all night, and you're writing a letter involving the word IDIOT, but you accidentally typed IDOIT. What happens then? You immediately *hear* a beep, so you know something's up. You instantly *see* a window that doesn't list IDOIT, but it does list IDIOT and its sound-alike words, so your screen window looks like this:

A. IDIOT
B. IDIOTS
C. IDIOM
D. IDIOTIC
E. INDICT
F. IDIOMS
G. ADD WORD TO AUXILIARY DICTIONARY

So you move your cursor to A, which is the correct spelling for IDIOT, hit return, and the spelling mistake is instantly fixed.

Turbo Lightning also gives you instant synonyms

IDIOT was the word you planned to use in your note next door, but is it the best word? And should you use that particular word since your neighbor fools around with his guns when he's full of whisky (which is every night), and besides that, he's 6'10", a black belt, *and* your cousin?

Because you have Turbo Lightning's Random House Thesaurus at your fingertips, you can look at the *synonyms* for IDIOT. Type in IDIOT and what you see is:

- NOUN -
A. CRETIN
B. MORON
C. HALF-WIT
D. BLOCKHEAD
E. JERK
F. NITWIT
G. FOOL

Any one of which expresses your opinion of your cousin's mental stature. So write the letter, but *don't mail it!*

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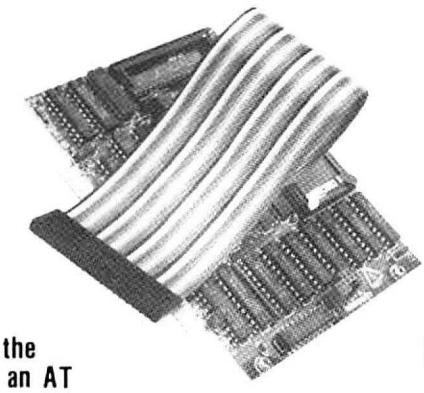

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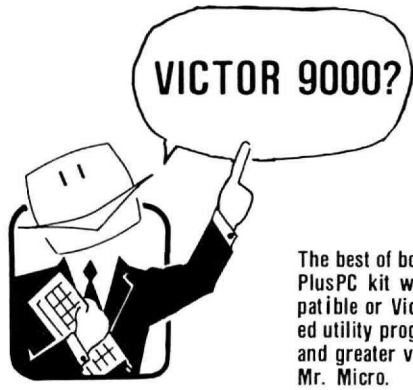

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A Bad Track Record

Hats off to Larry Thiel, whose letter in *PC World*, February 1986, bemoans the now-infamous AT hard disk failures. I encountered 'disk failure' error messages six months after buying an AT in June 1985. I loaded the drive lock-down program into a batch file on the screen menu. Now I run the drive lock-down program before I turn off the AT and, to date, have experienced no further drive problems.

My real complaint, however, is with IBM. Thiel bought his AT in September 1984; I purchased mine nine months later. Knowing that the drives caused problems in the short run, Big Blue continued to install them in "enhanced" ATs. Why?

I'm a staunch IBM user, but this insensitivity has tempered my enthusiasm.

William W. Campbell
Bardstown, Kentucky

When contacted by PC World, *a representative from IBM said it was not its policy to respond to Letters to the Editor. —Ed.*

The Macro That Missed

LaserJet owners printing *1-2-3* worksheets with the line printer macros 5 through 8 listed in Figure 1 of "Lotus by Laser" [*PCW*, February 1986] will find their output in portrait rather than landscape orientation as expected. The code for landscape orientation is

(continues)

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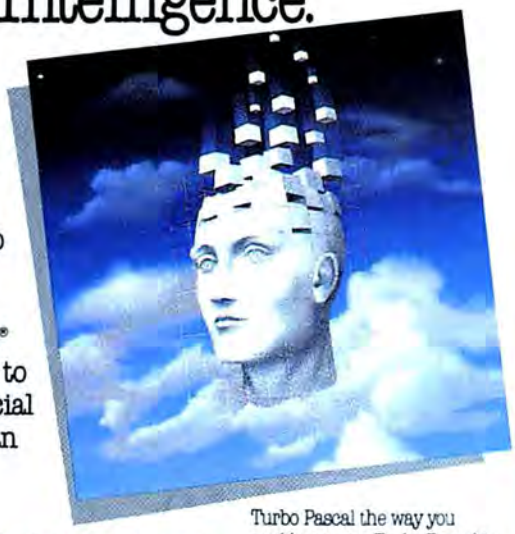

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contained between the two backslashes and should read **\027&l1o8D** for macros line printer 5 and 6 and **\027&l1o6D** for macros line printer 7 and 8.

The same article contains a walk-through of Figure 1's first macro, Courier 1. The left margin settings in cell C5 on page 247 and in the explanation of margin settings on page 248 should be **~ml4~** rather than **~m14~**.

Our apologies for any inconvenience these errors may have caused you.

Sound Advice

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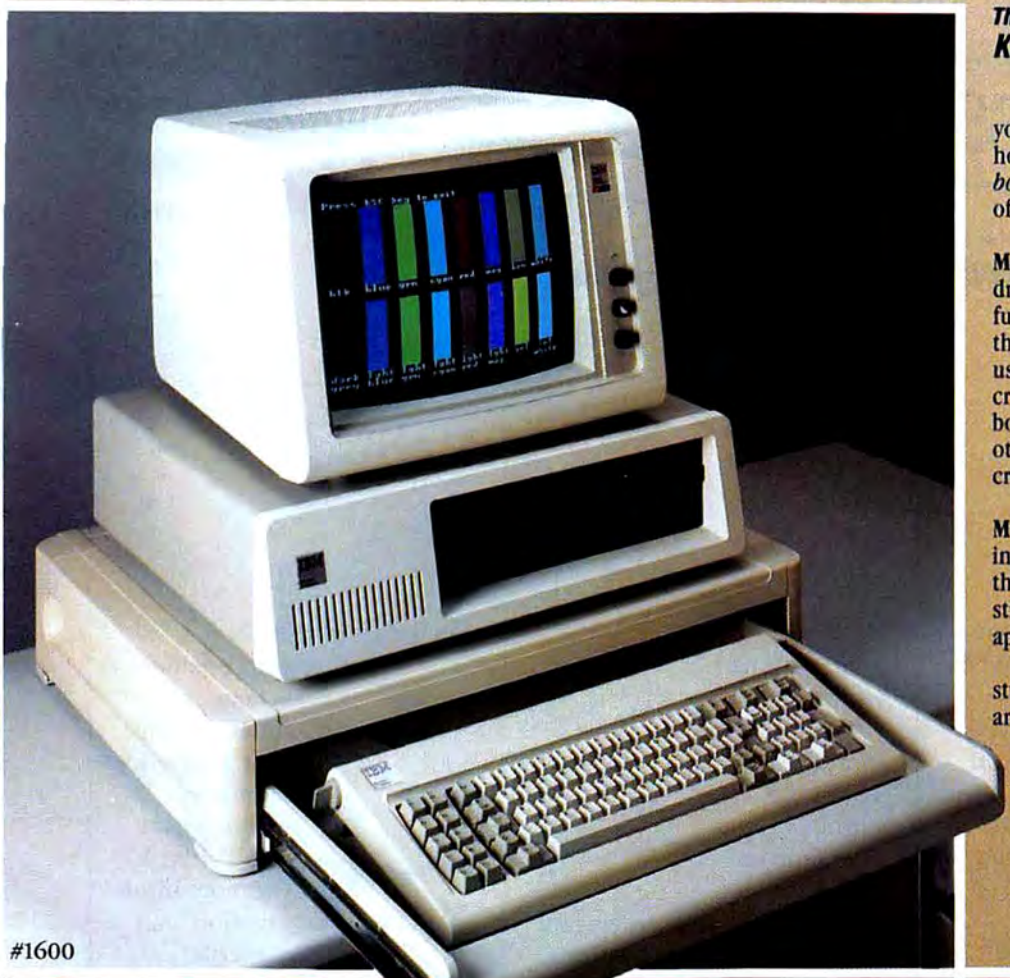

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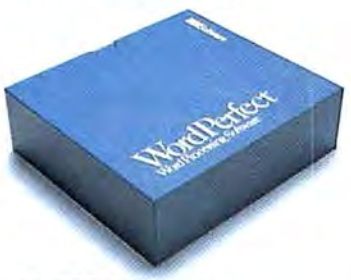

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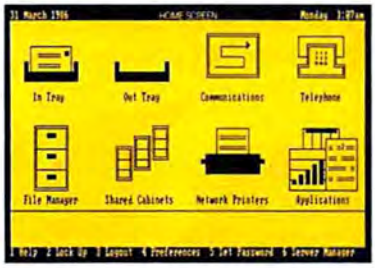
At Last A Network That's Easy To Use

FIVE TERRIFIC REASONS TO TRY TAPESTRY® NOW

No matter what local area network hardware you choose – your next choice should be Tapestry networking software from Torus Systems. Here's why.

1 **IBM chose Tapestry** for its overseas market, and it quickly became the hottest LAN system in Europe.



This is the friendly screen that caught Big Blue's eye.

2 **It's the world's easiest-to-use networking software** – much simpler than Novell, 3Com, or IBM because Tapestry is managed with icons. To use it, you just point to graphic symbols: the "in-tray" to get mail, the "cabinet" to access files, and so on.

You even use icons to configure the system, so almost anyone can set up a Tapestry network – and keep it running smoothly.

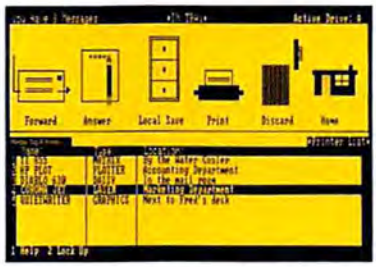
3 **Tapestry is the most complete LAN software money can buy.** The basic system gives you:

• Advanced electronic mail
Compose memos with the Torus text editor. Send them to any person or group on the network, just by pointing to names. Track the mail you've sent. Get messages instantly.

• Cost-effective sharing of hard disks, printers and modems
You can have up to 100 Tapestry workstation/servers and access any one of them by touching the right icon. Since all Tapestry servers are undedicated, each station is free for business as usual. You don't have to invest in specialized hardware, or sacrifice your valuable PC's.

• Advanced communications capabilities
Need information from the company mainframe or an outside service? Just point to the desired Service icon. Torus offers a family of network gateways* that automatically make the connection and speed your information through.

• And there's more!
Tapestry also provides central storage of all your applications so they too can be accessed with icons. Automatic file locking so you can safely run single-user applications not originally designed for networks. File Manager icons that let you manipulate files without using DOS commands. And a Telephone Manager that places your calls and maintains a personal electronic rolodex.



What good is a network if your people don't know how to use it? Tapestry's screens are so easy to understand, anyone can net great results without special skills or training.

4 **Tapestry supports all the standards,** like IBM Token-Ring, PC Network and 3Com hardware. Like PC-DOS 3.1 and NETBIOS. So you can choose the LAN hardware that's best for you, and you won't have to worry if your software will run.**

5 **This coupon gives you great savings and a money back guarantee!**
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System Requirements: Station 1: IBM PC, XT, AT or compatible 384K, 10MB hard disk. Station 2: IBM PC, XT, AT or compatible 320K. Plus suitable networking hardware.

Notes: *TTY is standard, while VT100, 3270 SNA, and Remote Access are purchased separately. **Tested applications include: dBase III Plus, MultiMate Advantage, Open Systems Accounting, Displaywrite 3, WordPerfect, MS Word, Lotus 1-2-3, AutoCAD.

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Naomi Karten

REMark: MIS in Eclipse

Maybe MIS managers should wake up and smell the coffee. If PC users take system development into their own hands, MIS departments could lose the control they've fought so hard to gain.

As PCs continue to grow in power and capacity, you'd expect to see management information systems managers in hot pursuit of PC applications. Not so. Many MIS departments still consider PCs unsuitable for serious business solutions.

Despite MIS indifference to PCs, micro-to-mainframe connections are steadily evolving. As the kinks get worked out and the right data becomes accessible in the right format, the PC will be where the action is. MIS departments, however, seem unprepared for such an inevitability: It's a rare MIS programmer who can write full-scale, customized PC applications.

That's not to say that data processing professionals never use PCs. After some initial blustery resistance and a few years as the cobbler's children, MIS personnel started acquiring PCs and generating their own spreadsheets and data bases. They, too, got hooked on ease of use and split-second response time. But develop systems for the PC? No way! Many MIS staffers still won't condescend to write code for "toy" computers.

That such toys are playing catch-up with the mainframe at blinding speed doesn't seem to phase most MIS managers. They continue to rely exclusively on big, complex, inscrutable mainframes—machines so vital to corporate survival that they're housed behind locked doors, with access limited to a select few (and PC users are certainly not among the annointed).

Besides enjoying this apparent monopoly on computing power, MIS people relish the glamour of big numbers: 100,000-line systems, thousands of transactions per day, disk storage in the billions of characters.

Yet not every system needs to be developed or run on a mainframe. In fact, the PC is an increasingly appropriate (and in some cases, optimal) tool for sophisticated business applications that require the programming—complete with complex editing, loops, and calculations—that many MIS departments don't provide.

(continues)

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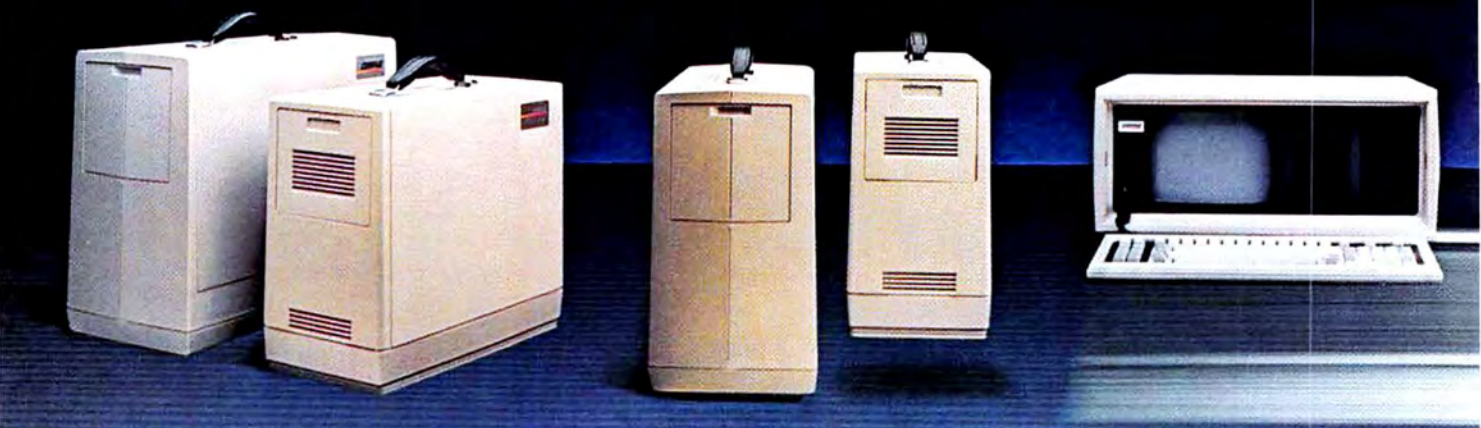

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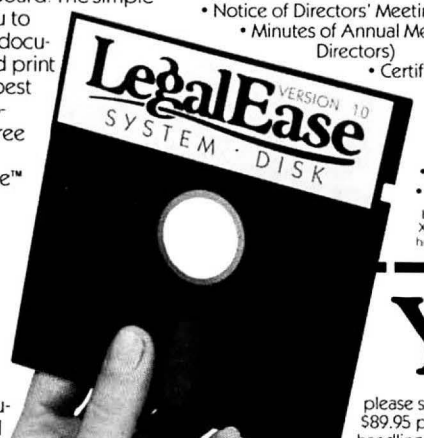

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[redacted]

In this era of user autonomy, why don't PC users program their own systems? Quite simply, most business users aren't programmers, nor should they have to be. Lacking both time and inclination, the majority of users barely skim the "read-me-first" section of the user manual. They can't be expected to make the analytical leap from an occasional "what if" to complex application development.

Information centers could develop PC systems if they wanted to, but in most cases they don't, or they won't. Such centers promote and support end-user computing, but they generally live by the dictum, Thou shalt not develop applications for users. The mission of the information center is to help users apply computer technology to solve business problems. In most information centers this translates into training users and providing a patient and helping hand during the learning process. Period.

Most MIS professionals won't acknowledge that full-blown systems can be developed for the PC, but users are proving them wrong. Increasingly, users are seeking out independent contractors to write their PC applications. MIS managers formerly controlled all development done by outside vendors; now, users are circumventing the MIS department, just as they did when they first acquired PCs. Contract programmers report directly to the users. The systems they develop range from applications using the top ten PC programs to logically complex systems written in C and assembler.

(continues)

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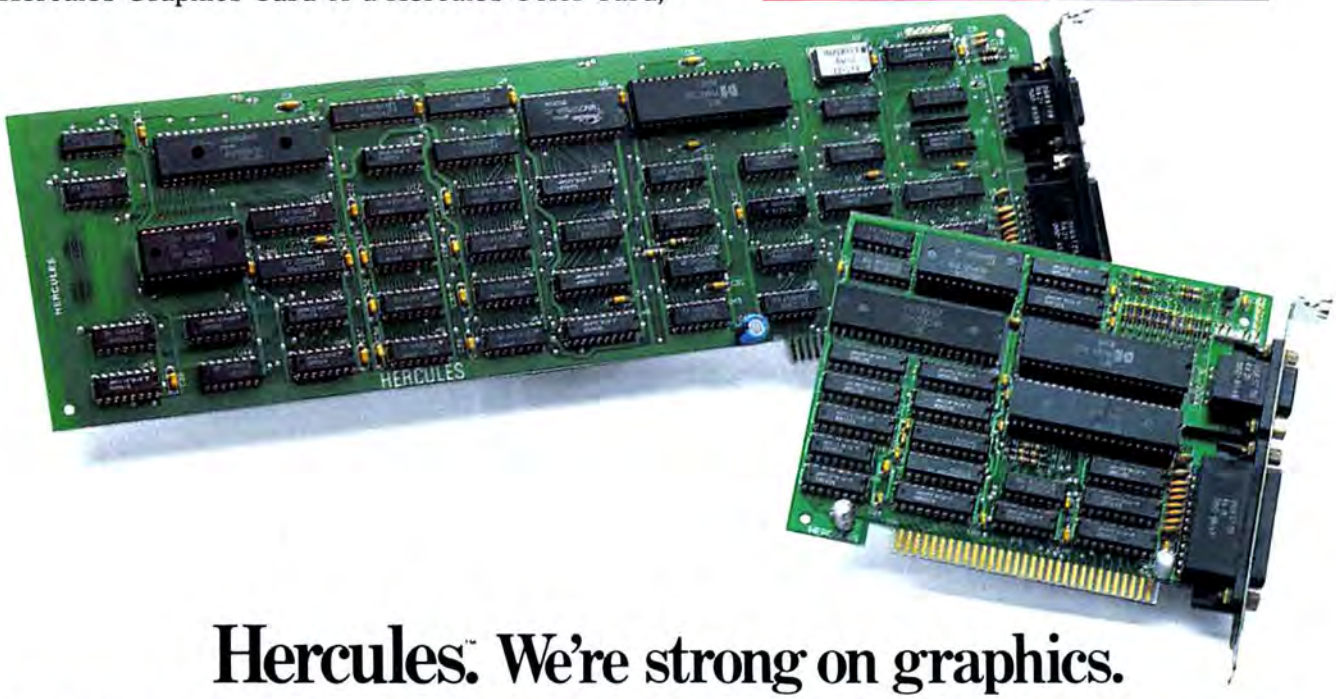

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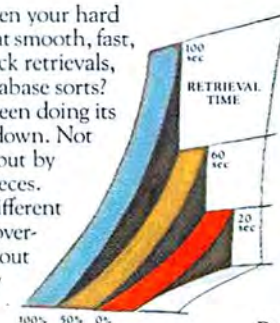
Your hard disk will run faster when it's not chasing around after files.

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

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

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

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



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

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

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

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

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

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

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

Analyze, scrutinize, optimize.

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

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

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

Get your hard drive back in shape—at a special low price.

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 have.

And the less chance you'll have to buy Disk Optimizer at the special introductory price of just $49.95*

That's a small price to pay to get back the speed you depend on. But it's a price that won't last long.

Ask for Disk Optimizer at your computer dealer.

Or order today by calling SoftLogic Solutions at 800-272-9900 (603-627-9900 in NH), or send the coupon below.

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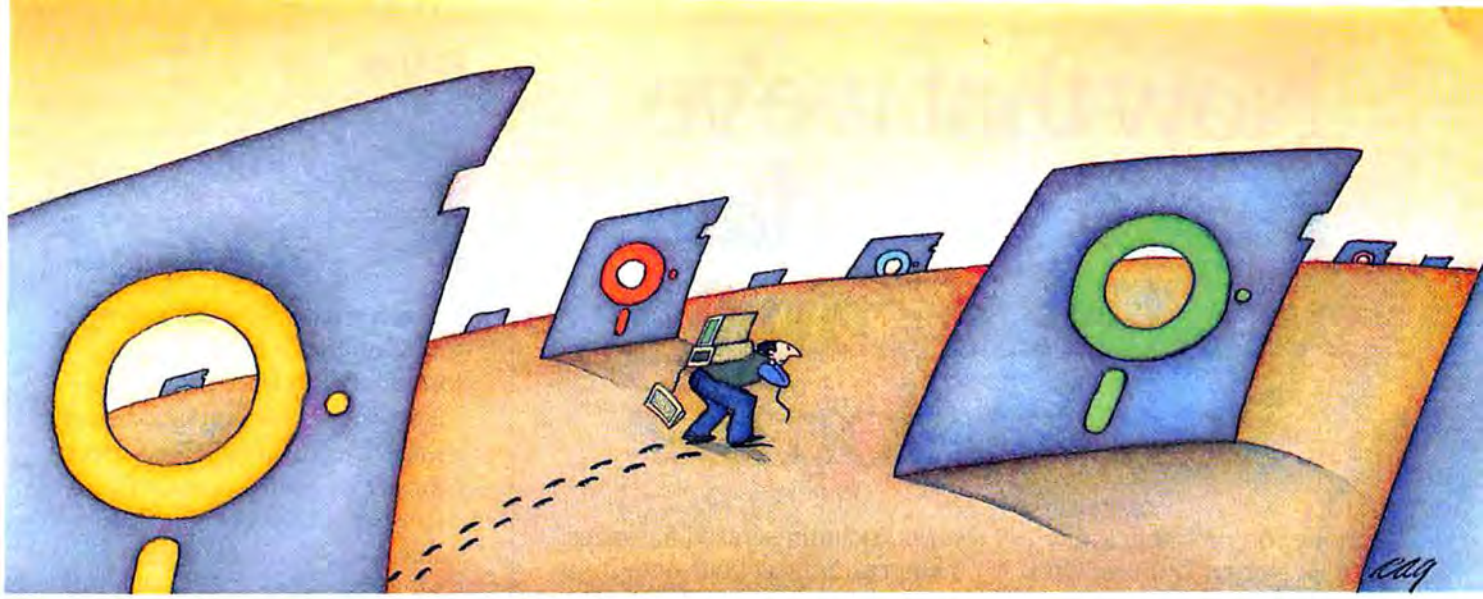


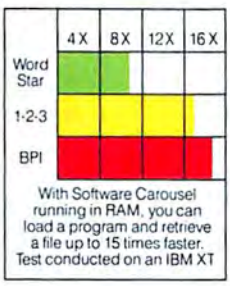
PROBLEM: There's just no easy way to move from one software program to another.

THE SOFTLOGIC SOLUTION: Software Carousel

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

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

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



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

Why call it "Software Carousel"?

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

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

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

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

Reach deep into expanded memory.

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

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

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

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

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

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

The easy way to maximize PC power.

With all this power, you might think Software Carousel is complicated and difficult to use. Not so. Set it up once, and it will remember forever. Better still, Carousel will look for the programs you use most often, and optimize them for the quickest access.

You can spend a lot more money, and still not get the convenience and productivity increase of Software Carousel.

The way we see it, there are certain things you have the right to expect from your computer. Access to your software is one of them. And at our special introductory price of just $49.95*, Software Carousel is the best way to get it.

But hurry. This price won't last long.

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By now, you probably know about The Norton Utilities™ with UnErase.™ You know, the program that actually searches for and retrieves lost data. No idle boast, and a pretty good thing to be famous for.

Problem is, UnErase is so popular, some of our other utilities just don't get the acclaim that they should. And there are some pretty nifty utilities in our package that we'd like you to know about.

For instance, you may have accumulated so much data on your disk, you've forgotten where you put it all. How do you organize your database so your information is manageable and accessible? First, List Directories gives you a list of all the directories and subdirectories on your disk. Then Disk Sort will sort all your directories five different ways. File Size gauges the amount of space your files occupy, to help you with transfers between disks and storage.

Find.

Sometimes you need to track down a specific bit of data. It's not deleted, just mislaid. Search your directories to find the file by name with File Find. Or if you only remember a few identifying words of the file, Text Search will search your entire disk for those words, including erased file space.

You can protect your data from harm with several of our other utilities. Disk Test will scan your disk for damaged sectors, unsafe for data. File Attribute makes your file invulnerable to alteration or deletion. Wipe File and Wipe Disk keep personal data confidential. Data is wiped clear by file or disk never to be retrieved. Not even with UnErase.

Test.

Are you an explorer at heart? Other utilities give you vital information about your system, a graphic map of your disk space, and let you scan your disk and snoop through programs.

Sort.

Every day The Norton Utilities help you sort, track, explore and protect your precious data. And should you lose something, UnErase is always there.

Snoop.

The Norton Utilities version 3.0 is designed for the IBM PC, PC-AT, and DOS compatibles. Available at Computerland and most software dealers. Order direct for $99.95 from Peter Norton, 2210 Wilshire Boulevard, Santa Monica, CA 90403. 213-399-3948. Visa and Mastercard welcome.

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Unfortunately, PC users sometimes suffer as a result of this enforced independence from MIS. They suffer as MIS suffered before them while learning how to select, contract with, and monitor the activities of outside developers. Inevitably, some of the PC systems built by outsiders will develop cracks or need improvements. But by then the developer may have moved on, leaving no forwarding address. Like separate fiefdoms, each department will have developed a system of its own that bears little or no relation to any of the others.

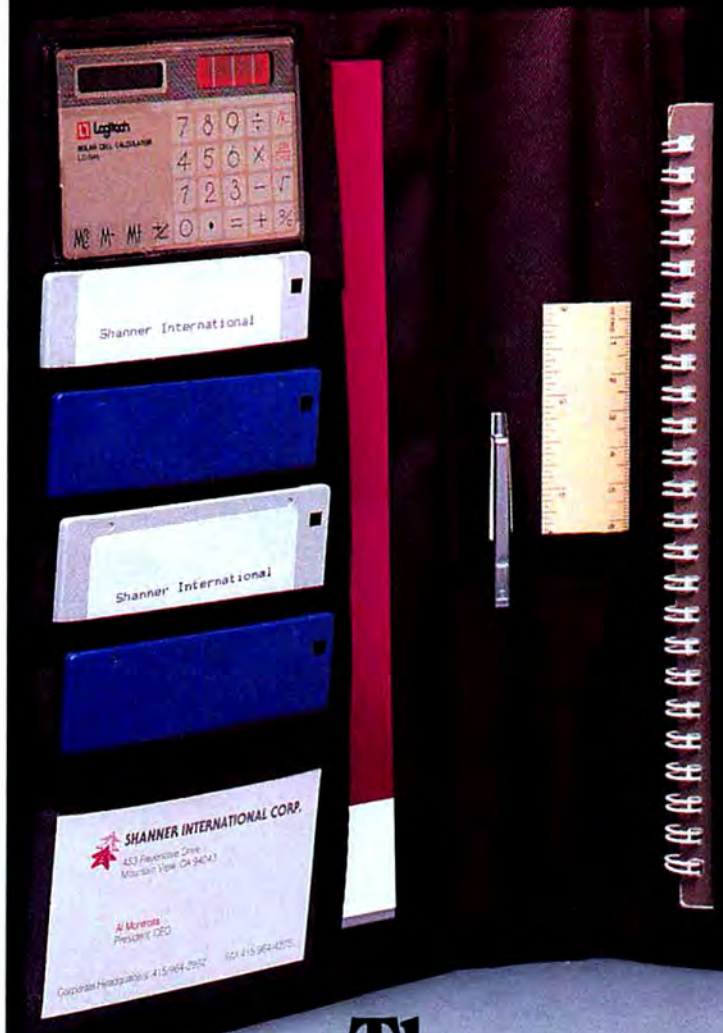
It's ironic that many companies justified PC purchases by projecting savings that would result from eliminating outside time-sharing services, whose costs had gone through the roof. Expenses had been incurred by many different departments, and no one, it seemed, was in charge of adding it all up. Now, dollars are flowing out again, only this time to contract programmers. And once again, it's unlikely that anyone is keeping track of the rapidly mounting total.

MIS managers are responsible for an organization's appropriate use of computer technology. Deep down, they know that the measure of any technology—large or small—is its ability to help users meet corporate objectives.

With that mandate in mind, MIS departments must now actively exploit the power of the PC. Let me make a modest proposal, a four-point plan for getting MIS departments to implement PC development.

(continues)

It speaks for itself.



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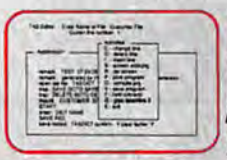

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Train mainframe programmers in PC programming. Unless they're after-hour hobbyists, most mainframe programmers don't know how to write programs for PCs. They need to see that programming a PC isn't difficult—it's just different from programming a mainframe. Chances are that with some training, many programmers would gladly trade in the glamour of the mainframe for the responsiveness and independence of the PC.

Develop screening procedures to determine whether a PC or a mainframe can better satisfy a user's request. Criteria for such screening might include system scope, processing complexity, security constraints, number and type of potential users, requirements for reconciliation with other systems, and source and volume of input data.

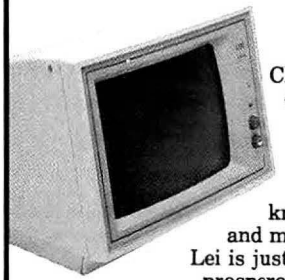
Adopt a methodology that standardizes the development process and promotes consistency within and among PC applications. As in mainframe development, universal rules, policies, and procedures should govern every aspect of every project, from the moment a user asks the MIS staff to develop a system through the documentation and final delivery of the system itself.

Finally, differentiate between MIS responsibilities and those of the users. Once completed, PC systems can be turned over to users for care and feeding. But who's in charge of enhancements, backups, security? The lines of responsibility must be drawn.

MIS departments have spent years refining their technical savvy in system development. Now it's time to look for opportunities to apply this expertise to PC development—and give the mainframe a break.

Naomi Karten, president of Karten Associates in Randolph, Massachusetts, is a consultant and trainer in the management of corporate end-user computing.

We've Been Around and We'll be around.



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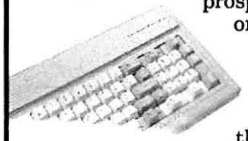

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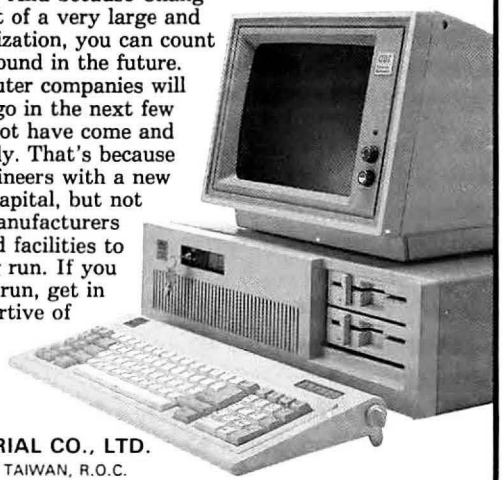

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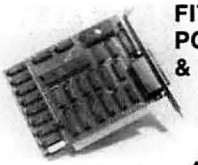

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What's it like to use it? If you have ever worked with or seen a RAM Disk you know what a difference speed can make when working with any program that frequently accesses the disk. Well, ***LIGHTNING***™ enables those programs to approach the same rapid speed as a RAM Disk, but it does it without the disadvantages. With a RAM Disk there is a constant danger that you can lose your precious data if you forget to copy it back to the disk drive. With ***LIGHTNING***™ you just use your programs normally. You don't have to remember anything.

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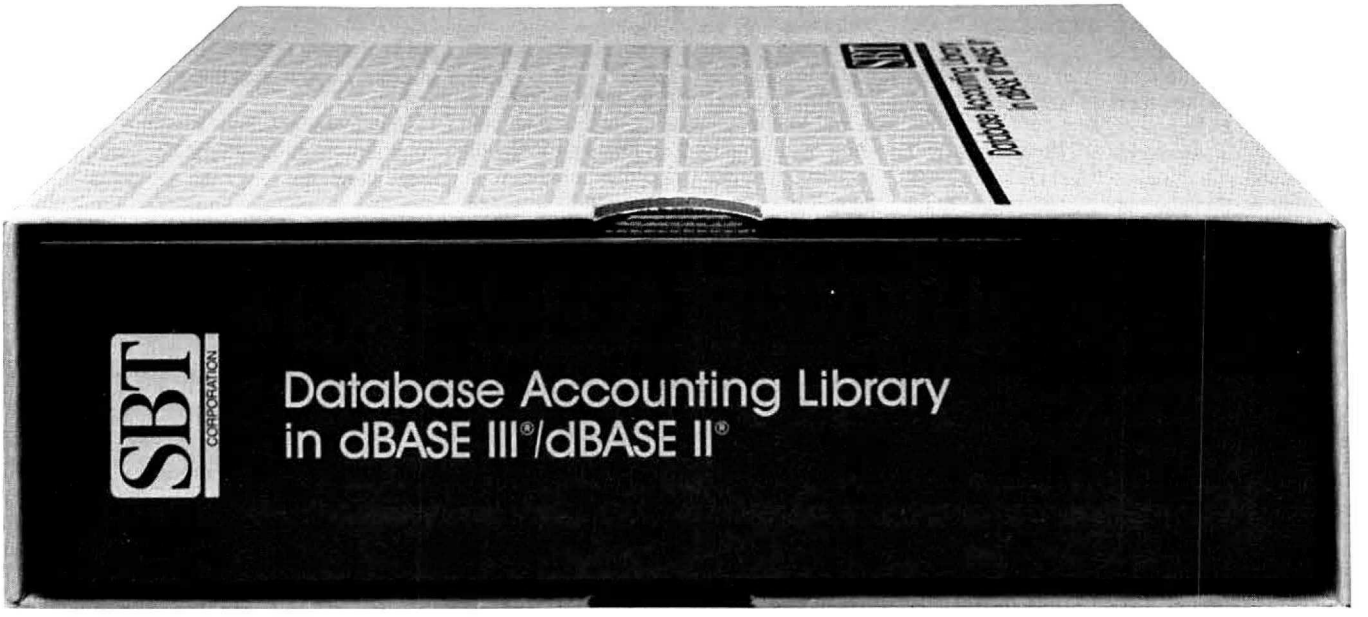

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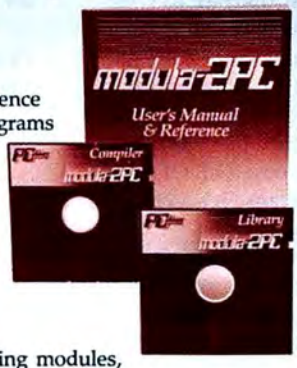

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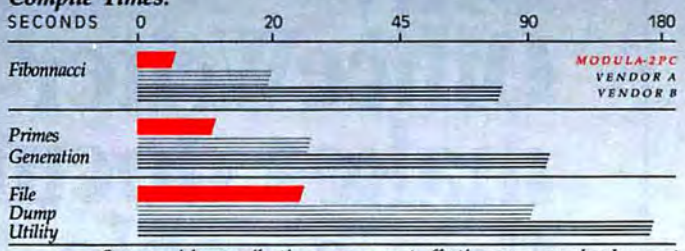

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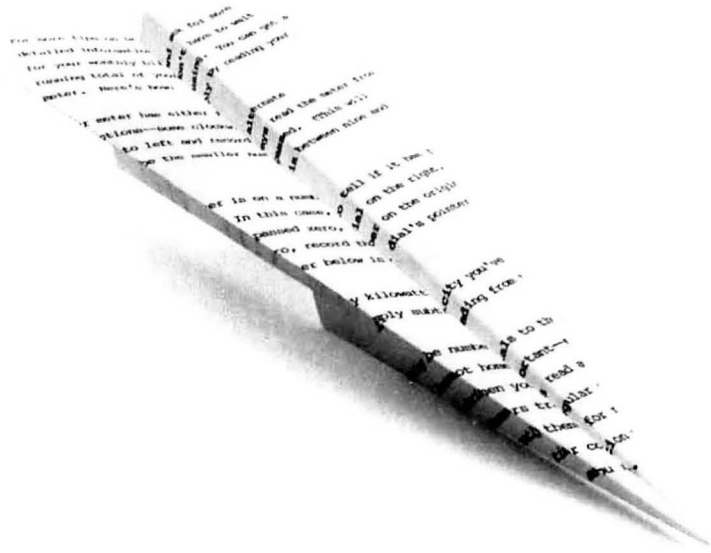

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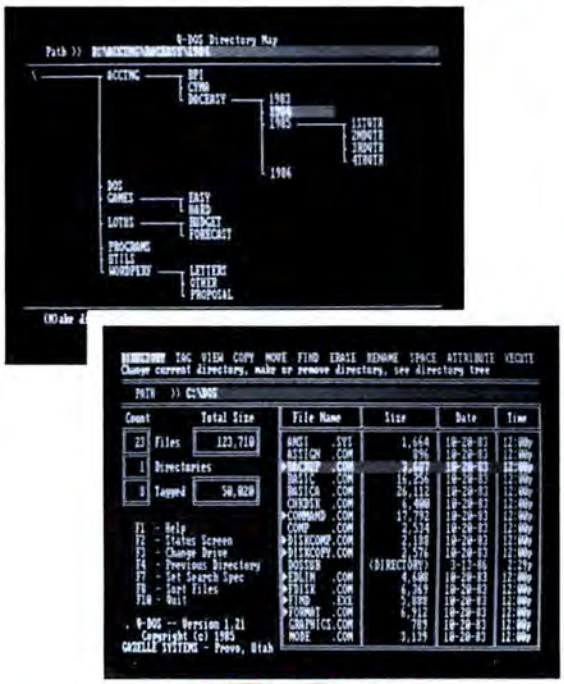

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Return to file mgr after running a program (1)	0.1 sec	24.0	24.2	n/a	2.8	.7	1.8
Copy 23 files from drive C to drive A (2)	34.0 sec	40.2	38.0	41.6	74.1	51.9	43.7
Start up program and find a file — maximum time (3)	12.3 sec	89.4	26.1	27.0	47.4	39.2	n/a
Show files on drive A, then return to drive C (1)	1.3 sec	40.3	25.5	12.4	5.5	39.2	7.1
Can be used to backup your hard disk?	YES	NO	NO	NO	NO	YES	NO
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(1) This shows the flexibility of the program; the time shown does not include the 2 or 3 second response time of user.
(2) PC-DOS 3.10 took 38.7 seconds
(3) Norton Utilities "file find" program took 24.9 seconds

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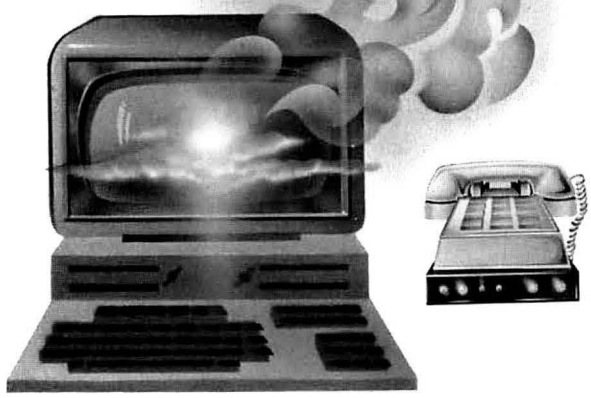

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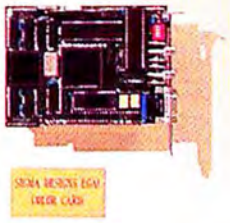

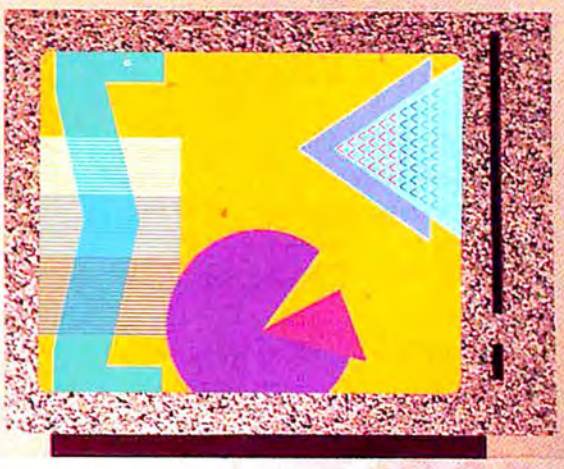

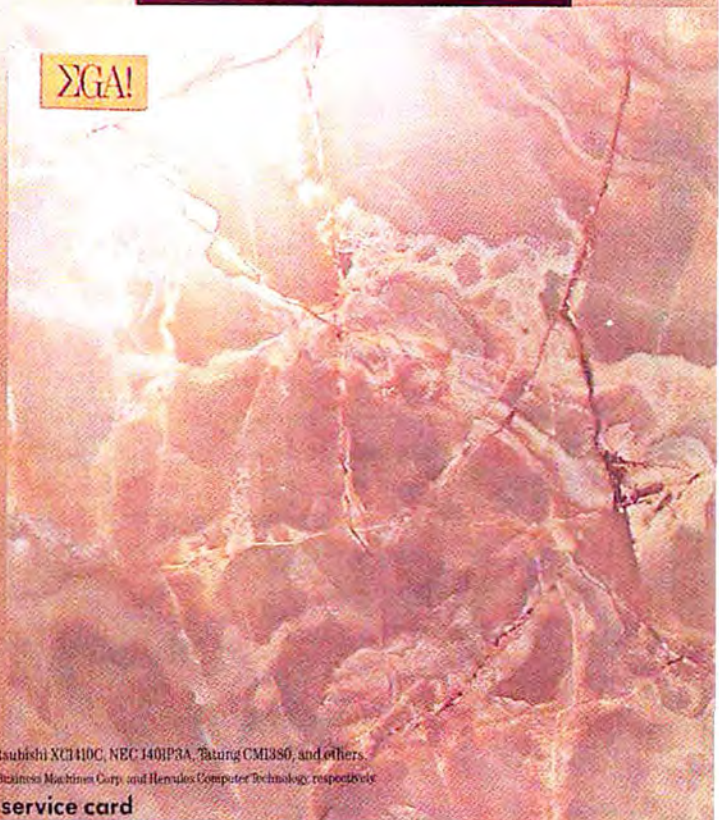

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PC WORLD

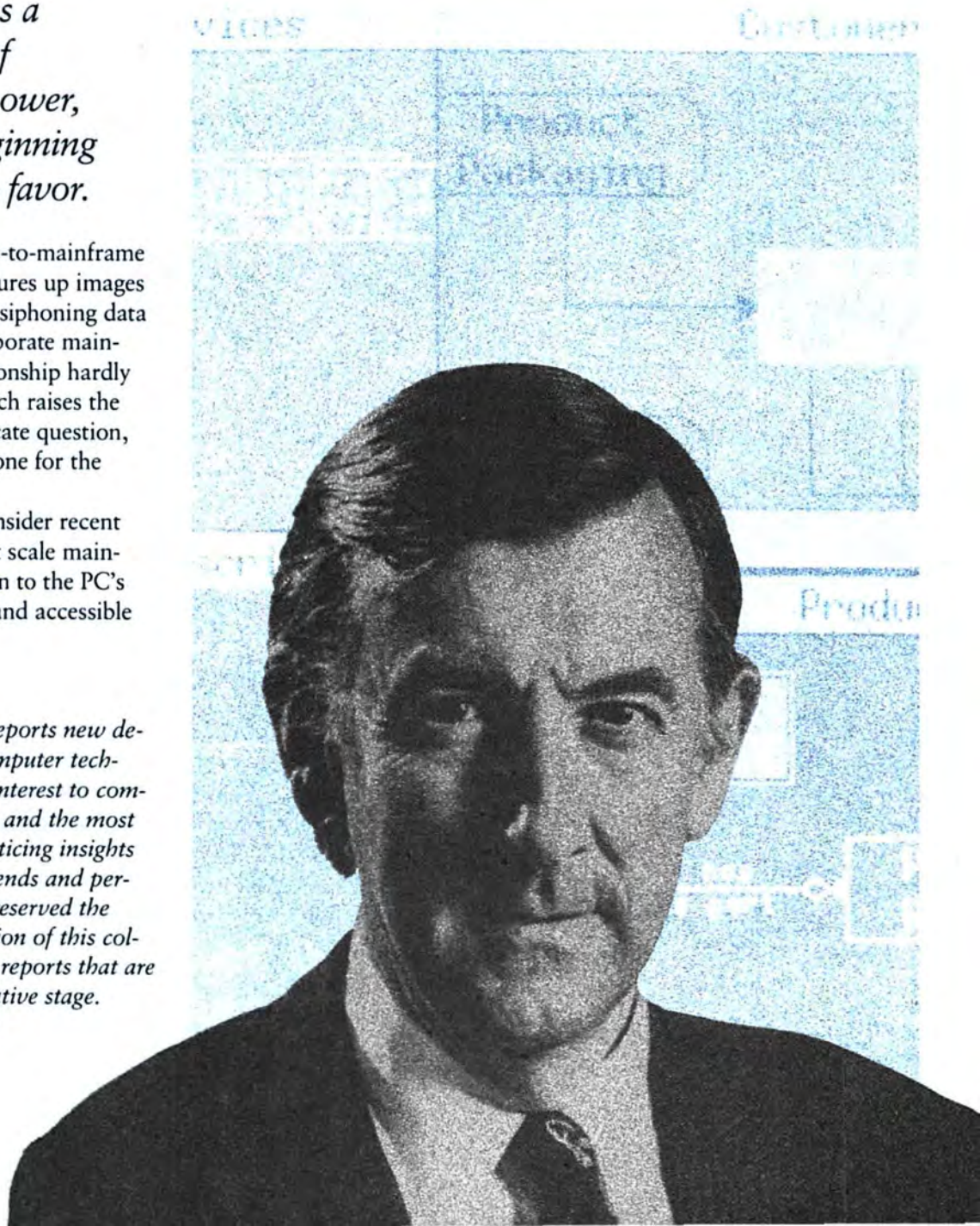
Automating Automation

After years as a beneficiary of mainframe power, the PC is beginning to return the favor.

The phrase "micro-to-mainframe links" usually conjures up images of PCs awkwardly siphoning data from ungainly corporate mainframes. That relationship hardly seems mutual, which raises the legitimate if indelicate question, what has the PC done for the mainframe lately?

Plenty, if you consider recent breakthroughs that scale mainframe system design to the PC's more manageable and accessible level.

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



View

News and notes for the computing community

Take the *Information Engineering Workbench (IEW)*, for instance. *IEW* is part of a new breed of micro-to-mainframe links; it's an expert system that blends PC and mainframe software diagramming capabilities, then substitutes that methodology for the traditional, tedious process of manual system building. *IEW* transforms an AT equipped with AboveBoard, DRI's *GEM*, and a mouse into a systems analyst's workstation. Also in *IEW*'s neighborhood: Computer Corporation of America's *PC/Workshop* and Index Technology's *Excelerator.* All attempt to automate the very processes by which automated systems are built.

IEW is a joint venture of KnowledgeWare, the Ann Arbor company founded by noted data base consultant James Martin, and the Information Technology Group at the Big Eight accounting firm Arthur Young. This $7500 collection of PC-based "workbench" tools is geared to hastening system design and implementation—a notoriously expensive, labor-intensive process that has beset many Fortune 1000 MIS shops with nightmarish backlogs and cost overruns.

James Martin, prominent architect of mainframe systems design, brings his blueprints down to the PC.

KnowledgeWare claims *IEW*'s diagramming methods enable designers to proceed step-by-step from flowcharting to code generation, while creating data models flexible enough to change as business needs change. *IEW*'s data models consist of elements that define an organization's structure—people, concepts, events, and so on. These interchangeable components permit designers to recycle applications developed in one context for use in another. Designing systems on PCs has the additional benefit of making mainframe data more accessible to users and systems designers alike.

The system design process encompasses project management, training, and client services. Accordingly, *IEW* modules deal with planning, modeling, implementation, and maintenance functions. Program components form a pyramid whose base is a "data encyclopedia"—a means of storing and updating the systems analyst's work in a form both users and engineers can share.

IEW, which was released commercially in April, underwent beta testing by information centers and MIS managers at 15 corporate sites. A version of the program will soon be released under *Microsoft Windows* and may eventually be implemented on the RT PC. *—Susan Gubernat*

Would You Buy a New Car From This PC?

It seems improbable in the extreme that technology could replace the time-tested American ritual of buying a new car. Can you get by, after all, without kicking the tires, flinching at the sticker, breathing deeply of fresh Naugahyde?

The Chevy man can. Chevrolet has compressed a good part of the car-shopping exercise to floppy disk; the car maker calls its program *Chevy Tech* and invites users to "take a disk drive."

The company's entire 1986 lineup is as near as your RGB monitor. From Chevette to Cavalier to Corvette, you can check

(continues)

Garlands and Glitches

With this issue, PC World View *inaugurates an occasional feature in which we'll give credit where credit is due—and likewise take note of ignominious developments on the PC scene. We give* garlands *to those we like; those we don't receive* glitches.

▼ ***Glitches*** Ashton-Tate, for announcing the eventual trimming of 35 percent of Multimate's workforce despite an avowal by one Ashton-Tate insider that the word processing unit would continue to operate as an "independent subsidiary." A-T cited "job duplication" as the rationale for its cutbacks in the operations, marketing, and financial arenas of its Connecticut-based acquisition.

▲ ***Garlands*** Javelin Software, for seeing the distribution light before *Javelin*, its worthy product, reached the end of the tunnel. Javelin initially shunned advertising and the usual distribution channels, relying on word of mouth and sometimes ecstatic press. The $695 data analysis tool is now distributed through Softsel's 2000-dealer network and can be seen at IBM's 88 Product Centers nationwide.

▼ ***Glitches*** To International Resource Development (IRD), the Connecticut market research firm, for trumpeting a recent study with the headline "Terrorism, AIDS Bring New Urgency to Secure Access Control." The IRD report outlines supposedly growing support in industry for "biometric" identification systems, with this explanation: "Much of the market growth [in biometric systems] will come from 'paranoia' about contact with the increasing numbers of AIDS-infected people. The AIDS epidemic is . . . also leading to reluctance by end users to touch lock mechanisms, fingerprint-scanning pads, etc." Even if IRD is merely the messenger in this case, a bit more responsibility in the delivery would be appreciated.

▲ ***Garlands*** IBM, for its generosity in awarding a $1 million grant to the Smithsonian Institution's proposed exhibit hall, "The Information Revolution" (see *PC World View, PCW,* March 1986). Big Blue's long green goes a long way toward the Smithsonian's $4.3 million fund-raising goal.

▼ ***Glitches*** Kaypro Corporation, the first manufacturer out with an AT compatible—and the first to withdraw one from the marketplace. In halting production of the Model B, one of three members of its 286i family, Kaypro neglected to mention what the machine was or why it no longer exists. Perhaps that says it all.

▲ ***Garlands*** The 35-member data processing staff of the Philippine Commission on Elections, which took a hike during the presidential vote count last winter, claiming the PC-based "quick count" system was rigged. The team, professional technologists all, sensed that the 120 PC and XT compatibles enlisted for the quick count were not above reproach.

Would You Buy a New Car . . . ? *(continued)*

out standard equipment, build on options from any of eight categories (power train, radio, air conditioning, and so on), and quiver as the price takes off in response to your fantasies. Prefer two-tone paint and radials? No problem; make a change or two, print it out, and you've got your sticker. (Never mind that they've forgotten dealer markup.)

Just as in life, your next stop is the finance manager's lair. Key in the price, the trade-in value of your '52 Rambler, the down payment, and the interest rate; *Chevy Tech* kicks in monthly payments, total outlay, and total interest. Payments too hefty? Maybe you'd better skip the radials and work out another financing scenario.

Chevy claims the program is purely tongue in cheek, a point driven home by Depreciation Derby, a *Pong*-like game on the *Chevy Tech* disk. The idea is to get one of your 12 clunkers—all sans brakes or steering—into your Chevrolet dealer's showroom ASAP, the better to obtain a respectable trade-in allowance.

On second thought, it doesn't sound like a game at all.

The Morrow of the Tale

David Bishop

Ever lend someone your favorite tennis racket only to have them turn around and trounce you? Or worse, force you out of a tournament entirely? Well, you can empathize with Morrow Designs, which recently filed for bankruptcy under Chapter 11 after it was aced in its bid for a fat Internal Revenue Service contract.

When the IRS gave Zenith Electronics its coveted $27 million order for 15,000 to 18,000 laptop machines, other bidders, like IBM, AT&T, and Data General, lost fair and square. But Morrow, a San Leandro, California, concern, had the galling experience of being beaten by its own computer. Problem was, it was wearing a Zenith logo.

Morrow developed a version of its PC-compatible Pivot in a joint venture with Zenith, but cash flow and technical problems broke up the relationship (see *PC World View, PCW,* January 1986). Morrow eventually sold manufacturing rights to Zenith for $1.2 million, then teamed with Sperry to enter the Pivot in the rich IRS sweepstakes. "The IRS decision confirms the quality of our machine," says Howard Fullmer, head of the Pivot design team.

It doesn't, however, mean royalties. The award won't earn Morrow a nickel, and that rankles.

This spring, a week after Zenith got the IRS nod, Morrow announced it was filing for reorganization under Chapter 11. When Sperry lost the bid, Morrow lost big: Its creditors, awaiting a verdict from the IRS, needed to wait no longer. "It hurt us that the IRS took so long making its decision," says Robert P. Shepard, Morrow's chief operating officer. Perhaps the company saw it coming. Just prior to the filing, president Barry Berghorn quit, prices were trimmed by nearly 25 percent, and—displaying a stiff upper lip—Morrow unveiled a hard disk version of the Pivot.

At Zenith, the scene could hardly have been more of a contrast. Sales manager Pat Gallagher exuberantly attributed Zenith's winning bid to "price, technical competence, and vendor support." IRS representatives weren't on hand at the contract announcement, but copies of IRS Form 1040 were as abundant as confetti on New Year's Eve.

Zenith dressed up the Z-171 for its IRS assignment, packing calculator, communications, and calendar programs in ROM.

Meanwhile, the hope at Morrow Designs is that its machine, whatever the logo, will stimulate demand for laptops—as Zenith has intimated—and resuscitate the company. Sadly, should the IRS ever do a field audit on George Morrow, he'll have the painful satisfaction of being hoist on his own petard. *—William Rodarmor and Bill O'Brien*

Nancy Glendanel

Quarterdeck chief executive Therese Myers is basking in standards set by IBM.

The Quarterback at Quarterdeck

Waiting for your favorite application to show up under Microsoft Windows? One small but committed software firm has another idea.

After years in vapor, *Microsoft Windows* is no longer an apparition. Even so, the contest among so-called environment managers is not entirely history. IBM's *TopView* is said to be lurking about, and Quarterdeck Office Systems' *Desqview* remains a dark horse vying for vendor and customer attention. Of the three, *Desqview* lays strongest claim to providing a quasi-multitasking solution *now*.

For Quarterdeck president Therese Myers, striving to articulate product plans above the din of the marketplace remains the job at hand. Quarterdeck's bundling arrangement with AST (see "AST's Multifunction Success Story" in this issue) has added volume to its pitch, but the firm is still very much an upstart.

Quarterdeck is one of several small Santa Monica-based vendors—like Locus Computing and its subsidiary, Uniform Software—active around the periphery of DOS. *PC World View* recently caught up with Myers long enough to get her perspective on tackling the heavyweights. An edited transcript follows.

PCW: How much room does the marketplace have for similar products in this genre? Can Windows, TopView, *and* Desqview *all prevail?*

Myers: Why not? There are hundreds of word processing and data management packages. There *will* be an environment product of preference, which I think will be the best performer.

PCW: The difficulty with all three, of course, is how much work you have to do to convert existing applications to these environments.

Myers: What a product requires reflects a philosophical difference, and that has to do with clout. We can't require software developers to rewrite their packages to run with *Desqview*. IBM calls programs that can't run under *TopView* "misbehaved." We don't have the confidence to use that term. If software doesn't run, we usually think there's something wrong with us.

Each product can perform better if it behaves in terms of DOS, or—in our case—better still if it becomes "*TopView* aware." Or you can write *TopView*-specific pro-

grams. But how well a program works with *TopView* depends completely on the developer. Lately, vendors have been sending us software packages, unsolicited, with notes saying things like, "Would you please make sure that it runs with *Desqview*?" But the onus is still on us.

PCW: How do you assess the market acceptance of TopView?

Myers: First, IBM has a commitment to *TopView*. We see it in the corporate marketplace; departments within Fortune 1000 companies are writing *TopView*-specific programs. On the retail side, *TopView* doesn't exist—you don't see it. But we still feel *TopView* will be the standard because of that corporate support. On top of that, the idea of multitasking has finally caught on. Thanks to a great selling job by IBM, people understand they have a need for it.

PCW: How similar are TopView *and* Desqview?

Myers: Very similar. From the outset, we worked to make *Desqview* compatible with *TopView*. Our philosophy is to run industry-standard programs without modification. We use a technique called *shadow* that we're seeking to patent; it enables us to run in a window those applications—like *1-2-3*—that write directly to the screen. But the most important part isn't running in a window; it's the ability to run applications in the background.

In the beginning, we perceived the need for virtual memory. We were amazed that IBM didn't have it initially. We also saw a need for expanded memory. The AST [expanded memory] spec, which *Desqview* supports, enables you to have multitasking capability without modifying your programs.

PCW: How important is graphics support? Right now, TopView *and* Desqview *are character based, although IBM's William Lowe has endorsed a graphics-based product.*

Myers: Being character based is only temporary. IBM believes in a smooth transition—they don't put out products and then render all the software obsolete. Step one was that *TopView* had to run on the monochrome display and be character based. We can't wait for IBM to announce a graphics *TopView*.

VisiCorp with *Visi On* and Microsoft with *Windows* shared the same philosophy. Both like graphics and said simply, "Everybody will have to rewrite the software, and we'll control the software resources." *Windows* is in fact a way of directing software resources. But our bet was—and still is—that you should follow IBM.

Better Fed Than in the Red

Every 18 seconds of every working day during fiscal 1985, the executive branch of the federal government awarded a contract for goods and services worth an average of $440,000. This, according to Grafton Biglow, senior program analyst at the Federal Procurement Data Center (FPDC), is the reason computer manufacturers desiring to beef up sagging sales would do well to court Uncle Sam.

Before marketing reps rush off to the phones, however, Biglow cautions them to remember that a federal agency just can't buy PCs at a moment's notice; the feds need authorization from a government purchasing office. The catch is that thousands of purchasing offices exist and each is specialized.

That's where the FPDC comes in. As part of the General Services Administration, the data center will, on request, identify the contracting office that procures PCs for a given department or agency. "Otherwise," says Biglow, "you might find 20 purchasing offices, but you'll miss 40 more."

The FPDC issues a free quarterly report with basic information about government purchases. More detailed information is available for a price—usually $250 to $350. Special reports can be tailor-made according to any combination of 25 data elements. If you sell modems, for example, the

(continues)

In the Vanguard

Once upon a time, PCs were supposed to empower individuals, grass-roots groups, and the corner baker with all the clout inherent in data processing. Don't look now, but the trickle-down of personal computing just might be happening after all.

At the Vanguard Public Foundation, a San Francisco Bay Area clearinghouse that relies on a staff of six to distribute roughly $600,000 in annual grants to community organizations, an AT is more than a mainstay; it has, in the words of program officer Paul Haible, "categorically changed the way we're able to raise money."

According to Haible, that lone AT has enabled Vanguard to more than triple its mailing list and enter "a different marketplace" for the funds it collects and disburses to its constituency—an amalgam of neighborhood, disarmament, health, human rights, and media groups. Fewer than 10 percent of those cash-starved recipients are themselves automated, giving Vanguard's system additional import.

Everything is fair game for the foundation's machine: fund-raising, list management, word processing, basic accounting. Haible and staff turn to *Volkswriter Deluxe*, *dBASE III*, *1-2-3*, *DonorBank* (a commercially available *dBASE III* application), and an in-house grant management program.

Next stop, more hardware. Haible is intent on acquiring machines dedicated to word processing and to Vanguard's nascent community loan fund. Although he acknowledges that PCs initially left him nonplussed, Haible is now hooked. "Creating a system, a donor base, in a scientific fashion—and enjoying the process—actually shocked me," he says.

Better Fed Than in the Red
(continued)

FPDC can create a report identifying the government agencies that buy modems, their addresses and phone numbers, key contracts, and the number of modems purchased—even the value of contracts awarded to a specific firm.

While the FPDC monitors everything from mops to mainframes, more specific information about PC products and services is available from its sister agency, the Federal Equipment Data Center (FEDC). "The FPDC," Biglow explains, "tells you who's buying PCs from whom. The FEDC tells you where the PCs go after they're bought and who's using them."

Gramm-Rudman-Hollings notwithstanding, nothing is likely to stay the federal purchasing agents from their appointed rounds. If you need to reach FEDC, call 202/566-1284; FPDC can be reached at 703/235-1326.
—*Wes Nihei*

Wes Nihei is PC World*'s Editorial Assistant; Susan Gubernat is Editor of* Publish!*; Bill O'Brien writes on technology from New York City; and William Rodarmor is a freelance writer based in Oakland, California.*

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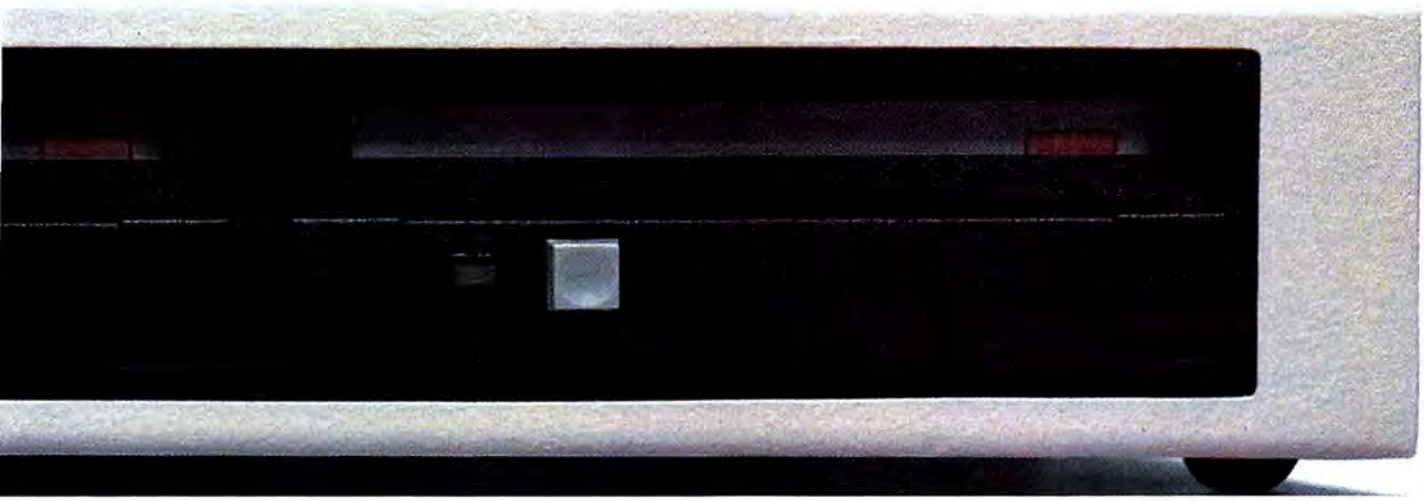

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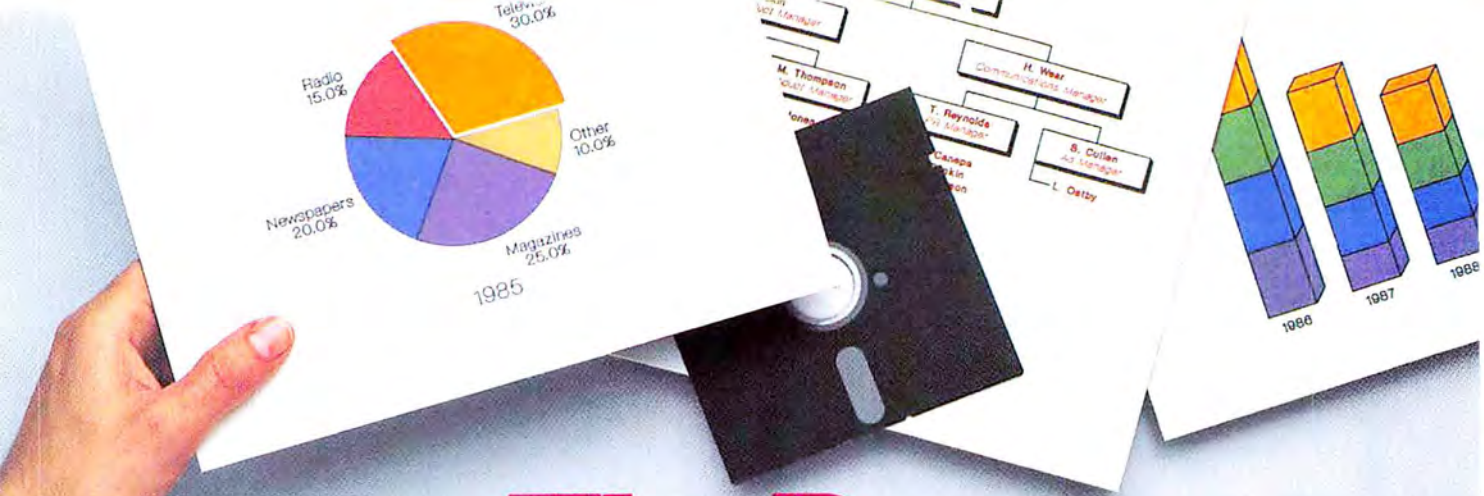

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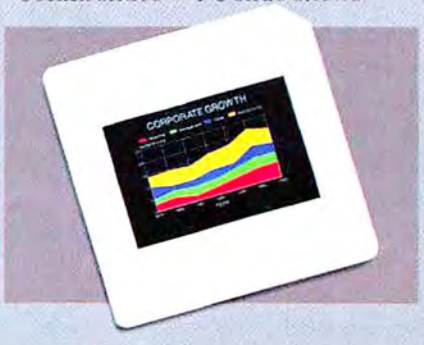

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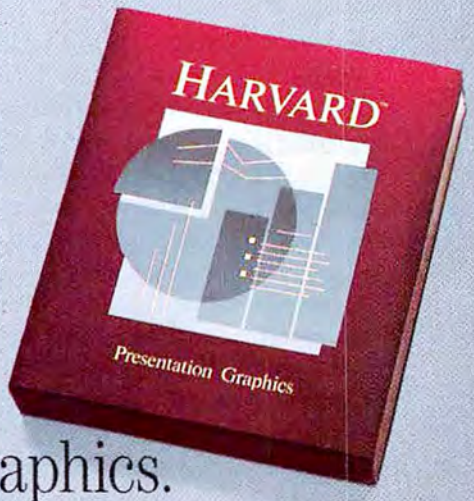

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From the Software Shelf

PC World offers first impressions of recent software releases

Masterful 1-2-3 reports, a Grand Master on disk, a mind-reading word processor, and the end of the DOS blues

Edited by Robert Luhn

1-2-3 Report Writer

It's hard to review an almost faultless program because you end up sounding like a manufacturer's shill rather than the hard-hitting post-Watergate investigative journalist you thought you were. But in the case of Lotus Development's *1-2-3 Report Writer,* I'll gush: This is a full-featured, easily learned report generator that casual and experienced *1-2-3* and *Symphony* users will find indispensable for sculpting mailing labels and professional-looking reports. Until *Report Writer* came along, generating anything more complex than a simple tabular report required a mastery of macros and an acceptance of Spartan aesthetics.

Not so with *Report Writer.* The program follows *1-2-3*'s familiar command structure to a T and provides documentation and context-sensitive help screens as thorough as its progenitor's. *Report Writer* gives you complete control over typefaces, headers, footers, margins, and nearly every other important presentational aspect of a report. As a bonus, you gain powerful sort, query, and tabulation features unavailable in *1-2-3* or *Symphony.*

If this sounds too exultant, let me air a major criticism—*Report Writer* is not integrated into the *1-2-3* environment. You cannot simply call up *Report Writer* from *1-2-3*'s command line, manipulate a worksheet, and unfold a gorgeous report on screen. Instead, you must exit *1-2-3,* load *Report Writer,* and create the report format based on the structure the program lifts from the worksheet at hand. For example, *Report Writer* represents employee names and salaries in a worksheet not with actual data but with a string of rectangular boxes and number signs (#). In effect, you create a template that *Report Writer* lays over a worksheet at print time—a process that is some-

(continues)

Fred Simson

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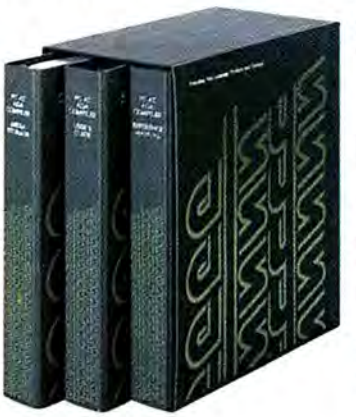

Lastly, this compiler comes with a 4-megabyte memory upgrade board. That, by itself, is worth the price of admission.

At this point, we suspect you might be tempted to pull out a credit card and give us a call.

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```
Field: Department                    Line:  7 Col:  6                    READY
Type / for 1-2-3 Report Writer commands.  Press F1 for help.

                         Department Summary
                       Average Company Salary
Department      Name                 Date of Hire   Salary  Dept. Code
'■■■■■■■■■■■■■ '■■■■■■■■,■■■■■■■■■  DD-MMM-YY  ($###,###)  #########
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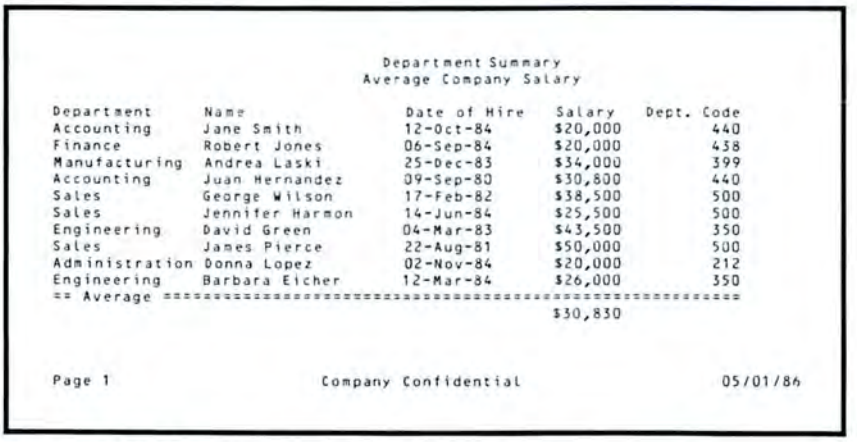
Screen 1: Mocking up a report format with 1-2-3 Report Writer. Alphabetic characters are represented by small squares, numbers by number signs. At print time, this template is laid over a worksheet with the result shown in Figure 1.



```
                         Department Summary
                       Average Company Salary

Department      Name                 Date of Hire   Salary   Dept. Code
Accounting      Jane Smith           12-Oct-84      $20,000         440
Finance         Robert Jones         06-Sep-84      $20,000         438
Manufacturing   Andrea Laski         25-Dec-83      $34,000         399
Accounting      Juan Hernandez       09-Sep-80      $30,800         440
Sales           George Wilson        17-Feb-82      $38,500         500
Sales           Jennifer Harmon      14-Jun-84      $25,500         500
Engineering     David Green          04-Mar-83      $43,500         350
Sales           James Pierce         22-Aug-81      $50,000         500
Administration  Donna Lopez          02-Nov-84      $20,000         212
Engineering     Barbara Eicher       12-Mar-84      $26,000         350
== Average ==========================================================
                                                   $30,830


Page 1                    Company Confidential                  05/01/86
```

Figure 1: Final output from 1-2-3 Report Writer

times like dancing in the dark (see Screen 1). You may think you're designing the perfect report, but you can't be absolutely sure until you see the finished product incorporating actual worksheet data (see Figure 1). Fortunately, *Report Writer* allows you to preview the report on screen—with data—at any juncture by selecting Print Destination Display Go.

Once you are familiar with this less-than-intuitive method of generating reports, *Report Writer*'s flexibility will delight you. A template's elements—labels, rows, columns, and so on—can easily be moved, copied, transposed, edited, and otherwise cajoled on screen to create the perfect report. *Report Writer* automatically stores a worksheet's report formats in a library file tagged with the worksheet's file name and the .RPT extension. The program never alters the original worksheet data; better still, once you save a report format, you can use it with other similarly structured worksheets.

When *Report Writer* is loaded, choose a file as you would with *1-2-3*, select Create from the command line, and *Report Writer* will display the worksheet's field structure. For the process to succeed,

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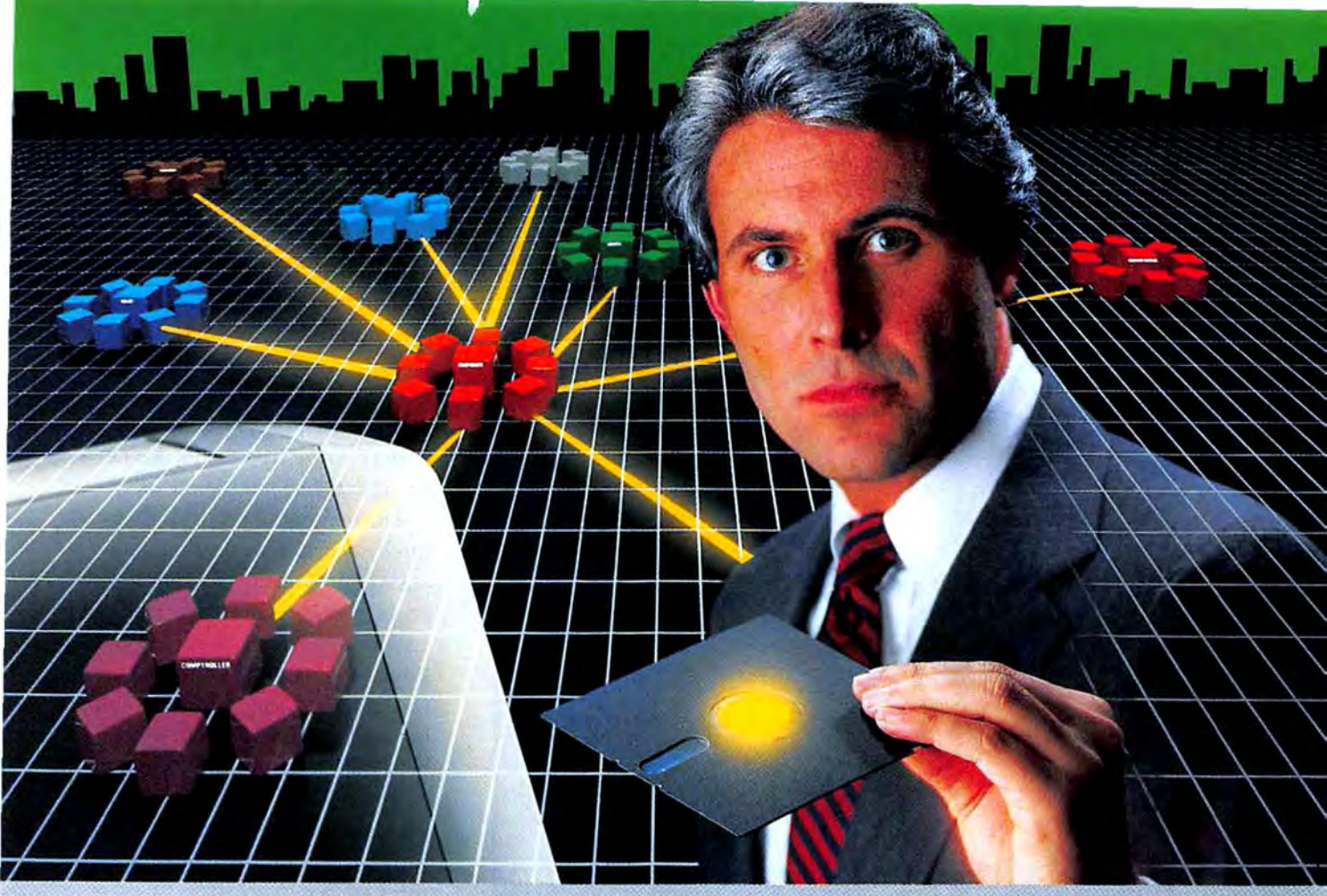

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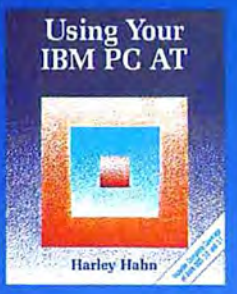

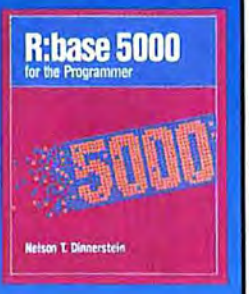

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the first row in the worksheet must contain field names. A single report can comprise up to 100 fields (columns) and any number of records (rows). If you previously created report formats, select Retrieve, and *Report Writer* lists the formats in a *Symphony*-like pop-up menu.

Any number of report formats can be tied to a worksheet, allowing you to generate different reports from the same data. Since an existing layout can be applied to similarly structured worksheets, you can also create consistent-looking reports from different sets of related data—a useful feature, for example, if you generate monthly financial statements. *Report Writer* warns you if a format and a worksheet are not matched.

Once a report layout is loaded, you can add descriptive headers and footers of up to five lines and left-justify, right-justify, and center text. *Report Writer* automatically places a blank line between field names, headers, and footers and generates page numbers and dates. You can set numeric fields for currency, percentage, and seven decimal formats. Printer settings, start-up directories, page margins, date and currency formats, and other values can be set once and forgotten.

Several key *Report Writer* commands—Totals, Sort, and Query—not only boost reporting power but extend the capabilities of *1-2-3*. The Totals command calculates sums, averages, and minimum and maximum values for numeric fields and counts the number of entries in a column. Subtotals (sometimes called break points or control

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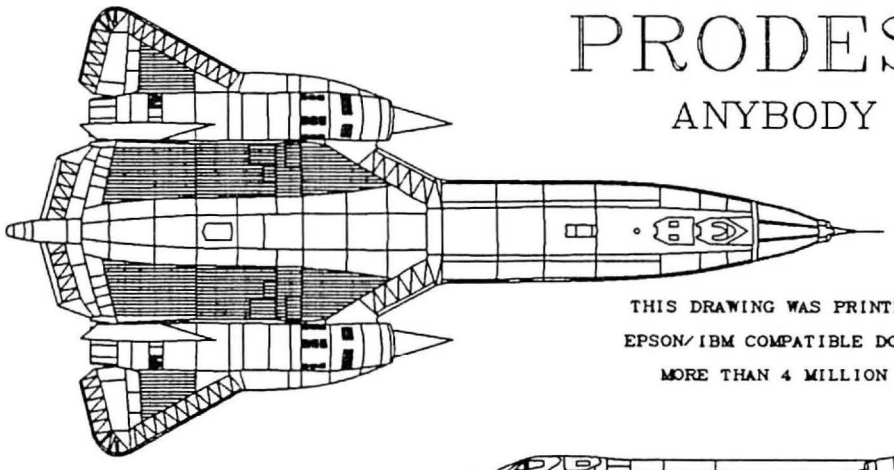

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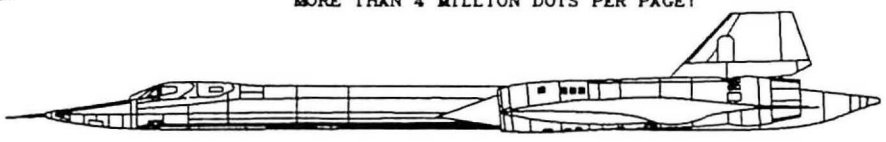

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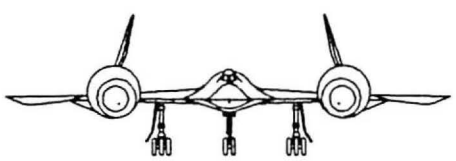

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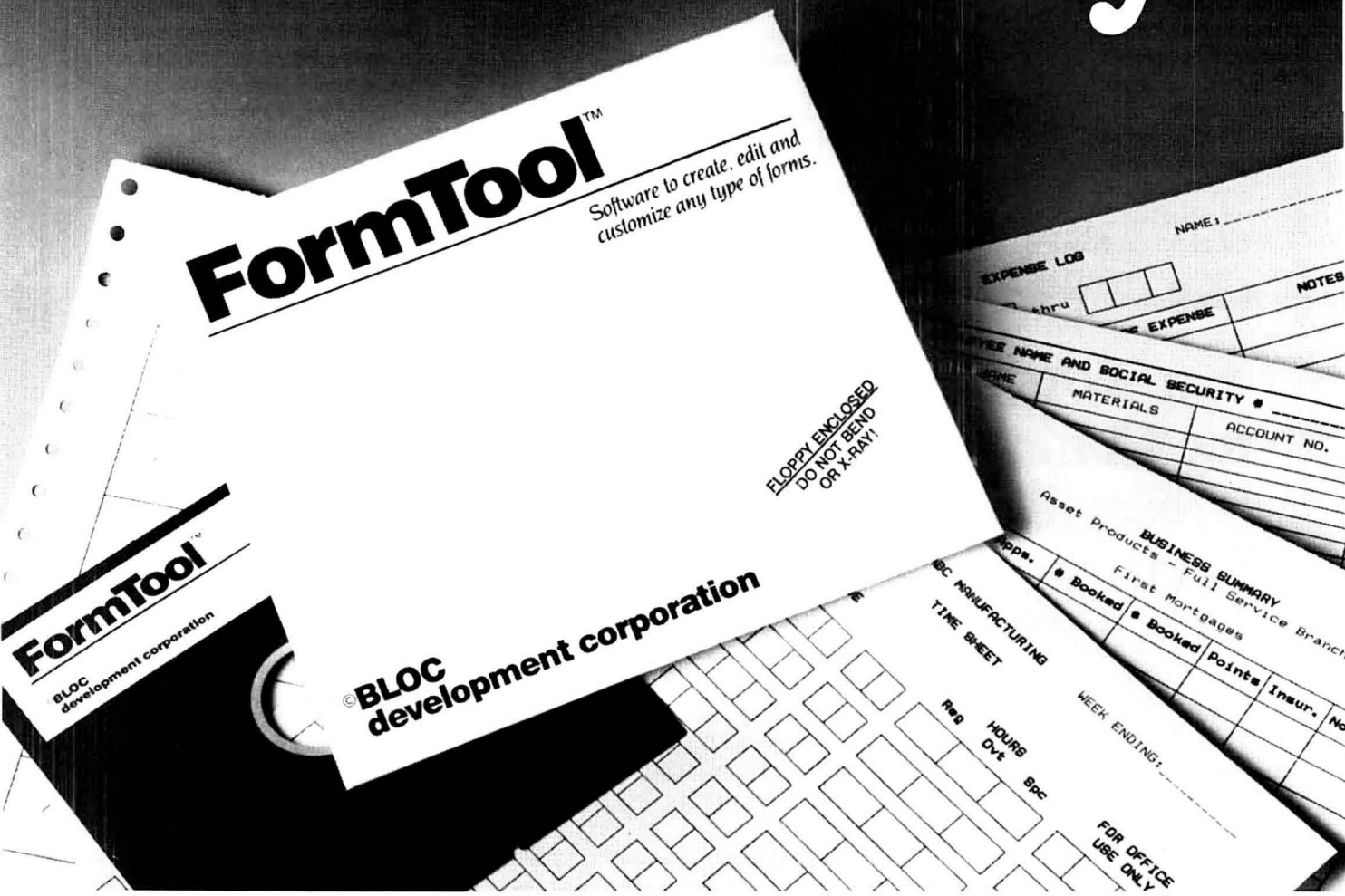

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development corporation
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Circle 50 on reader service card

breaks) can be calculated and printed out at a single point in a report by merely marking the desired field. When the value of that field changes—for example, from CA to NY—a subtotal is generated. Thus, you could produce a report that subtotals division profits by state and sums all profits at the end of the report.

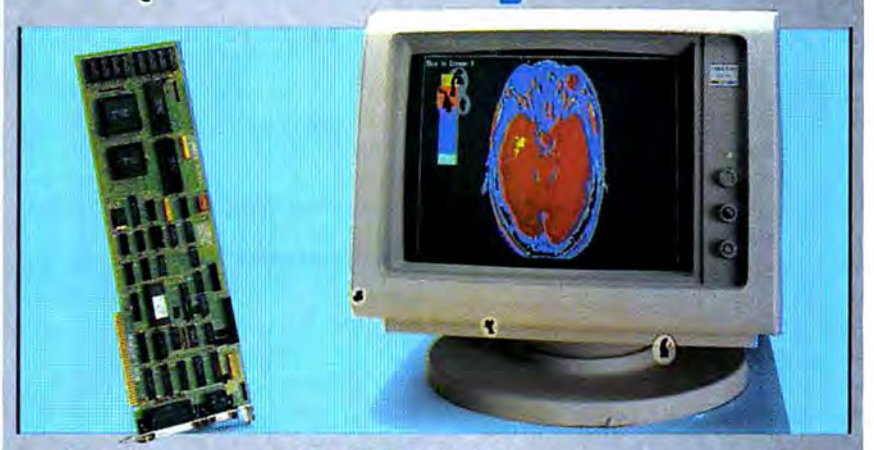
Report Writer's Sort command works much like *1-2-3*'s but allows you to use as many as four key fields. Keep in mind that like *1-2-3* releases 1 and 1A, *Report Writer* sorts by ASCII character codes, ordering uppercase characters before lowercase ones. As a result, an ascending sort would find 'Vanderbilt, Amy' and 'von Bulow, Claus' separated, as ever, by a wide gulf. (Note that *1-2-3* release 2 ignores case when sorting.)

With the Query command, *Report Writer* can pick out only those fields that meet certain criteria, in effect distilling data into more focused and refined reports. Selecting Query elicits the prompt 'Select all records where'. Supply a field name, one of ten comparison statements (such as 'greater than or equal to'), and a second field name or a value. Using connectors such as AND or OR, you can string together any number of conditions.

In the old days, minting mailing labels from a *1-2-3* worksheet usually produced more headaches than labels. Like so many *1-2-3* devotees, I eventually swallowed my pride and transferred my files to *dBASE II*. Now you can put Ashton-Tate's workhorse out to pasture: *Report Writer* finally makes the process

(continues)

The Only EGA



A fully compatible 256k EGA card with a parallel port for only $259. If you buy any display card: Color, Monochrome, Hercules, or EGA, without reading this ad, you're probably throwing away a lot of money.

BT/EGA Enhanced Graphics Adapter: 256k of memory, and parallel printer port. Works with all standard IBM displays, and compatible displays.
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This really is the only display board you may ever need. Regardless of what monitor you buy today, this card is a clear upgrade path for the future, and the best choice today, even if you are only going to use a Monochrome Display. This means one board today does monochrome 640x350 bit mapped graphics and text, and provides a clear upgrade path to 640x350 Enhanced Color Display with no change of display board. It also runs with the 640x200, 320x200 Color Display.

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All boards come with a full 256k of memory, and a parallel printer port. That means no extras for later, and 16 simultaneous colors displayed from a palette of 64 colors, and crisp clear text on both Monochrome and Enhanced Color Displays - features or options that are not available on other EGA boards. Since all your current software will run, you're set for today, and prepared for the standard of the future.

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Of course many of you will want to take advantage of the EGA card right away, so we are offering a special deal when you buy the board together with a Basic Time HR 31-350 monitor - you get both for just $749, or the card only for $259. This means that you can equip all your PC's now and in the future with displays and EGA cards and get the Qubie' "No Risk Guarantee", our one year warranty, and 48 hour turnaround on warranty repairs. The price is the whole price, there are no extras for freight, insurance, or credit cards.

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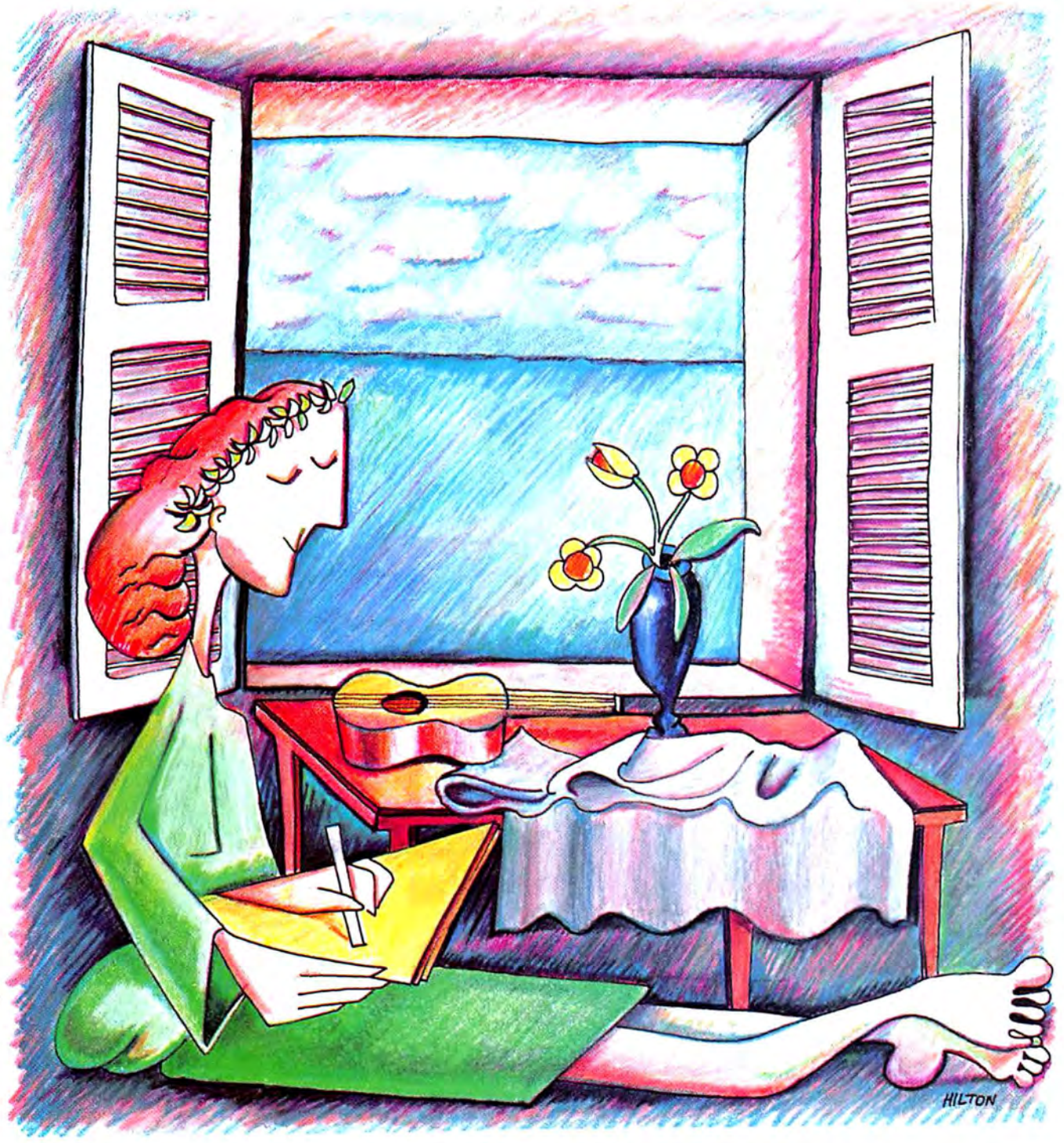

HOW TO GET A BETTER VIEW FROM A WINDOW

The new Palantir Filer with its runtime version of Microsoft Windows is more than just a filing program. It's a powerful data management system that lets you design your own filing systems, build custom databases and write fully integrated reports.

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simple. A single command stacks field names into a column; individual fields that normally appear side by side on a label, such as State and Zip Code, are easily shunted into position with the cursor keys. It's surprising that *Report Writer* doesn't provide a prefab format for this common application—but of course, you can easily create one.

Like *1-2-3* release 2, *Report Writer* is copy protected, which adds bumps to otherwise smooth operations. On a dual-floppy PC, you must load DOS, remove the DOS disk, and insert the *Report Writer* disk. The program's intricate copy-protection scheme spares hard disk users from needing a key disk, but it restricts the program to a single hard disk at a time. Note, too, that before you back up the entire hard disk, you must first remember to uninstall *Report Writer* back to the master floppy disk.

Report Writer finishes a job Lotus should have undertaken years ago. It simplifies sophisticated report generation, expands *1-2-3*'s limited data management powers, and eliminates macro gymnastics. If you use *1-2-3* or *Symphony, Report Writer* should be your next purchase. *—Reed McManus*

1-2-3 Report Writer
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
617/577-8500
List price: $150
Requirements: 256K, two disk drives, DOS 2.00 or later

(continues)

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PC 20: Standard, internal mounted 1/2 height unit for use in floppy disk area of a PC, PC XT or compatible
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The Choice

We offer both types, an internal mounted like your floppy, or a card mount for the same $499 price. Let's face it, the bracket doesn't cost us 450 bucks. While some people prefer the standard mounting, (like a floppy) so they can see the read/write light, others want a card mount so they can use both floppies they now have. Both drives boot directly from the hard disk, and require no software patches. They run all the popular software, and are low power. Our format software allows changeable interleaving that gives you noticeable speed improvement over the standard XT drive. Both have the ability to run a second drive from the controller, (Part Number 2nd-20HP $399), giving you 40 megabytes of storage for under $900.

The Goodies

We give you some software that really enhances the use of a hard disk. 1dir is the hard disk organizer that really makes DOS a snap, and our special Qubie' version of **ZyIndex**, the super searcher is also included. Easy to read manuals make installation a snap. Of course the drives are backed by our "No Risk Guarantee", our one year warranty, and 48 hour turnaround on warranty repairs. The price is the whole price; there are no extras for freight, insurance, or credit cards. Order part numbers PC20 for IBM PC and compatibles. PC20-1000 for Tandy 1000, or HardPack 20. By popular demand we still offer the matching ashtray for just $450, (Part No. PCKIDDING).

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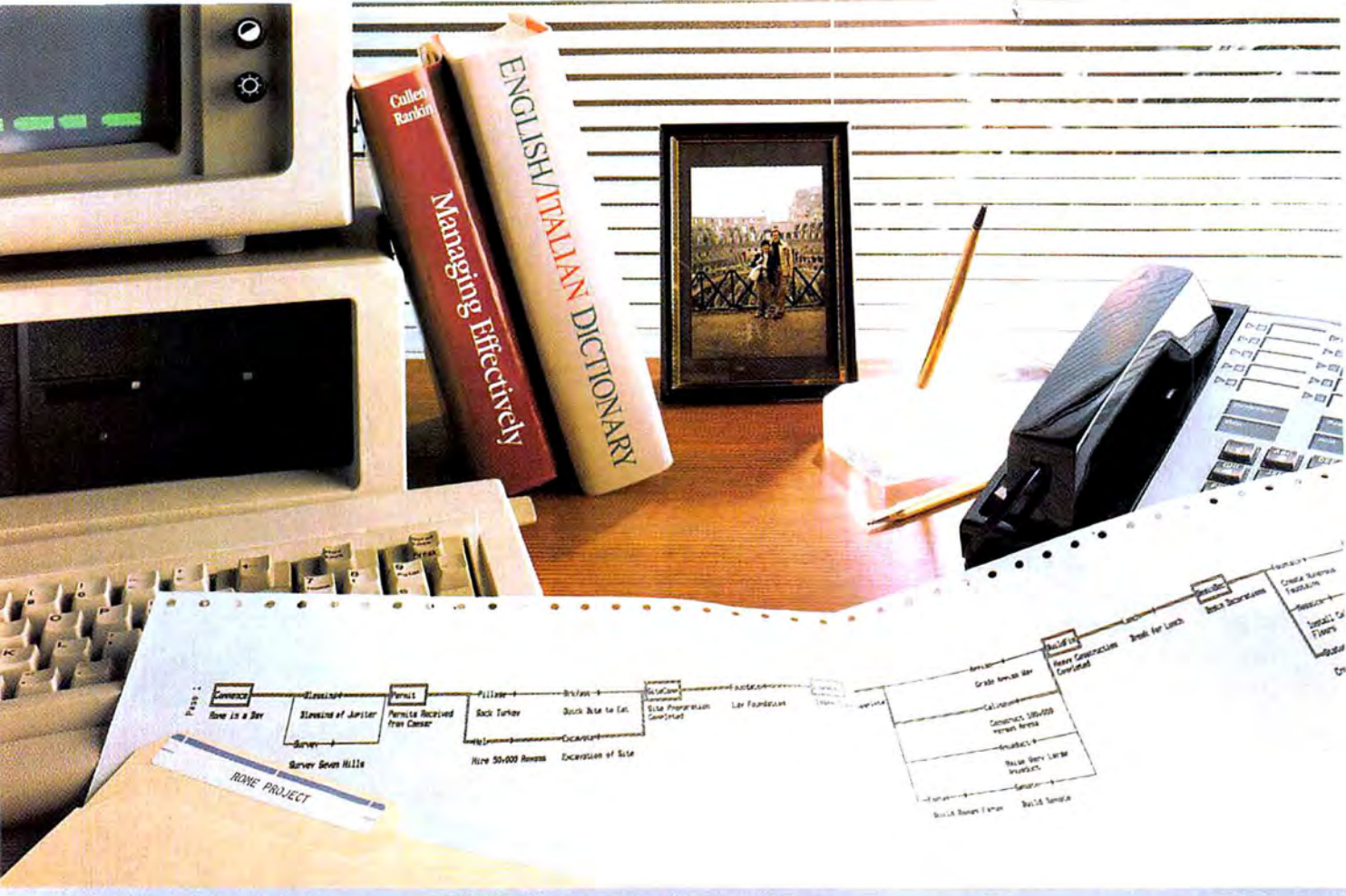

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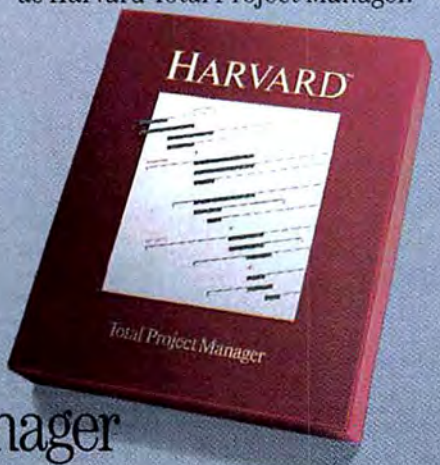

Graduate to Harvard Total Project Manager

Runs on IBM PC, Compaq, Leading Edge, AT&T and other compatible MS DOS computers. A product of Software Publishing Corporation.

version; compatible with worksheet files from 1-2-3 releases 1A and 2 and Symphony releases 1.0 and 1.1
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Paul Whitehead Teaches Chess

Martin Marshall first met Paul Whitehead in a laundromat in 1978. A programmer and chess enthusiast, Marshall was killing time with a chess set and a strategy book, hoping to improve his game. Whitehead, then 17 and fresh from capturing the U.S. Junior Chess Championship, asked Marshall if he'd like to play a game. Before the spin cycle was over, Marshall had lost the game but formed a relationship that eventually spawned *Paul Whitehead Teaches Chess.*

Whitehead is still one of the country's top-ranked players, and Marshall has transformed the champion's skill and wisdom into an engaging chess tutor. Using a storehouse of 517 animated chess problems, *Paul Whitehead Teaches Chess* shows beginners the ropes and exposes intermediate players to time-honored strategies and tactics. To test newfound proficiency, the package includes a formidable chess program whimsically dubbed *Coffeehouse Chess Monster,* an adaptation of Cypress Software's *Spoc.*

But it's the thorough and thoughtful tutorial that distinguishes *Paul Whitehead.* Loosely

(continues)

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Real Harmony

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Inside

Our internal modem card is designed specifically for the IBM PC and PC/XT, and most compatibles. Users who have PC-compatible units should call to see if our modem card will work with your machine. The board occupies one full length slot. The internal speaker lets you know about the call progress. A RS-232 serial port is standard, COM1 or COM2; you can use the port for other peripherals when the modem is not being used.

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Our external standalone modem can be used with any computer or terminal which utilizes an RS-232C serial port. The modem fits snugly under a standard telephone. You can visually check the modem's operational status by the eight indicator lamps and adjust the modem's speaker output with the volume control knob at the back of the unit. A snap off front panel allows quick setting of the switches for all types of communication packages.

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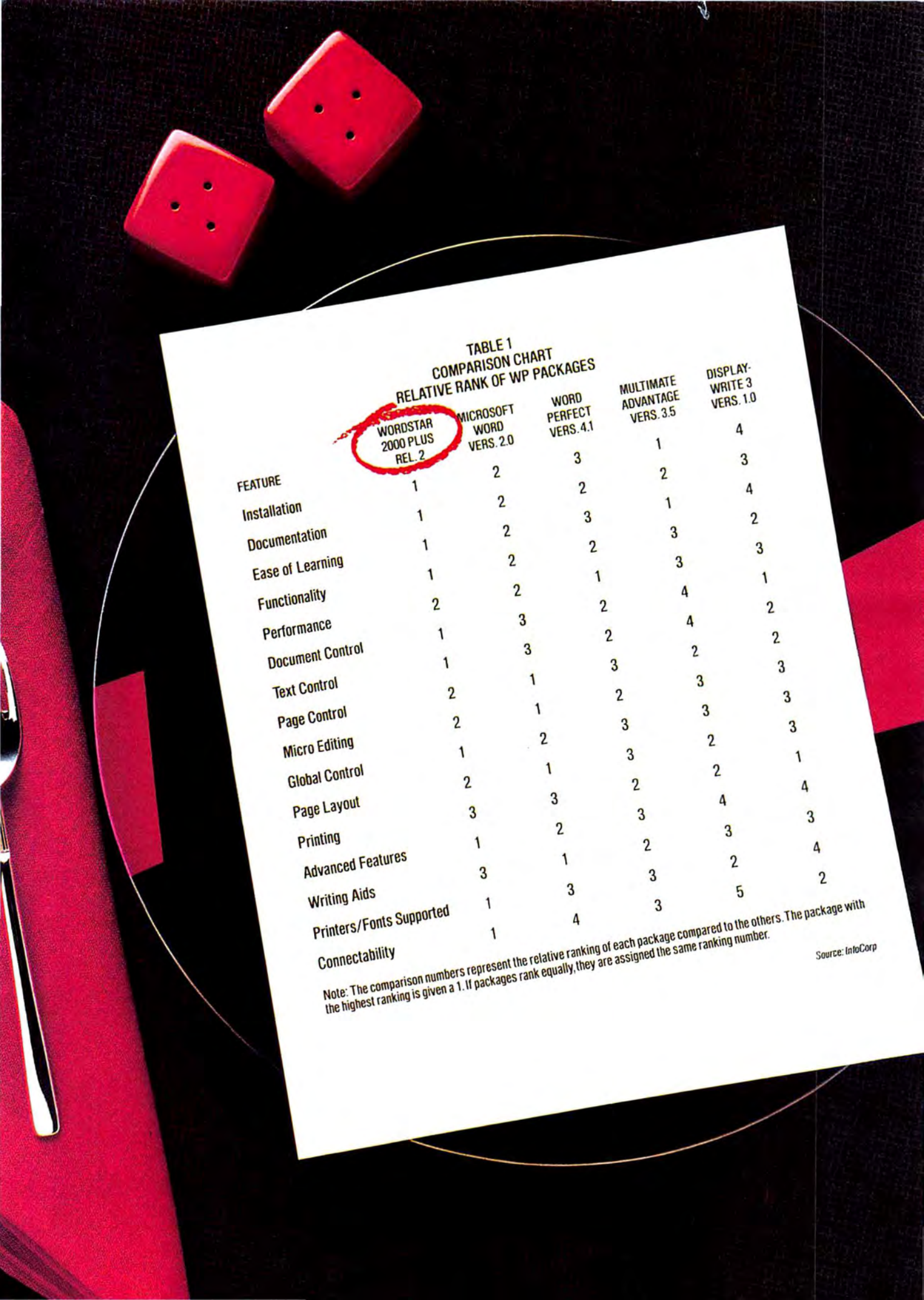

TABLE 1
COMPARISON CHART
RELATIVE RANK OF WP PACKAGES

FEATURE	WORDSTAR 2000 PLUS REL. 2	MICROSOFT WORD VERS. 2.0	WORD PERFECT VERS. 4.1	MULTIMATE ADVANTAGE VERS. 3.5	DISPLAY-WRITE 3 VERS. 1.0
Installation	1	2	3	1	4
Documentation	1	2	2	2	3
Ease of Learning	1	2	3	1	4
Functionality	1	2	2	3	2
Performance	2	2	1	3	3
Document Control	1	3	2	4	1
Text Control	1	3	2	4	2
Page Control	2	1	3	2	2
Micro Editing	2	1	2	3	3
Global Control	1	2	3	3	3
Page Layout	2	1	3	2	3
Printing	3	3	2	2	1
Advanced Features	1	2	3	4	4
Writing Aids	3	1	2	3	3
Printers/Fonts Supported	1	3	3	2	4
Connectability	1	4	3	5	2

Note: The comparison numbers represent the relative ranking of each package compared to the others. The package with the highest ranking is given a 1. If packages rank equally, they are assigned the same ranking number.

Source: *InfoCorp*

SINK YOUR TEETH INTO THIS.

Introducing WordStar® 2000 Plus Release 2, the new and improved software that topped InfoCorp's chart of word processing packages.

We could make all kinds of claims about our new WordStar 2000 Plus Release 2.

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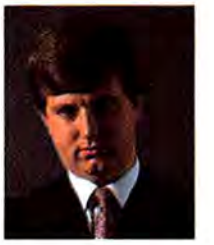
That would be easy to do.

But we decided to let the experts do the talking.

In a comparative report—the report containing the chart to the left—Robert Lefkowits of InfoCorp said:

"WS 2000+ emerges as a clear winner in overall applicability. InfoCorp believes WS 2000+ would appeal to the largest number and widest variety of users. Its layered functionality, ease of learning, and excellent communications features make it ideal for corporate users, ranging from secretaries to clerks to managers to executives."

And, after reviewing WordStar 2000 Plus Release 2 alongside MultiMate™ Advantage™ and IBM®'s DisplayWrite® 3, International Data Corporation's Jim Chapman concluded:



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PCW

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- Autodiscriminates all popular symbologies.
- Clearance, up to 6m/m.
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IBM PC/AT/XT keyboard reader Model BM-BAR

- Autodiscriminates all popular symbologies.
- With high clearance (up to 2m/m) scanner.
- Install inline with keyboard and main unit without affecting keyboard operation.

IBM-PC/XT/AT internaly mounted barcode reader Model BMBD – 51

- Autodiscriminates all popular symbologies.
- Decoded output to host is 8 bit ASCII

THERMAL PRINTER with reader Model BW-200T

- High density printing.
- Quiet operation.
- RS-232C and Centronics type interfaces to host computer.
- Internal reader permits barcode duplication without computer connection.

Other products:

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	BL-Series
Fixed Scanners	BX-Series
Barcode writers	BW-110T

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Circle 372 on reader service card

Screen 2: Chess master on a disk—Paul Whitehead's interactive tutor demonstrates time-honored strategies and tactics.

divided into rules, tactics, openings, and end games, the tutorial also covers the middle game and a rich array of ploys, from Grob's Attack to the Nimzo-Indian defense. An eight-page "road map" guides you through the tree-like data base, enabling you to track your progress and identify particularly interesting lessons. The only other documentation is a pamphlet summarizing the program's simple command set.

For beginning players, basic moves are graphically demonstrated. Complex simulations can involve dozens of moves, which you execute and retract with the <CursorRight> and <CursorLeft> keys respectively. The program suggests tantalizing alternative moves at critical junctures, and quizzes you after each lesson to see if salient points have been hammered home. Of equal value is the lively commentary on chess principles peppered throughout a lesson. Important moves summon comments, which range from pithy to full-screen diatribe (see Screen 2).

If you've used other chess programs, *Paul Whitehead*'s superior graphics will immediately engage you. Chess pieces slide gracefully across the board rather than disappearing from one square and abruptly resurfacing on another. When playing the *Coffeehouse Chess Monster*, you move by placing a black frame around the desired piece with the cursor keys, pressing <Enter>, moving the frame to the target square, and pressing <Enter> again. This

(continues)

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REPORT BUILDER CYCLE:

Key in the report parameters on screen

Print your listings
- New report format for reference
- Report element layout

Press a key, wait 6 secs*

Key in the report data elements on screen

Report Builder automatically writes the program code and links it to your datafile

Print your listing
- Report program source code listings

Compile the report builder code using the Turbo Pascal™ compiler

Attach the new report module to your system menu

SYSTEM BUILDER CYCLE:

Paint the menu screens

Paint the application screens

Press a key, wait 6 secs*

Define the datafile(s) on the screen

System Builder automatically writes the program code and combines the datafiles into a relational database

Print your listings
- Program source code listing
- Datafile layouts
- Self-documenting program (includes screen schematics)

Compile the System Builder code using Turbo Pascal™ compiler

Start using the completed system

*System Builder will generate 2,000 lines of program code in approximately 6 seconds.

REPORT BUILDER FEATURES:

- Automatically generates Indented, Structured Source Code ready for compiling Turbo Pascal (no programming needed)
- Automatically interfaces to a maximum of 16 Datafiles created with System Builder
- Supports Global Parameters such as Headings, Footers, Lines Per Page, Print Size and Ad Hoc Sorting
- Produces reports containing an unlimited number of Sub-Headings, Sub-Totals and Totals
- Page breaks on Sub-Totals
- Report Builder will generate Report Programs which can contain Report Elements not just restricted to Data Elements. Reports can also include Text Strings, Variables or Computed expressions containing references from up to 16 Datafiles
- Use range input screens produced by System Builder to allow End Users to select portions of a report as needed (i.e. specific account ranges can be requested)
- Produces standalone Report Modules
- Easy-to-use Interface Program to access dBase Files

SYSTEM BUILDER PERFORMANCE

(Typical 10 screen 8 file/index application)

TASK	SYSTEM BUILDER	DBASE III™
Planning and Design	60 minutes	60 minutes
Screen Painting	15 minutes	3 hours
Programming	2 minutes	10 hours
Elapsed time to completed system	**1 hour and 17 minutes**	**14 hours**

SYSTEM BUILDER FEATURES:

- Automatically generates Indented, Structured, Copy Book Source Code ready for compiling with Turbo Pascal (no programming needed)
- Paint Application and Menu screens using Keyboard or Microsoft Mouse™
- Finished Application screens all use System Builder's In-Line machine code for exceptional speed
- Use fully prompted Screen Guidance Templates™ to define up to 16 Datafiles per application, each record having an Unlimited Number of fields
- Define up to 16 Index Keys per application database
- Paint functions include:
  - —Center, copy, move, delete, insert or restore a line. Go straight from screen to screen with one keystroke
  - —Cut and paste blocks of text screen to screen
  - —Draw and erase boxes. Define colors and intensities
  - —Access special graphic characters and character fill
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- File Recovery Program Generator to make fixing of corrupted datafiles an automatic process
- Automatically modifies datafiles without loss of data when adding/deleting a field
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- Easy-to-use Interface to access ASCII and dBase Files

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Please rush me: ____ copies of SYSTEM BUILDER at $99.95 per copy; ____ copies of REPORT BUILDER at $75.00 per copy. I've enclosed $5.00 for postage and handling. California residents add 6% sales tax.

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30-Day Money-Back Guarantee
(less postage and handling). There is a $10 restocking fee if the disk envelope is opened. **Not copy protected.**

System Requirements—System Builder/Report Builder: IBM PC/XT/AT[1], or similar, with minimum 256K RAM, dual floppy drives, or hard disk, color or monochrome monitor, MS[2] or PC DOS[1] version 2.0 or later, Turbo Pascal Version 2.0 or later (Normal, BCD or 8087 versions).

[1]Trademarks of International Business Machines Corp.
[2]Trademark of Microsoft Corp.
™Turbo Pascal is a registered trademark of Borland International.
™dBASE is a registered trademark of Ashton-Tate.

Circle 451 on reader service card

scheme is far more natural than entering cell coordinates or standard chess notation.

At the beginner's level, the Monster has 1½ seconds to make a move; at the advanced level, the Monster can sip a cup of joe for 15 minutes before crushing you with its processing prowess. You can cheat, of course, by retracting your last move or forcing the Monster to make one immediately. At the end of a game, you can print out a record of play, though not in standard chess notation.

Some minor flaws bear mentioning. The program's few help screens are terse and fail to return you to your place in a game. Hard disk users must fiddle with a floppy key disk and take special care when installing the program, since lessons on both program disks are named RECS.

But these are niggling concerns. *Paul Whitehead Teaches Chess* deserves accolades for both concept and execution. If you're a raw beginner, or if musty, obscure chess books with microscopic illustrations have kept you from bettering your game, this penetrating tutorial may rekindle your interest. It's a pain lugging a portable to the laundromat, but otherwise, *Paul Whitehead Teaches Chess* makes improving your game a blast. *–Eric Knorr*

Paul Whitehead Teaches Chess
Enlightenment, Inc.
1240 Sanchez St.
San Francisco, CA 94114
415/641-9131

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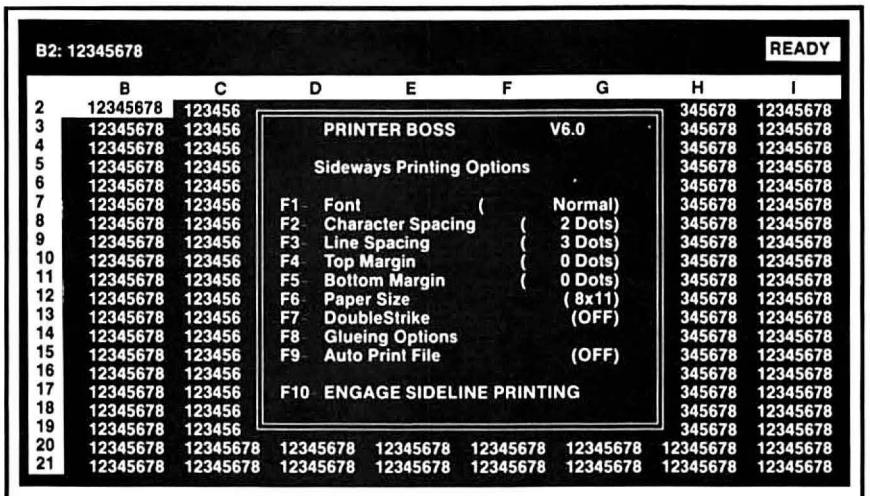

Print sideways from inside Lotus 1-2-3!

THAT'S RIGHT! WITHOUT LEAVING YOUR SPREADSHEET!

With your Lotus or any other spreadsheet on the screen, simply...

1 - Press both shift keys
2 - Press F10
3 - Press F9

...and print to the printer. And your spreadsheet prints out sideways! It's as simple as that!

Printer Boss V6.0

The all-new Printer Boss V6.0 pops up within your spreadsheet program to give you sideways printing of spreadsheets and many other features on-the-fly. No more hassle with creating print files and hopping in and out of Lotus to set parameters!

And, operated in regular mode, Printer Boss uses machine-level source code to give you superfast operation, command-line input option, double and quad density letter quality, download character sets, pathname support, RAM printer buffer, unlimited menu setting storage and recall, dazzling font design features including letter quality and sideways, typewriter output mode and much, much more. Now you can take full advantage of the capabilities you paid for in your dot-matrix printer, on one plain-English menu, at the touch of a few keys. And everything can be controlled from an AUTOEXEC.BAT file! No other program gives you all these features for $129.95.

And for those who want to print sideways but need to economize, there's a separate package, Sideline V6.0, which includes ONLY the sideways printing features of Printer Boss plus regular typewriter mode for $59.95. It's a heck of a deal.

Printer Boss and Sideline for the IBM-PC, PCjr, XT, AT, 3270 and all compatibles with 128K RAM and one double-sided drive using PC-DOS 2.0, 2.1, 3.0, 3.1 or equivalent. For the Epson and IBM dot-matrix printers and all compatibles. Printer Boss $129.95, unprotected. Sideline $59.95, unprotected. Demo disk $10.00 Visa, MC or send money order or check. Company purchase orders accepted. Shipping $4.00 per package, COD add $2.00. Outside USA $15.00. Dealers welcome. Free info.

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- A 20-digit alpha numeric account code allows unlimited number of Department Accounts and Sub-Accounts
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- Load and Go in 15 minutes

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PAYROLL MODULE
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On screen context sensitive help available at all times	YES	NO	YES
On screen editing for errors	YES	NO	YES
Multi-client/Multi-company capabilities	YES	NO	YES
Payroll available	YES (extra)	YES (extra)	YES
On disk tutorial	YES	NO	YES
Custom report writer	YES	LIMITED	YES
Upgrade path to multi-user LAN version of package	YES	NO	YES

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Maurice Silver, President
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System Requirements: IBM (PCjr, PC, XT or AT)[1] or other compatibles. 128K RAM, 80 or 132 column printer, 80×24, monitor, MS-DOS[2], PC DOS[1] 2.0 or later.

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ROYAL AMERICAN *Technologies Corporation*™

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HOW TO COPE WITH THE "STARES SYNDROME."

VGs™
American Optical Visiongard Glasses

RELIEF FOR "OFFICE EYESTRAIN"

Ask your co-workers who work at O.E. (office equipment) terminals how they feel after a stint of several hours and chances are you'll hear a common response: "My eyes bother me." Ask them to elaborate and they'll probably tell you their eyes feel tired, or that they hurt, or that they seem to burn or sting. In fact, some of your co-workers may complain of blurred vision, eyestrain—and more.

Although research has produced no evidence thus far indicating that prolonged glare is harmful to the eyes, office workers could be suffering from a complex of eye discomforts that may be linked to the office workstation and its environment. American Optical calls these eye discomforts "The Stares Syndrome"—a growing problem that can have serious impact on employee morale and productivity in the automated office of the 80s.

INTRODUCING VGs™: RELIEF FOR "STARES EYESTRAIN."

"VGs" is short for AO's new Visiongard—occupational eyewear designed specifically for people who suffer from ocular discomfort and changes in visual performance after prolonged exposure to extraneous light. In other words, eyestrain and visual fatigue. It is true that some office equipment operators who report such eye discomforts may also suffer from uncorrected refractive or eye muscle problems—problems which may contribute to their eye discomforts. But preliminary studies have shown that VGs do promote improved eye comfort among office equipment operators, including those who may require corrective eyewear.*

HOW VGs REDUCE GLARE AND REFLECTIONS IN THE OFFICE ENVIRONMENT.

Anyone who has ever tried to watch television in a well-lighted room is aware of the troublesome effects of glare and reflections. The troubles are compounded in the office environment—and even more so if the operator wears ordinary glasses.

Glare is simply the uncomfortable sensation produced by light sources which are brighter than the office equipment, and which are within the operator's field of view. These can include sunlight, incandescent or fluorescent lights, reflections from paper and tabletop surfaces, etc. Moreover, the lens surfaces of ordinary eyeglasses can reflect images of extraneous light sources (including portions of the wearer's face itself) into the pupils of the operator's eyes. This combination of glare and reflections can be sufficient to distract the operator and cause discomfort—or even loss in visual performance.

VGs have been designed to reduce the effects of reflections and glare in the office workstation area and to improve contrast as seen on VDT screens. This is achieved, in part, by a special combination of lens technologies. According to AO's research, these technologies reduce glare and reflections in the workstation area, and reduce lens reflectance by approximately 61 percent.

FEWER VISION PROBLEMS MEAN GREATER PRODUCTIVITY.

Probably the main reason why your company uses O.E. terminals in certain applications is to achieve the greatest possible productivity. It stands to reason, then, that the alleviation or elimination of any unpleasant distractions and discomforts associated with the use of office equipment is certain to have a positive effect on the morale of the people who operate them, and that improved operator morale is likely to result in improved productivity.

LOOK INTO AO's "OFFICE" VISION SECURITY PROGRAM.

Product is available through your eyecare professional or call your AO Representative at **1-800-982-2828.**

AO's concern for the people who suffer from the "Stares Syndrome" has resulted not only in the development of VGs, but in the development of a complete Office Vision Security Program of support, as well. Support for safety directors, medical directors, industrial hygienists—as well as eyecare professionals.

We can help you install sight-screening instruments for screening your employees' vision. And we can supply convenient prescription folders for your employees to take to their local eyecare professional, and guidelines for their eyecare professional to use in fitting them with VGs—whether prescription or plano.

Why not contact your AO Representative for more information about our Vision Security Program today? He or she will be glad to describe it in detail, and show you how easily a Program can be established in your company.

AO® Safety Products **1-800-982-2828**

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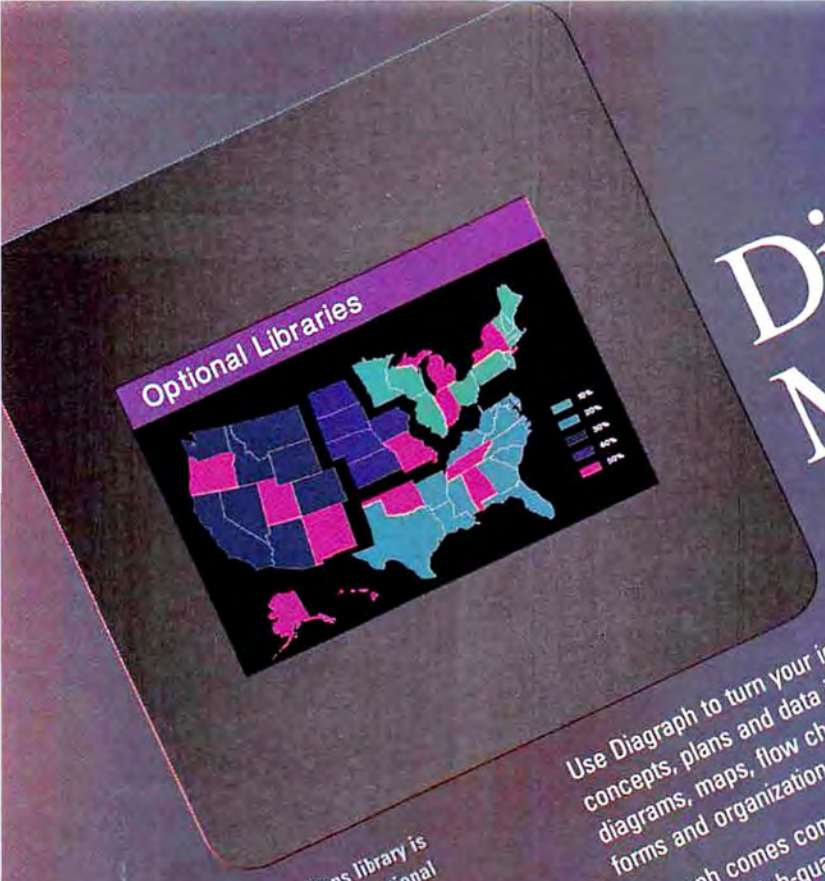
Diagraph™ Makes Slides.



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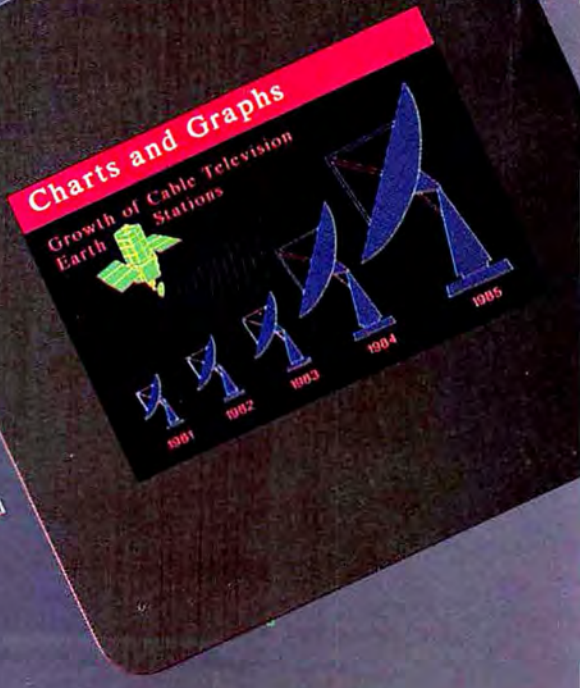

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Circle 257 on reader service card

List price: $49.95
Requirements: 128K, one disk drive, DOS 2.00 or later version
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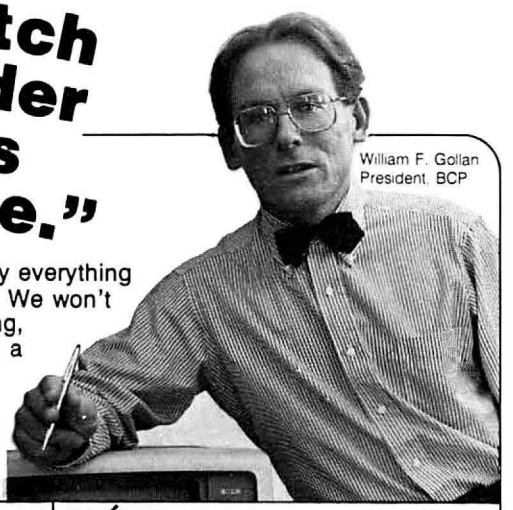
MindReader

Humphrey Bogart was not a flamboyant actor. He spoke with a raspy, nasal twang and moved as if he were going to an IRS audit. Yet his presence in classics like *Casablanca* and *The Treasure of the Sierra Madre* mesmerized millions of filmgoers. Of course Bogie had help. Actors like Lauren Bacall, Ingrid Bergman, Peter Lorre, and Sidney Greenstreet helped catalyze the special cinematic chemistry that produced movie magic.

As word processors go, *MindReader* from Businessoft is similarly unassuming and unfailingly competent. It too has a killer supporting cast aimed at helping the Bogies of the business world prepare everyday business documents without stepping into the ring with heavyweights like *Word* or *WordPerfect*. In keeping with this minimalist approach, most *MindReader* word processing functions and utilities can be accessed by pressing a function key in combination with <Shift> or <Alt>. Function key descriptor lines bordering the top and bottom of the screen list each combination, but if you need further assistance, context-sensitive help is always available. Between the two, most PC novices will find little need to refer to *MindReader*'s

(continues)

"We will match any mail order price in this issue."



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Smartmodem 1200B w/sc	349.95	***US Robotics***	
Smartmodem 2400	579.95	Password 1200	209.95
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Prometheus		***Venitel***	
Pro 1200	289.95	1200 ½ Card w/Crosstalk	359.95
Pro 1200B w/sc	249.95	2400 ½ Card w/Crosstalk	459.95
Racal-Vadic		2400 +	459.95
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PERIPHERALS

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AST		ESCELL AT w/Ok	379.95
Rampage PC w/2mB	539.95	PC Net Starter	759.95
Rampage PC w/256k	299.95	***Persyst***	
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Rampage AT w/512k	449.95	Conquest w/Ok	264.95
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Ramvantage AT w/128k	299.95	Short MEM w/384k	199.95
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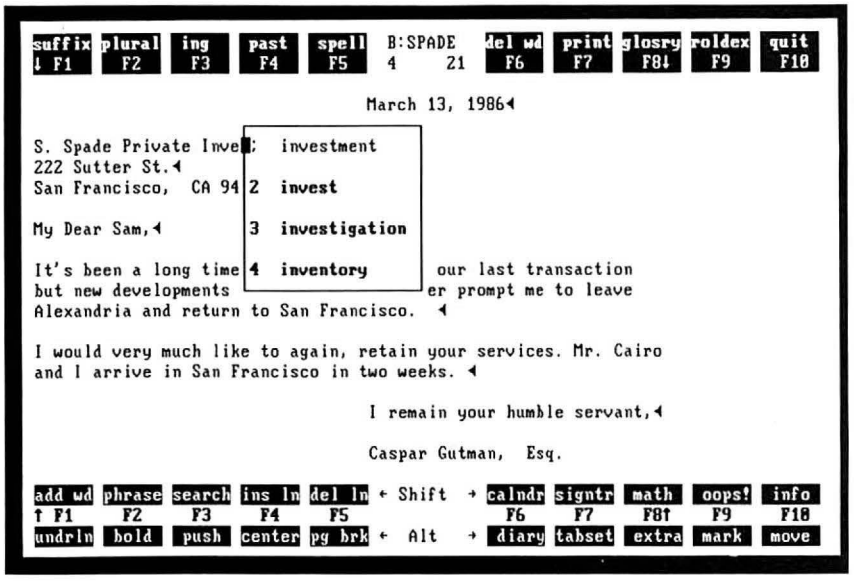

Screen 3: MindReader works like a proofreader on your shoulder. Type the first few letters of a word, and a list of possible completions pops up.

brief but thorough manual. *MindReader* is designed with the hunt-and-peck typist and occasional user in mind—though faster typists may be intrigued by some of *MindReader*'s ancillary functions.

At the core of *MindReader* lies an artificially intelligent component called WordComplete. After you type the first few letters of a word, WordComplete opens a window listing as many as five suggestions (see Screen 3). Typing *tre*, for example, elicits 'treasure', 'treatment', and 'tremendous'. Pressing the corresponding number key completes your word. This saves time for slow typists and helps tentative spellers. If you find the constantly flashing windows distracting, you can turn them off.

WordComplete relies on a 2500-word dictionary that Businessoft claims holds the terms most commonly used in business correspondence. *MindReader*'s surmises are usually right on the money, and if a word is used frequently enough, the program scoots it up the list and eventually assigns it to the semicolon key, just a pinkie's press away for quick entry. Of course, *MindReader*'s roster may be lacking words specific to your discipline. Accordingly, you can expand the dictionary to the limits of available disk storage and even store phrases up to 20 words in length.

In some ways, *MindReader* practically does your writing for you. A glossary can store memo formats, signature blocks, and boilerplate phrases 700 characters long and insert an entry into a document with a few quick keystrokes. Highlight a word, press the appropriate function key, and *MindReader* will create a plural or a gerund, recast the word in the past tense, add a

(continues)

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suffix, or verify the word's spelling. The program saves further keystrokes by automatically adding a space after a comma or period and capitalizing the first letter typed at the beginning of a paragraph.

But like a TV offer for Ginzu steak knives, there's more. *MindReader* also comes equipped with a calculator, a calendar, a 60-day appointment scheduler, and a remarkably versatile electronic Rolodex. Rolodex entries can be sorted alphabetically or by zip code, searched, and mail merged to address envelopes and letters. If you have trouble remembering that IA and ME stand for Iowa and Maine, the Rolodex displays a chart with the Postal Service's two-letter codes for all 50 states. While you're working, *MindReader* automatically saves documents every 20 minutes, indicates the current file size, and notes your typing speed in words per minute. To top it off, the program even includes a word game.

MindReader's capable but limited word processor and printing functions may give experienced users pause. The program cannot include footnotes or automatically reform text, and page breaks are displayed only by means of a special command. However, you can boldface and underline text, cut and paste blocks, perform a global search and replace, delete a word or line, and restore accidentally deleted text. While you wouldn't tackle a large report with *MindReader*, the program easily handles letters, memos, and other straightforward documents. Print functions similarly reflect the program's orientation toward business correspondence.

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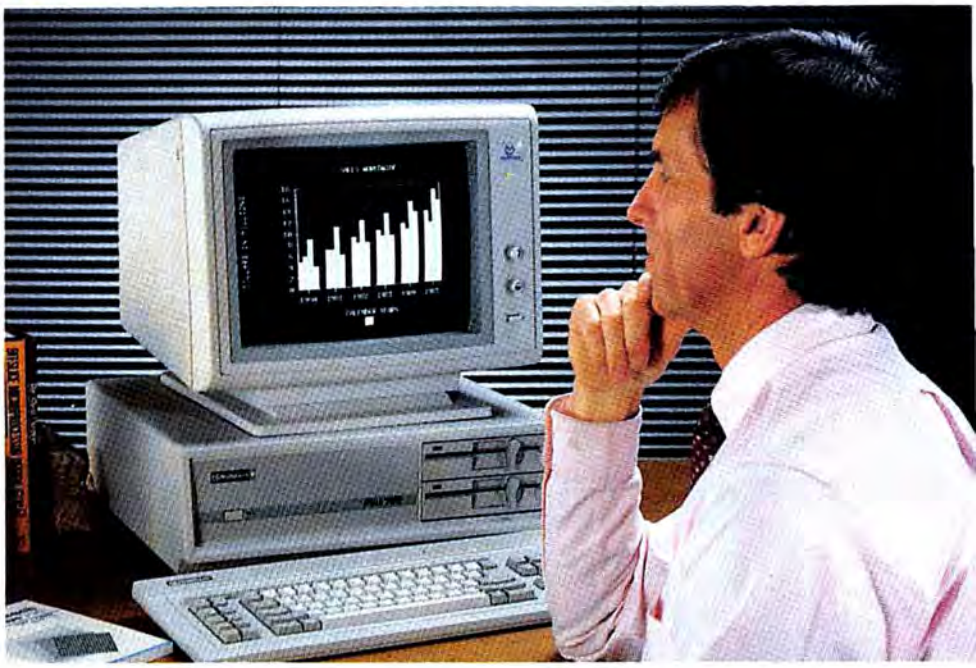

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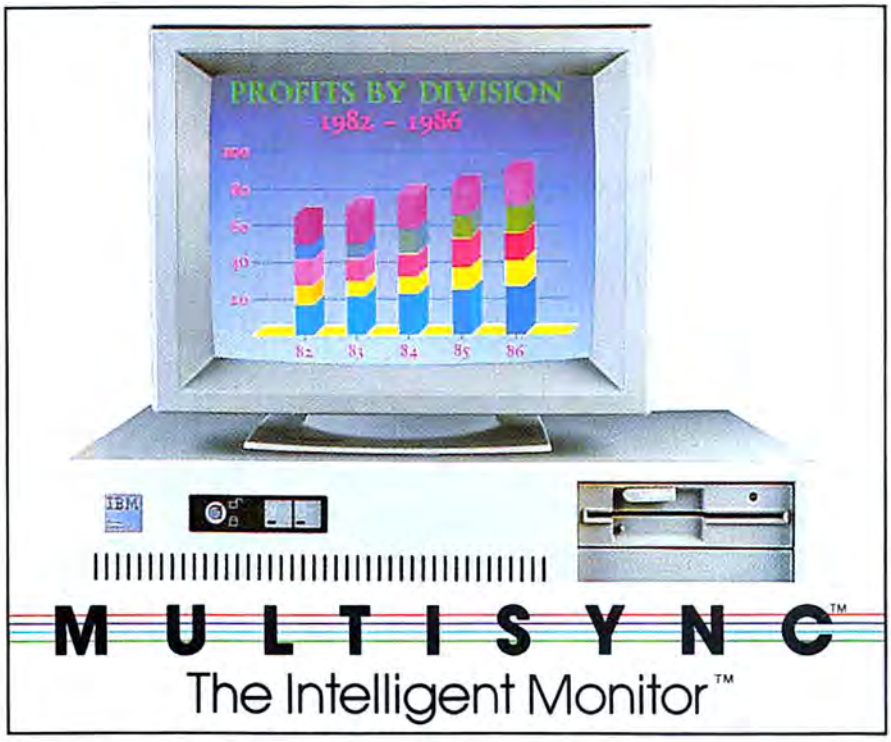

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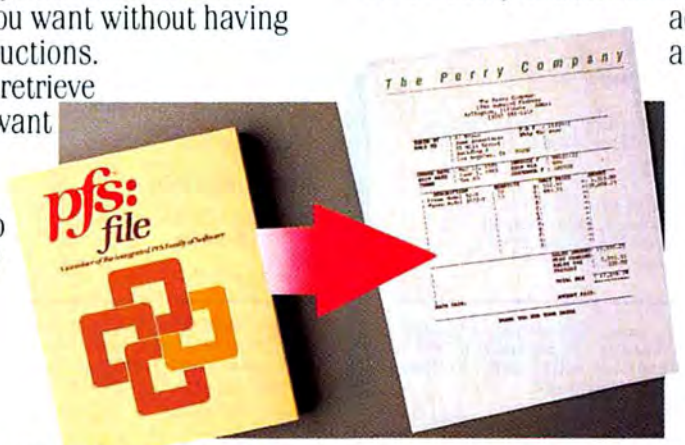

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rely on typing skills to make a living but needs some word processing and a handful of reliable desktop management tools. *MindReader* may not be flashy, but it wins this reviewer's Academy Award. —*Wes Nihei*

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DOS-Helper

Whenever I have to flip through my DOS manual, a wave of existential nausea washes over me. Where am I? Who am I? What are object modules and hexarithmetic commands, and should I care? But IBM's answer to the *Tao Te Ching* remains mute, a rune written for those technological druids who can best interact with a hex dump. Now at last, there's help for the rest of us.

Aristo Software has conjured up *DOS-Helper,* a dandy little program that's like an angel on your shoulder—one that can refresh your memory on DOS commands or hold your hand as you plunge into the back country of DEBUG and LINK. *DOS-Helper* is essentially an on-line DOS 2.00-3.10 manual. Compared to the IBM/Microsoft enchiridion, it's well written, superbly organized, and marked by a comprehensibility that's positively breathtaking. The program is composed of 107 help files. Every major DOS function is covered, from the nuances of mode commands to the arcana of memory buffers. The help files also specify which explanations apply to which versions of DOS.

(continues)

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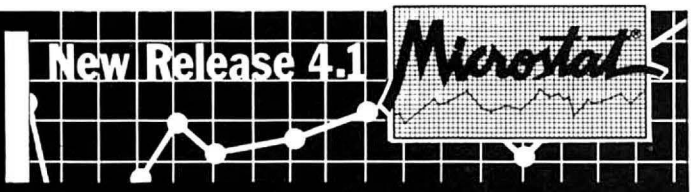

Eco-C88 is a full C compiler for MSDOS machines. Everything you need is included in the low price of $59.95, including a full-screen editor. Here's what some reviewers are saying about the Eco-C88 C Compiler:

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The program can be run from disk or, like *SideKick*, kept lurking in memory behind an application until it's needed. Either way, help is only a few keystrokes away. For example, say you want to use the DOS command RECOVER to salvage a damaged file but are unsure of the syntax. From *DOS-Helper*'s main menu, you can search for the appropriate help file from either an alphabetized or a topically arranged directory. To display help, type in the file name (RECOVER) and press <Enter>. You can also elect to quickly browse through the program's dictionary of DOS commands and their brief accompanying descriptions.

The help screen defines the command in English and gives an example of its use and syntax. Additional screens elaborate on the command's purpose and relation to other DOS functions, explain pertinent error messages, and provide the kind of usage tips seldom found in a manufacturer's manual. The discussions are so forthright and clear, you'll wonder why PC users have put up with IBM's abstruse manuals this long.

The help files, which may include as many as six screens, are written with the DOS neophyte in mind. If you need to get up and running with DOS quickly or, conversely, are charged with educating new users, *DOS-Helper* is just the ticket. And $35 for the package is a reasonable entrance fee.

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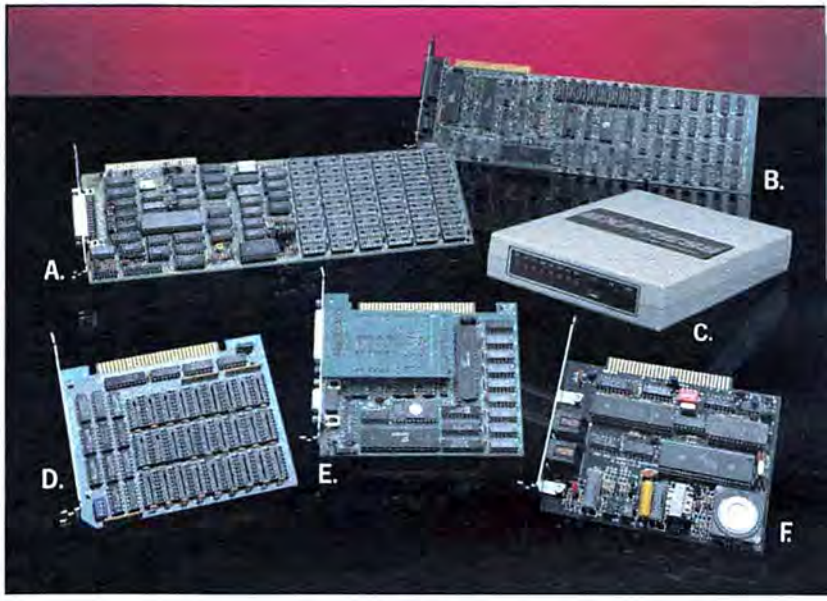

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using a word processor's ASCII file mode, save it, and give the file a .HLP extension, place the file in the program's \HELPDOS subdirectory, and add the file name to *DOS-Helper*'s directories.

My only reservations? The program's help screens could be a bit more consistent in their coverage and a little less leaden in their prose. For example, the program offers a number of tips on using DISKCOPY, but gives scant coverage to VERIFY.

More often than not, however, *DOS-Helper* hits the mark, consistently aiding the first-time user and giving the DOS pro an assist now and then. With *DOS-Helper,* I can finally put my 800-page *DOS Miserables* back on the shelf where it belongs. *–Judy Getts*

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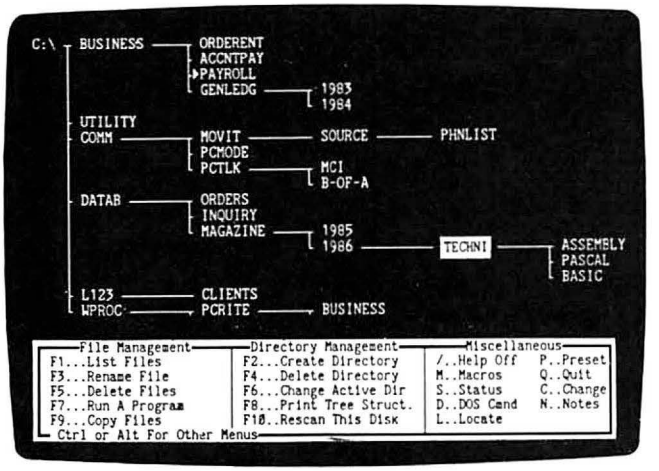

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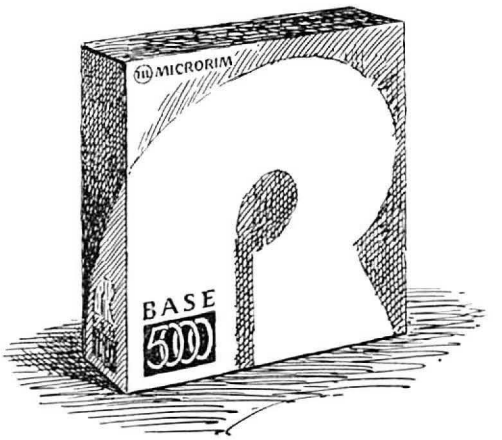

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From the Hardware Shelf

PC World offers first impressions of recent hardware releases

A PC compatible proffers a red-hot price, a laptop pulls its weight, a board suffers an identity crisis, and a floppy drive flies the coop

Edited by Eric Knorr

Leading Edge Model D

Among computer vendors, Leading Edge is the low-key New England version of Crazy Eddie, the price slasher. One of the pioneer purveyors of cut-rate PC products, Leading Edge has promoted a modest line that roused little excitement—until the Model D. Demand for this new compatible has been so relentless, the company has been hard-pressed to fill orders.

The reason for this hubbub is the Model D's dazzling price. Now $1495 might not seem like an outrageous deal for a plain vanilla PC—until you tick off the list of standard features: 256K of RAM, two 360K half-height disk drives, a monochrome monitor, a video adapter that supports either high-resolution text or Hercules-compatible graphics, and an IBM Color/Graphics-compatible RGB port. An optional 20MB hard disk raises the price to a mere $1895.

A standard 8088-based machine, the Model D is $200 cheaper than its 8088-2-based predecessor, the Model M. The Model D is also smaller, occupying about half the desk space of an IBM PC. The front of the machine is high-impact plastic, and the rest of the shell is metal and solidly constructed. As with the Epson Equity I, the on/off switch, system reset button, and keyboard connector are easily accessible from the front of the system unit.

The motherboard harbors a socket for an 8087 math coprocessor, and you can add 256K-bit chips to make the upgrade to 640K. The video adapter, floppy disk controller, battery-powered clock/calendar, and parallel and serial ports are built into the motherboard, leaving four slots available. A hefty 130-watt power supply lends authority to the Model D's expansion potential.

In regard to PC compatibility, the CPU's Phoenix Software BIOS looks promising (Phoenix has an excellent reputation for IBM PC mimicry). Sure enough, running *WordStar, SideKick, 1-2-3* release 1A, *EasyWriter II* version 4.0, and DOS 1.10, 2.10, and 3.10 was no sweat for the Model D. The machine also loaded *TenKey, SuperKey, Framework,* and *1-2-3* release 2 without balking.

Text is reasonably crisp on the machine's 12-inch green monitor, although a bit less sharp than on an IBM Monochrome Display; the monitor easily handles the monochrome shades assigned in graphics

A monochrome monitor and 640K RAM are standard with the Model D, Leading Edge's price-busting compatible.

mode. You can order an amber monitor in place of the green screen at no extra cost; an RGB monitor adds $400 to the machine's price. A switch on the rear panel lets you toggle between the monochrome and color ports.

The Model D's keyboard improves on that of the IBM PC by enlarging important control keys. The layout is identical to the PC's, except that the tilde key has been moved to the right of <Backspace>, and the backslash key resides to the left of the <Space> bar. The solid feel and reassuring IBM click-clack give a sense of durability.

The versions of MS-DOS and GW BASIC supplied with the Model D have all the standard functions, but Leading Edge's DOS also contains a print spooler. Currently, the *Leading Edge Word Processor* is being bundled gratis with the machine. The Model D's biggest drawback is its documentation, which is often vague and sometimes misleading.

One major selling point is free lifetime phone support. Leading Edge's tech support line responds promptly with clear, friendly assistance. The 15-month warranty on parts and labor is also generous.

Note, however, that some dealers have been unhappy with Leading Edge. Shipment of the 20MB hard disk machine was delayed for more than a month, and there have been reports of a scarcity of parts and documentation for the Model D. Leading Edge's dispute with Mitsubishi (supplier of the Leading Edge Model M, the company's discontinued PC compatible), not to mention the expressly prohibited use of *Consumer Reports'* rating for the Model D in advertisements, does little to inspire faith in Leading Edge's reputability.

Nevertheless, the small, sturdy, well-designed Model D is a fabulous deal. Its inclusion of a monitor and two floppy drives makes it a very attractive entry-level machine. Your decision to buy the Model D may well depend on your confidence in Leading Edge's continued support. *–Andrew T. Williams*

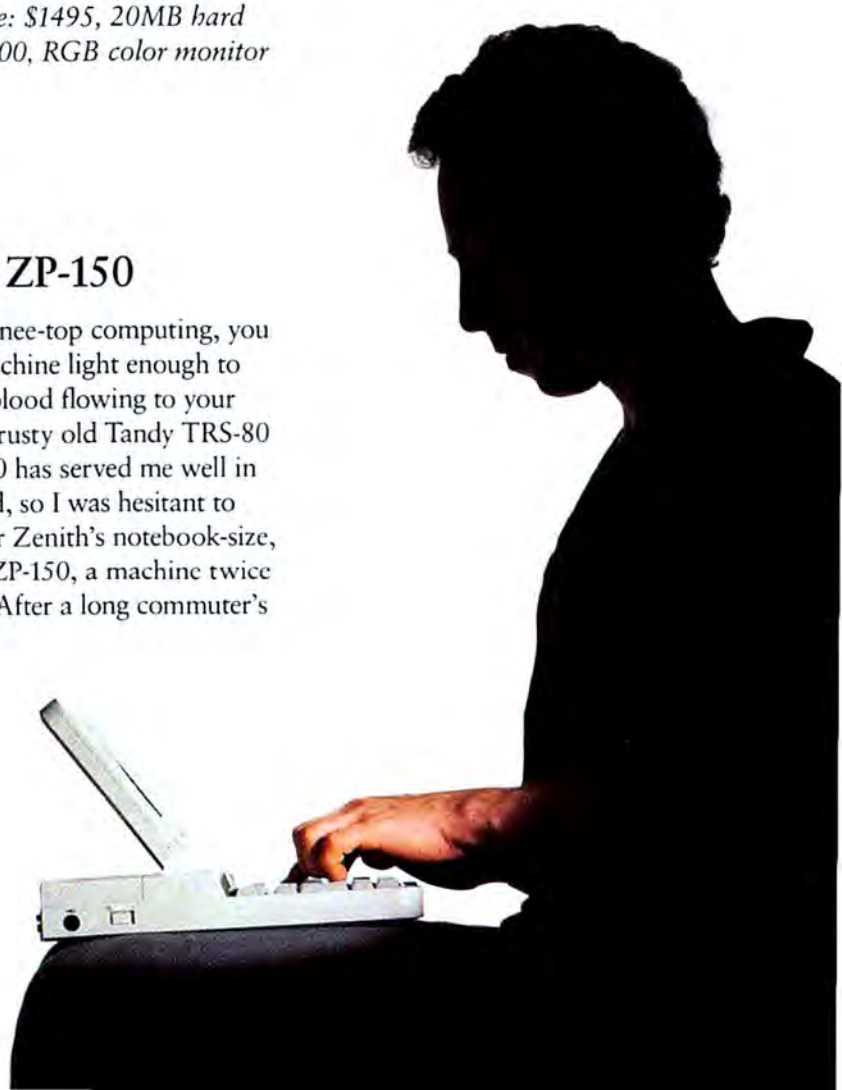
Leading Edge Model D
Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833
List price: $1495, 20MB hard disk $400, RGB color monitor $400

Heath ZP-150

For true knee-top computing, you need a machine light enough to keep the blood flowing to your feet. My trusty old Tandy TRS-80 Model 100 has served me well in this regard, so I was hesitant to swap it for Zenith's notebook-size, 8-pound ZP-150, a machine twice as heavy. After a long commuter's session with the ZP-150, I may not feel like breakdancing, but this laptop's power is definitely worth its weight.

Like most laptops, the ZP-150 lacks disk drives and PC compatibility. It has all the other familiar trappings of computing on the fly, including a flip-up LCD display, a built-in 300-bps modem, and a bundle of ROM-based productivity software. Either an AC adapter or ten AA batteries power the machine. The ZP-150 is on the thirsty side, draining its ten cells in 4 to 5 hours. Because the ZP-150 uses low-power CMOS RAM chips, a built-in nickel/cadmium battery can

(continues)



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maintain your files for more than eight days without the benefit of AA batteries or AC power.

The heart of the machine is an 80C88 microprocessor. Standard RAM is 32K, expandable to 416K—a magnanimous maximum, but one that takes a heavy toll. Each 32K increment costs $79, and only an authorized Heath/Zenith dealer can install the chips if you want your warranty intact. The included 32K suffices for a couple of word processing documents, but to lug around a fair-size spreadsheet or data base you'll need at least 128K. And if you max out your memory, you'll end up paying more than the cost of the machine itself—an absurd situation.

Like most LCDs, the ZP-150's 80-column by 16-line display is difficult to read unless you have that rare ideal light over your shoulder. The keyboard has a comfortable, crisp feel; the function keys and a diamond cluster of cursor keys are at the top. Unfortunately, the ZP-150 replicates two of the IBM PC keyboard's major flaws—the <Enter> key is too small, and the backslash key's proximity to the <Shift> key makes it too easy a target.

A panoply of connectors populates the rear panel, which is protected by a hinged cover. Ports include two standard telephone connectors, a male RS-232C serial port, a port for a bar-code reader, and a parallel printer port that requires a custom printer cable. On the side panel, you can plug in both a cassette recorder and an acoustic telephone coupler (yet to be released). An external system bus connector is also provided, presumably for future monitors or disk drives.

One chief feature that distinguishes the ZP-150 from the "lapdogs" is its bundled software. In 224K of ROM comes a wonderful integrated set of programs called *Microsoft Works*, which comprises miniature (though quite functional) versions of *Microsoft Word*, *Multiplan*, and *Microsoft File*. *Works* also contains a telecommunications program, a calendar, and a multiple-event alarm. Calculator and phone dialer desk accessories tag along for the ride, as do a version of GW BASIC and a shell for the operating system.

Works is, well, fun. All its modules let you share data easily through a clipboardlike area of memory, and the applications have numerous commands in common. When sending data to a PC, you can export data base and word processing files in ASCII and transfer spreadsheet files in SYLK format. The full-functioned telecommunications module uses script files for auto-dialing; auto-log-on; and timed, unsupervised file transfer. A 300-bps modem is tough to justify these days, however, even in a laptop.

It's a good thing that *Works* is packed with applications, because the ZP-150 contains no disk drives and is incompatible with all other computers. Two extra ROM sockets await future software, but as yet neither Microsoft nor Zenith has intimated that new ROM chips are coming. Neophytes should be forewarned that mastering *Works* is no

(continues)

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trivial chore: The documentation comes in a three-ring binder that's bigger and heavier than the computer itself.

The ZP-150's many features reflect painstaking design—especially on the software side, since *Works* made its debut on the machine. It's curious, then, that Zenith has done less to market the ZP-150 than it has for almost any other entry in the company's product line, offering it only through Heath outlets. Perhaps the machine's PC incompatibility, conventional LCD display, and exorbitantly expensive RAM made it too dicey for Zenith's tight advertising budget. Compared to some other laptops, however, you could do worse than ramble with a ZP-150 on your knees. *—Danny Goodman*

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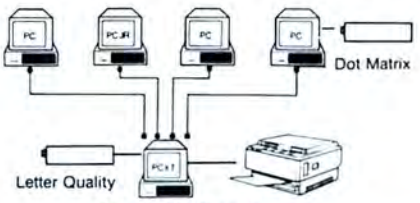

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†Features 30 millisecond access time

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*Cassette **Cartridge

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BIORHYTHM CHART

What kind of day is it going to be for you today? Are you at your peak physically, emotionally or intellectually? Which day this week will be ideal for beginning that new project you've been putting off? Is next Tuesday the right night to take that certain someone out to dinner, and pop "the question"?

Let's face it, on given day of our life there are any number of important decisions or options to consider. The data strips on the right contain a Lotus template, from the public domain, called BIORYTHM CHART that could help.

Use the Cauzin communications program to read the strips to a data disk. The Lotus Retrieve command brings the model into Lotus 1-2-3™. Enter your birthdate and the current date into the appropriate cells and your personalized BIORHYTHM CHART will appear on the screen. You are given data for 15 days prior, and after, the current date which is shown as zero.

Run your spouse's, friend's, or child's chart and figure out which days you should be doing things together, and which days to avoid one another. If you know your boss' birthday, you can figure out what mood he'll be in before he comes to work... and plan accordingly.
GOOD LUCK!

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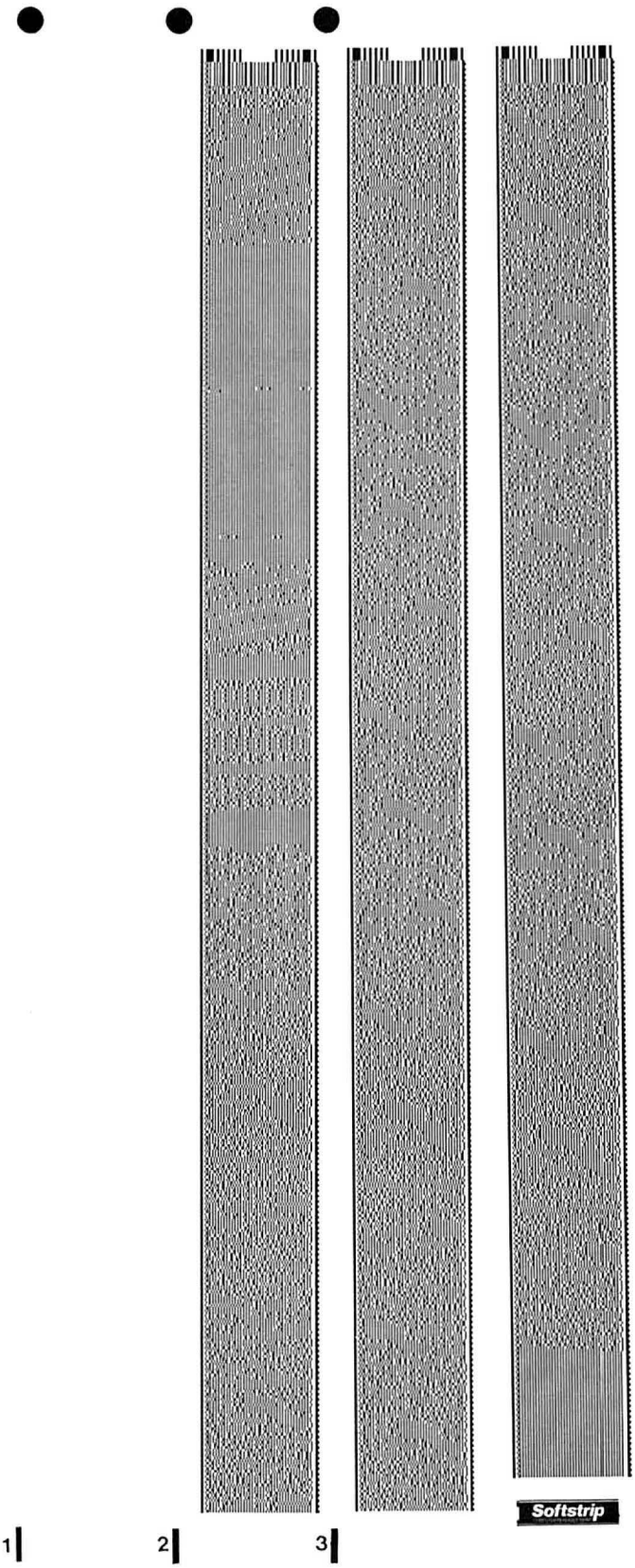

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disks develop instant amnesia when the computer is turned off or the system is reset, programs and data stored in the MegaFunction RAM disk are preserved by its power supply. In addition, instead of gobbling up large chunks of your PC's conventional memory, the board's RAM remains separate from system memory.

What's more, if you don't have a hard disk, you can start up your computer directly from the RAM disk instead of from drive A:. Otherwise, the MegaFunction Board comes ready to run with built-in ROM routines that emulate a hard disk drive. Like a hard disk on a card, the board gives you added storage without usurping a floppy drive, but with a much faster access time.

Although incompatible with the AT, the board performed well on an IBM XT, with or without a hard disk. No glitches occurred when copying files, creating directories, or transferring the DOS system files to the RAM disk (imagine formatting a 1280K disk in 11 seconds). With a hard disk present, the RAM disk is configured as drive D: and defers system start-up to the hard disk. Installing software on the RAM disk is identical to hard disk software installation.

Setting the MegaFunction Board's DIP switches and jumpers is relatively easy and clearly explained in the documentation. One useful option is the ability to backfill your PC's memory up to the 640K limit, although you must have a minimum of 256K already installed.

A few factors bear consideration before you fish around for your checkbook. If storage is your main concern, you'd be better off purchasing a hard disk. The cost per megabyte of hard disk storage (based on a price of $600 for a 10MB drive) is $60, while the per-megabyte storage cost for the MegaFunction Board, as determined by its $895 price tag, is approximately $700. You can reduce

(continues)

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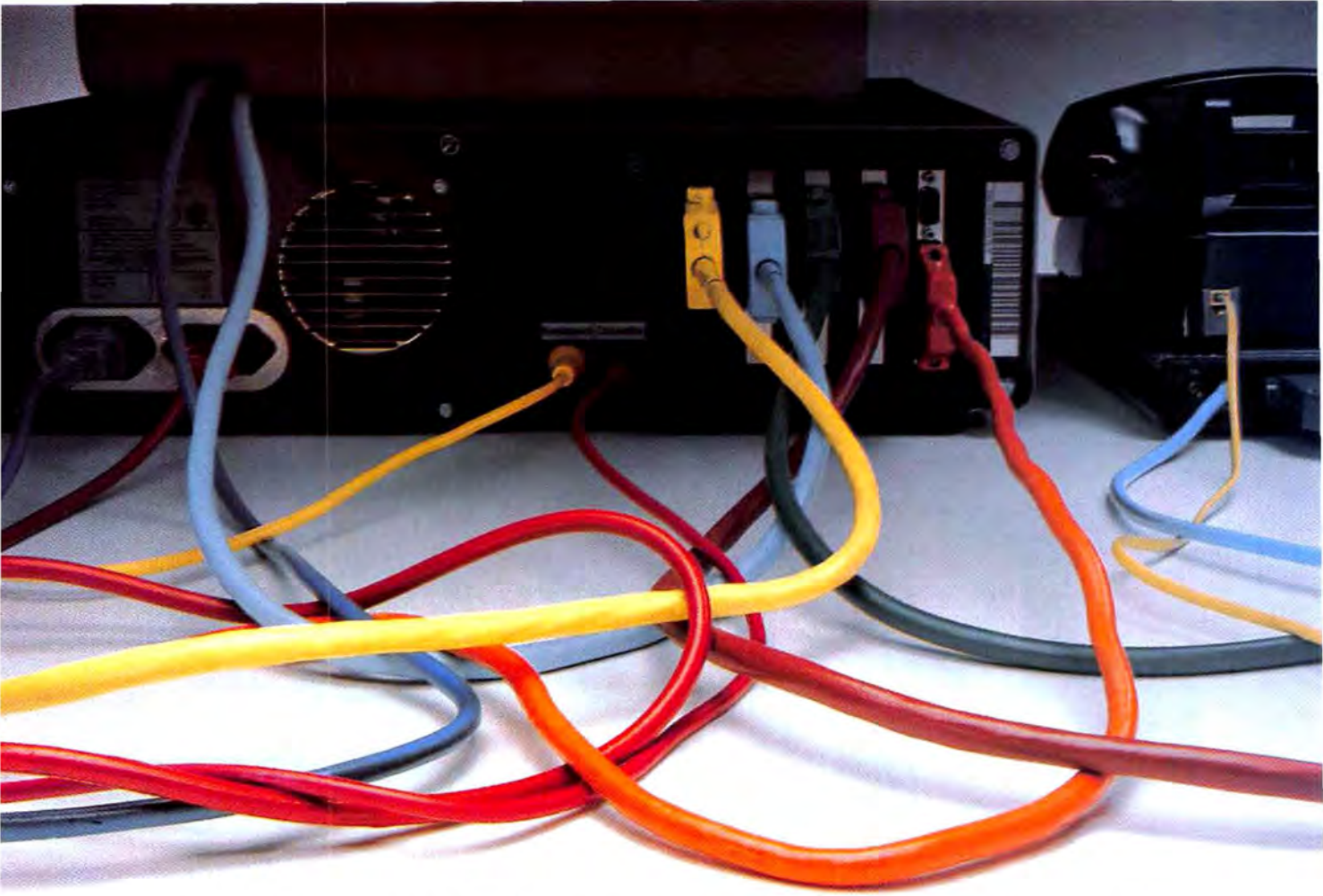

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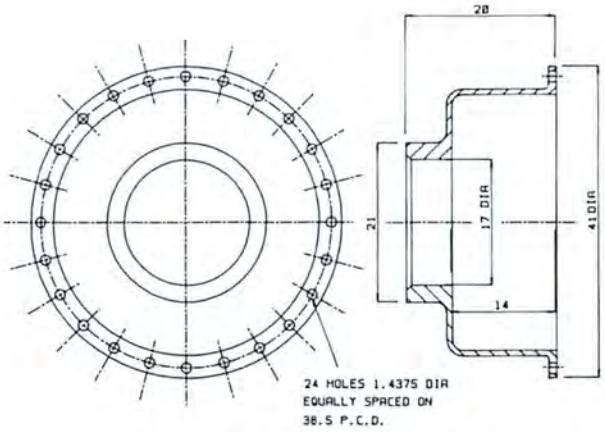
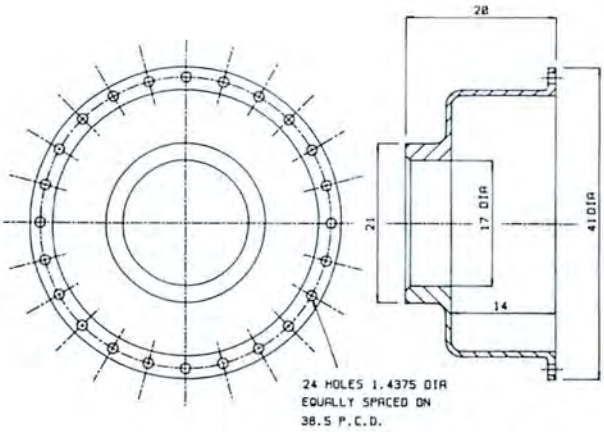


AutoCAD® plotted on DMP 29



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this to $515 per megabyte by adding Tecmar's 2MB daughterboard for $795, but then you're out $1700 and two expansion slots for a slim 3.28MB of storage.

Then, of course, there's the safety of your data to consider. If a power outage occurs, both the computer *and* the RAM disk will go down, vaporizing whatever's on the board.

The principal attraction of the multifunction board is speed. If you want near-instantaneous access to various program modules (such as spelling checkers, thesauri, or large data bases), then this board may be the answer. Otherwise, the Mega-Function Board seems to be a solution in search of a problem.
–Robert Nusbaum

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The Pelican

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(continues)

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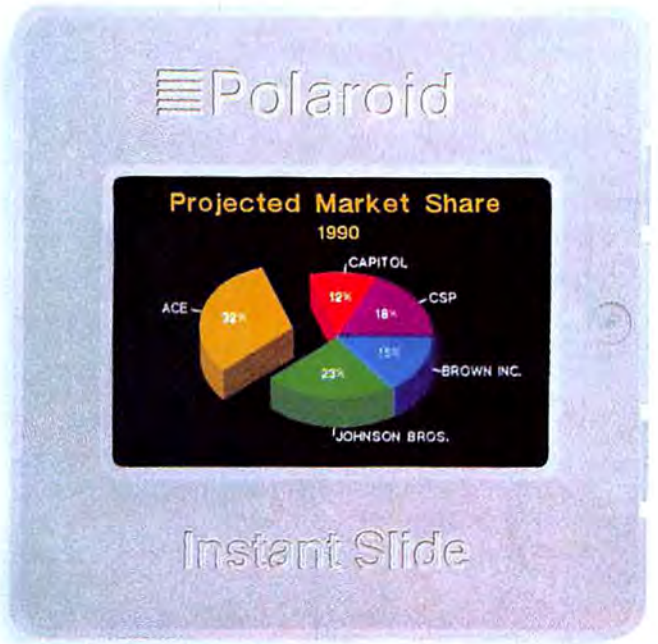

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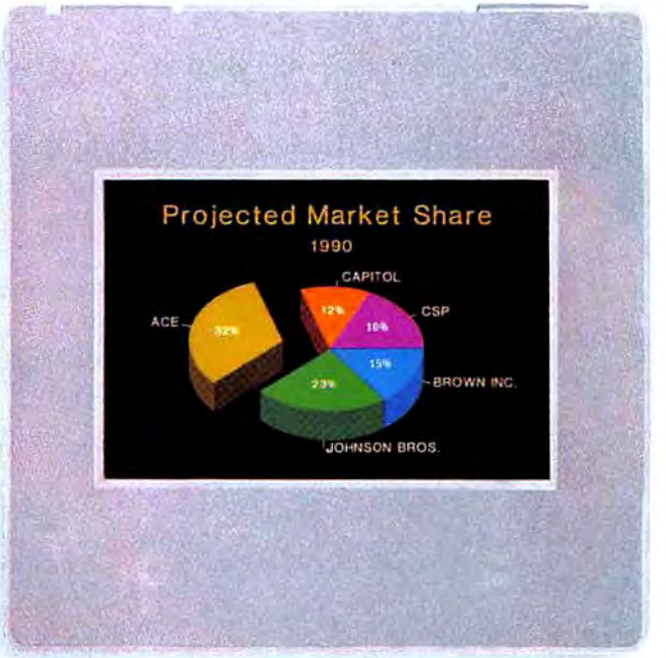

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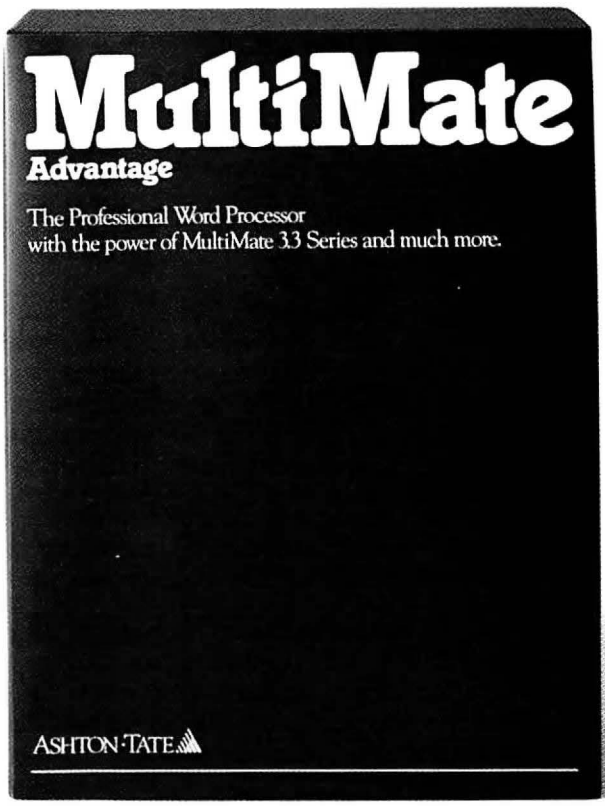

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Circle 501 on reader service card

this growing mountain of media: the Pelican 3.3 Mass Storage System.

Touted as a device for both backup and mass storage, the Pelican's polished aluminum case houses a half-height floppy disk drive that spins the new Kodak high-density 5¼-inch 3.3MB disks. (The 3.3MB figure is in fact misleading, because Kodak's hard-sector formatting scheme reduces the disks' capacity to 2.78 MB.) The $795 package includes a half-size disk controller board, two Kodak disks (which go for $15 a shot if puchased separately), a connecting cable, and sundry utilities.

Installing the Pelican is a straightforward affair. After completing the board and cable hookups, you simply add a DEVICE line to your CONFIG.SYS file and format a Kodak disk using the Pelform utility. If you don't have a CONFIG.SYS file, you can use Pelican's menu-driven Pelsetup utility to create one. The Pelican supports DOS subdirectories and paths, and automatically assigns itself the next highest drive letter (drive C: in a two-floppy system).

As a backup device, the Pelican forces a trade-off between speed and accessibility. It archives a 10MB hard disk in about 15 minutes—at least twice as long as most tape devices require. However, because the Pelican is as accessible as a hard drive, when you try to recover your data after a hard disk crash, you won't be stymied by the proprietary formatting schemes used by many tape units.

The Pelican's advertised 160 milliseconds (ms) average access time places it not quite midway between a floppy's 200ms and an XT hard drive's 85ms. However, Pacific Micro Systems claims that with disk caching (this technique, which you can employ with any disk drive, uses your computer's RAM as a holding area during read/write operations), it will run at least twice as fast as a floppy and potentially ten times faster. You specify the amount of system memory you want to devote to caching in the CONFIG.SYS file.

I put the web-footed bird through its paces using a disk test that performs continuous reading and writing of sequential data files as well as continuous random reading of data from those files. The Pelican sporadically lived up to its claim of running at ten times the speed of a floppy, but only on the high end of its 2K-to-256K memory cache range. Because overall speeds derived from caching depend on so many variables (basic disk speed, cache size, and type of application), absolute times are misleading at best. When the cache is not close to the accessed file size, velocity slows to slightly less than twice the floppy speed.

When running *WordStar 3.3*, for example, the silicon bird refused to attain its high-end read/write speeds. I missed the whoosh of acceleration when jumping from a floppy to a hard disk (not to mention the g-force rush of switching from a hard disk to a RAM drive).

Perhaps the Pelican's most practical role is as a storehouse for byte-hungry applications that require too much disk swapping on a floppy-based system. The Pelican's densely packed disks have ample room for a communications program, DOS, and sundry utilities, or even for a moderate-size data base or spreadsheet program. Otherwise, the Pelican is a strange bird in the mass storage marketplace, offering the security of removable media at one-fifth the price of a Bernoulli but with one-fourth the speed. Considering that the flashy new hard disk cards are similarly priced and 20MB hard drives much cheaper, the Pelican may not find enough hospitable homes in which to nest. *—Art Wilcox*

Pelican
Pacific Micro Systems, Inc.
160 Gate 5 Rd.
Sausalito, CA 94965
415/331-2525
List price: $795, box of five Kodak disks $65
Requirements: DOS 2.00 or later version

Andrew T. Williams, Danny Goodman, and Art Wilcox are Contributing Editors for PC World. *Robert Nusbaum is a freelance writer and programmer based in Grand Rapids, Michigan.*

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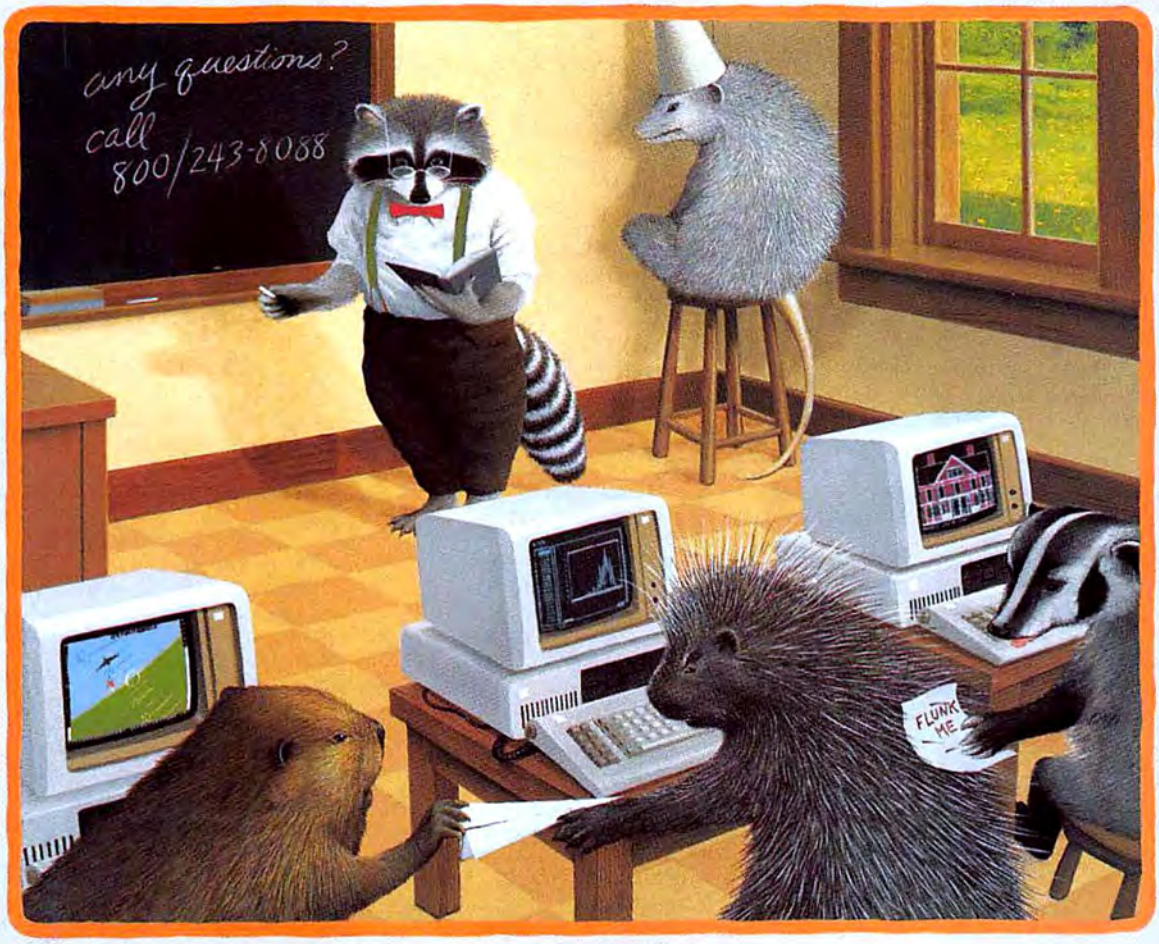

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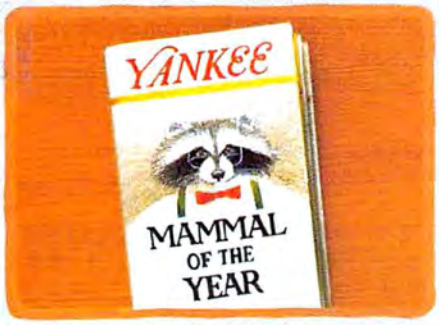

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3270: IBM's Extended Family

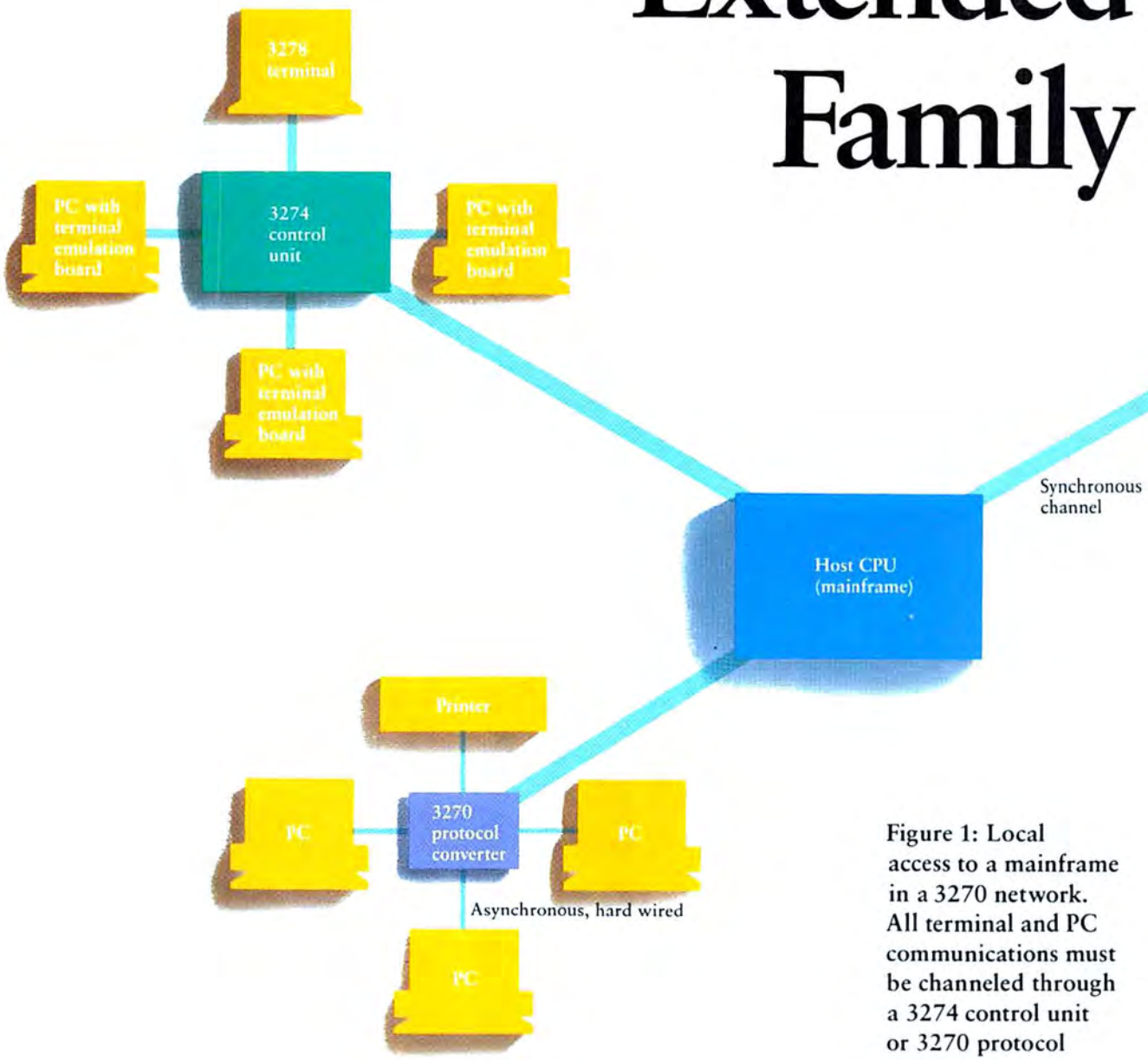
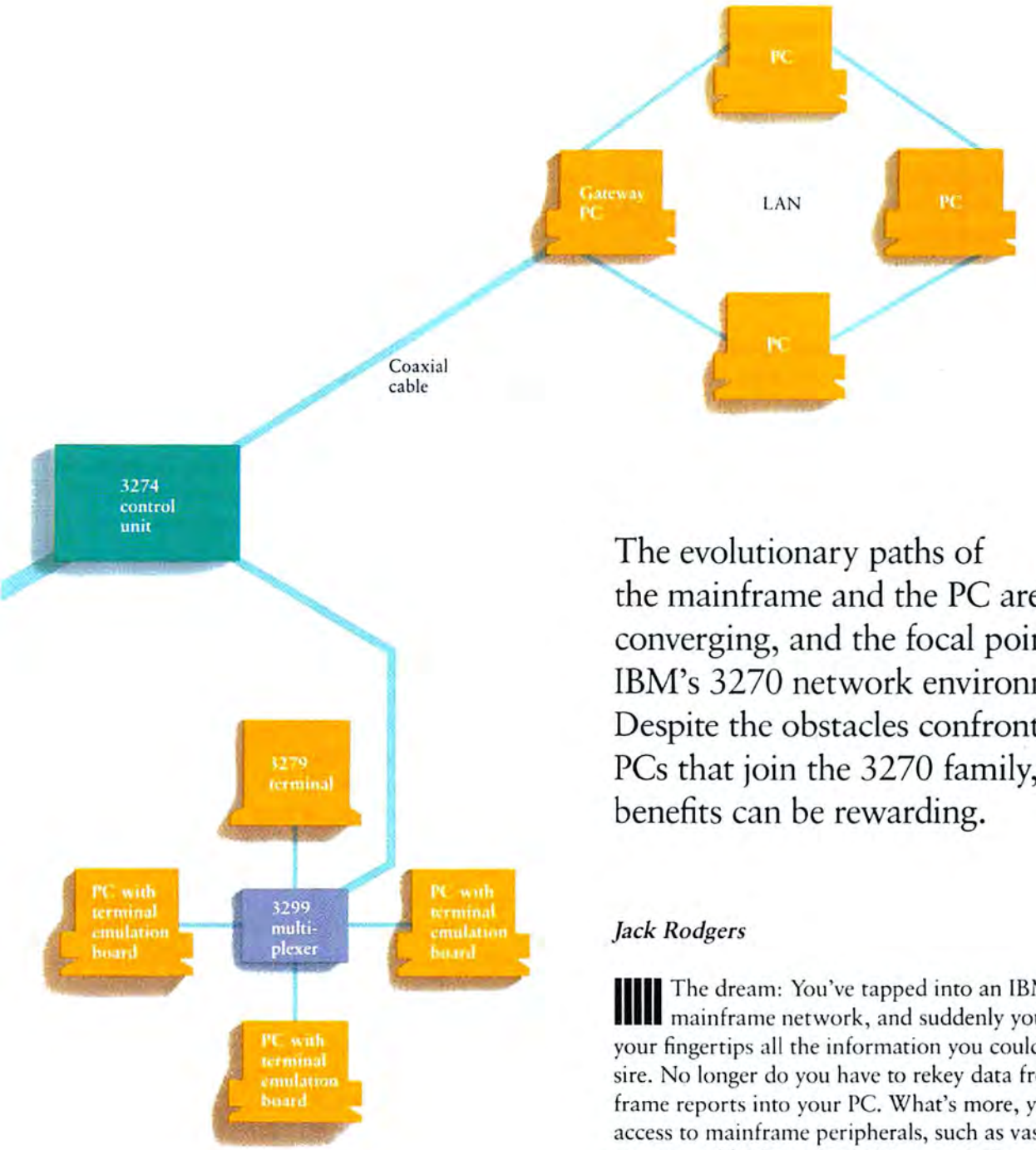


Figure 1: Local access to a mainframe in a 3270 network. All terminal and PC communications must be channeled through a 3274 control unit or 3270 protocol converter.



The evolutionary paths of the mainframe and the PC are converging, and the focal point is IBM's 3270 network environment. Despite the obstacles confronting PCs that join the 3270 family, the benefits can be rewarding.

Jack Rodgers

The dream: You've tapped into an IBM 3270 mainframe network, and suddenly you have at your fingertips all the information you could ever desire. No longer do you have to rekey data from mainframe reports into your PC. What's more, you have access to mainframe peripherals, such as vast disk storage and high-quality printers and plotters. Mainframe backups of your data ensure that disk failure will not be a catastrophe, and an audit trail ensures data security. You're not alone and out of touch anymore. You're part of the 3270 family.

The nightmare: You wait in front of the PC for a response from the IBM mainframe. It seems like hours, but you don't know for sure—you've lost track of time. Finally, the screen fills with a jumble of incomprehensible code and text. The monolithic mainframe has you by the terminal, and it's not letting go.

You've gone from PC independence to micro-to-mainframe slavery. With a low snarl, you contemplate crashing the entire system.

The reality: Although it's true that micro-to-mainframe communications can be slow, frustrating, and intimidating, if the link is properly planned and implemented, it can open your PC to vast data bases, prodigious processing power, and a host of sophisticated peripherals. In many cases, you may not be able to do your job effectively without access to your company's mainframe.

The combination of terminal emulation, file transfer, and the processing power of the PC enables you to participate on a 3270 network—the family of terminals and other systems that revolve around IBM mainframes. Until recently, protocols used in 3270 networks—binary synchronous (BSC) or Systems Network Architecture/Synchronous Data Link Control (SNA/SDLC)—did not make it easy for the PC to be a significant participant in the mainframe family.

For the most part, the PC has acted as a dumb window on the mainframe world—you could look but you couldn't touch. However, with recent changes to SNA and more sophisticated micro-to-mainframe links, distributed data processing—the ability to share job loads among computers—is now becoming a reality.

3270: The Terminal Revolution

PC users often think of themselves as computing revolutionaries, liberating knowledge from the citadels of the mainframe elite and redistributing it among the masses. Yet many users are unaware of another technological transformation that occurred 15 years ago and had comparable impact. In 1971 IBM introduced the 3270 family with the mainframe world's first terminal system for the masses—the IBM 3270 Information Display System. The 3270 control unit and the 3277 terminal brought the computer out of the machine room—changing the lives of mainframe programmers and opening up the computer to new users. The transition from pencil and coding sheet to terminals was an abrupt shock to a generation of computing professionals.

Fifteen years later, the spread of personal computers has further opened mainframe data base access. For today's PC user who wants to tap into an IBM data base, joining a 3270 network should not cause culture shock, but it will require adapting to different rules and customs. To create a link to the 3270 network family, a PC needs terminal emulation and micro-to-mainframe file transfer products. Five years ago few products existed that could do either, but today approximately 400 vendors offer a bewildering array of products in the micro-to-mainframe market.

Devices of the 3270 Family

The 3270 network is both like and different from a local area network (LAN). In a LAN the PC is independent of the server, which acts as a central repository for shared data and peripherals. However, on a 3270 network, the terminal is dependent upon the host, which does everything from interpreting each keystroke and executing programs to accessing data in storage.

Terminals and other members of the network connect to the mainframe via a 3274 control unit, or cluster controller, which provides the interface between the host CPU and as many as 32 terminals and/or printers. Less common are the 3276 controllers, which connect only 7 devices.

Devices are connected to a control unit by coaxial cable, the arteries of a 3270 network. The control unit gives each active device access to the host in succession. From the terminal's perspective, the line to the host appears to be dedicated, but actually it is sharing the line with other devices. Control units can be either local and channel-connected to the host, or remote and connected to the 3270 network via modem.

You can also equip a PC with an expansion board that emulates a 3274 control unit to provide 3270 access for up to 64 PCs on a LAN. The cost of the board is less than the least expensive 3274, but the trade-off is the cost of the LAN.

To stretch the limits of a control unit, you can use a device called a multiplexer, which enables multiple devices to share one communications line. The 3270 network multiplexer lets up to eight devices share one coaxial cable connected to a control unit. However, response time may lag during periods of heavy usage.

If you call in from a remote source via modem, your communications will pass through a transmission control unit (TCU), which is not officially part of the 3270 family. The communications controller acts

as a fast traffic director for remote communications. It accepts a barrage of messages from a patch box of rack-mounted modems and passes them quickly to the host CPU over a high-speed channel.

The key elements in the 3270 family are terminal display stations, which are something like a PC's monitor and keyboard but without the computer. Except for the 3290, the 3179/G, and some models of the 3279, all 3270 terminals are "dumb." Memory is limited to the screen buffer, and they have no local processing power. Each time you press a key, a signal is sent to the control unit, which interprets the character and sends it back for display on the screen. Even "smart" terminals lack processing power and memory, but at least they can interpret their own keyboards. Dumb or smart, terminals are dependent upon a host processor for application functionality.

Thanks to terminal emulation, the IBM PC and compatibles can be included in the 3270 family. PCs equipped with terminal emulation boards can emulate up to four 3270-type sessions, including 3270 color graphics. Your PC will likely join the family, masquerading as a dumb 3278 terminal or 3279 color terminal. The 3278 monochrome display has been the standard, but use of the 3279 color terminal has increased during the last two years. Creating and manipulating color graphics with the 3279 is more difficult than with the PC, and so far the primary use of mainframe color has been to highlight text in the process of formatting crowded screens for data entry or query applications.

IBM's recent entry into the 3270 world is the 3270-PC, which is essentially a PC with a built-in 3270 terminal emulation board and a keyboard that awkwardly borrows features from both machines. You can emulate a 3270 terminal and then switch to a PC-DOS application with a single keystroke. The 3270-PC's micro-to-mainframe link is fine for transferring text, but it falters with binary data. Such problems as well as competition from third-party products may explain why the 3270-PC has been a slow seller.

Printers in the 3270 network range from tabletop models that resemble PC printers to large, high-speed printers that seem to belong in the mainframe machine room. Because printers are not attached to terminals, requesting a printout during a session involves routing the output to the system (line) printer, which several users share. (For a detailed description of the 3270 network devices, see the sidebar "The Members of the 3270 Family.")

The Facts of Emulation

If you're accustomed to PC-to-PC file transfer, you may find mainframe file access frustratingly complex. Just plugging in a cable does not do the job. Because a 3270 terminal is designed to send screens of data instead of files, you will need several hardware and software tools to fool the 3270 system into thinking that it is sending screens of data when it is really sending files. The file transfer process includes such complexities as filtering out the control characters for the screen and the cursor.

When links were first established between the PC and the mainframe, the first product developed was a 3270 terminal emulation board. Software terminal emulation products such as VM Personal Computing's *Relay* series also emerged (see "Relay Strikes Gold," *PCW,* April 1986). Such programs require that a companion program be loaded on the mainframe. By mimicking the display attributes and keyboard idiosyncracies associated with a particular terminal, these hardware and software products fool the mainframe into thinking that it is communicating with a terminal.

However, 3270 emulation is never 100 percent accurate, no matter how the link is implemented. The shortcomings are usually minor, but they may be annoying. For example, you cannot toggle the <NumLock> key in terminal mode—you have to return to PC mode to change it. You may also experience initial discomfort with the 3270 keyboard mapping, because vendors take different approaches to the tricky job of emulating the 24 function keys of the 3278 terminal.

The question has often been asked, Why should I waste the computing power of a PC by making it emulate terminals? Cost considerations often favor buying low-cost terminals, which are especially appropriate if you communicate exclusively with the mainframe and only rarely require access to PC software (for example, in data entry applications). But for people who access a mainframe periodically, the ability to switch easily to PC-DOS applications makes the PC a better choice.

The Members of the 3270 Family

The members of the 3270 Information Display System include a wide range of terminals, control units, printers, and other equipment.

Terminals

3101 Display Terminal: A low-cost asynchronous monochrome terminal with 24 rows by 80 columns. The 3101 is not officially a member of the 3270 family, but it is emulated by PCs linked into the 3270 environment using asynchronous transmission.

3178 Display Station: Introduced in 1983, the 3178 was designed to replace the popular 3278, but so far it has a smaller installed base than its predecessor. The 3178 has a monochrome, 14-inch screen that displays 24 rows by 80 columns, and offers a choice of four keyboard layouts.

3179 Color Display Station: Displays eight colors (red, green, blue, white, pink, yellow, turquoise, and a black background) as well as high-intensity text, cross-hatching, reverse video, blinking, and underscoring. The 14-inch screen displays 24 rows by 80 columns. The 3179/G is a new "smart" model with vector-to-raster technology to reduce host processing.

3180 Display Station: A monochrome, 15-inch screen with four selectable formats: 1920 (24 rows by 80 columns), 2560 (32 rows by 80 columns), 3440 (43 rows by 80 columns), and 3564 (27 rows by 132 columns).

3277 Display Terminal: The original terminal for the 3270 environment. It is still in use today but is no longer produced.

3278 Display Terminal: The mainstay terminal in recent years.

3279 Color Display Terminal: Different models display four or seven colors with 80 columns by either 24 or 32 rows.

3290 Information Panel: A 17-inch flat plasma display capable of displaying up to 9920 characters, and up to four host sessions simultaneously. The screen can be partitioned and scrolled vertically.

Printers

3262 Line Printer: A stand-alone, stainless steel band impact printer with 132 print positions. It prints at 325 or 650 lines per minute with a 48-character print band.

3268 Color Dot Matrix Printer: A pedestal-mounted, bidirectional matrix printer that has 132 print positions at 10 characters per inch. The maximum speed is 340 characters per second.

3287 Color Dot Matrix Printer: A tabletop, bidirectional matrix printer that has 132 print positions at 10 characters per inch. The maximum speed is 120 characters per second.

Control Units

3274 Control Unit: The cornerstone of the 3270 network. Depending on the model, it can support 16 or 32 devices and is used for local and remote locations. The control unit supports the 3299 multiplexer and transmits from 2400 to 57,600 bps. All models support bisynchronous protocol and some also support SNA/SDLC.

3276 Display Station Control Unit: A less powerful control unit that can attach only seven additional devices. It does not support color. IBM is no longer enhancing this unit.

Multiplexers

3299 Terminal Multiplexer: A coaxial fan-out unit that connects devices to the 3274 Control Unit. Up to eight devices share one coaxial cable between the 3299 and the 3274.

Communications Controllers

3725 Communications Controller: Although the 3725 is not an official member of the family, remote 3270 networks would not be possible without it. It controls the data flow between terminals and the host.

Personal Computers

3270 Personal Computer (PC, /G, /GX): A custom IBM PC that has a variety of screen and keyboard options. It functions either as a local PC or as a 3270 terminal or color graphics workstation.

Recent developments in the micro-to-mainframe arena have transformed terminal emulation into the primary connection around which other link applications are developed. Now, you can use your PC as a terminal, perform file transfers between the PC and the mainframe, develop query procedures to extract data from the mainframe data base, and even use part of the mainframe disk storage as a "virtual" disk for the PC. (See "The Emulators" in this issue for a review of 3270 terminal emulation products, and "The Mainframe as Peripheral" for a comparison of virtual disk programs.)

Hot Links

Because the PC uses the asynchronous communications protocol, which sends data in a serial stream, and the 3270 network uses the synchronous protocol, which transmits in contiguous blocks of data, your micro-to-mainframe link may also require protocol conversion. In the typical local connection, a terminal emulation board in the PC transmits data in synchronous protocol at 9600 to 19,200 bits per second (bps) through a coaxial cable to a 3274 control unit that is channel attached to the host CPU (see Figure 1). If the PC does not have a terminal emulation board, it is hard wired (usually via an asynchronous RS-232C connection) into a device called a protocol converter, which emulates a 3274 control unit and is usually channel attached to the host CPU. In this configuration, the PC emulates an IBM 3101 asynchronous terminal and transmits data at 2400 to 9600 bps.

You can also connect to the network via a LAN gateway, in which the server on the LAN is attached by coaxial cable to the 3274 control unit. This setup provides 3270 access for all PCs on the LAN. Although the gateway can transmit at 9600 to 19,200 bps, terminal contention often results in slower speeds for an individual PC on the LAN.

In a remote connection, the PC may be attached to a 3274 control unit as in the local connection. In this case, the 3274 transmits over dedicated phone lines with synchronous modems to the 3705 or 3725 TCU (see Figure 2). Another option would be to use dial-up phone lines, in which the PC software emulates a 3101 terminal and transmits asynchronously directly to the TCU. Either a hardware or software protocol converter on the host CPU converts the asynchronous protocol into 3270 synchronous protocol to complete the link.

Adjusting to the 3270 Environment

You may experience psychological trauma in trying to adapt to the new 3270 environment—a feeling of being lost or a nervous tic. You know your PC, but now you can't see any red lights or hear your disk drive working. How ironic that the once-annoying disk drive noise could be a comforting sound. You don't know the tricks of the new operating system, and there are few how-to paperbacks in the mainframe world.

While you are working on the 3270 network, your PC's CPU is either dormant or doing some background processing. The biggest psychological adjustment is realizing that on the 3270 network, you no longer own your CPU or your data.

You may feel constrained by the mainframe security systems and resent the overprotective MIS managers keeping you from your data. Be patient.

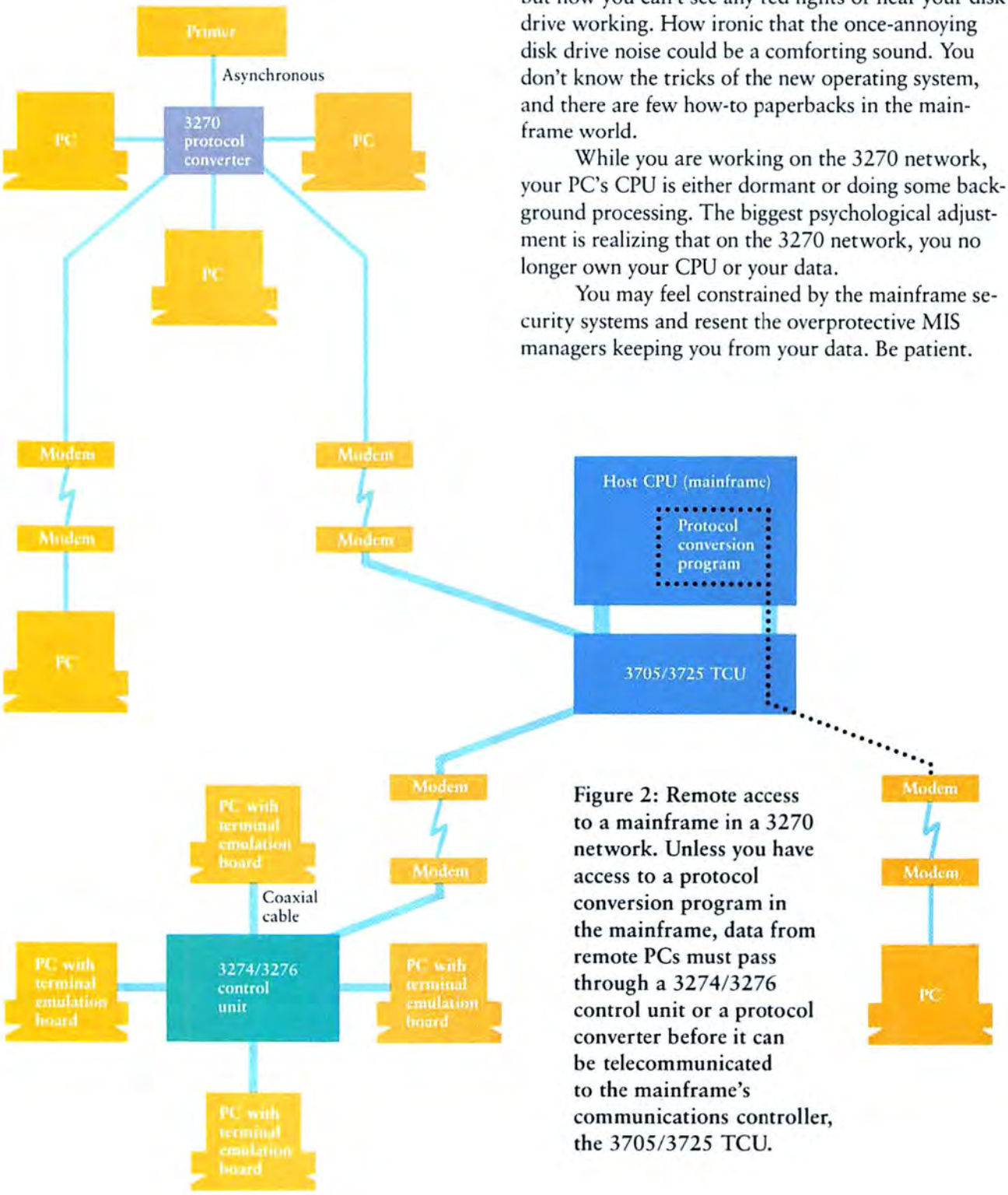


Figure 2: Remote access to a mainframe in a 3270 network. Unless you have access to a protocol conversion program in the mainframe, data from remote PCs must pass through a 3274/3276 control unit or a protocol converter before it can be telecommunicated to the mainframe's communications controller, the 3705/3725 TCU.

The MIS attitude improves after the micro-to-mainframe link has been working awhile. Eventually, you'll figure out the complexities of mainframe data bases and the process of extracting data, transferring it to your PC, and converting it into a usable form. One frustration a PC user does not usually experience is downtime, which is common in the mainframe world. With so many users and programs sharing the environment, system crashes always seem to occur just before you intend to save your data. To reduce the impact of these delays, you can enter text or data locally and transmit it to the mainframe when the system comes back up.

However, even when the 3270 network is up and running, you probably won't enjoy the subsecond response time that is typical of PCs. Response time on a 3270 network can vary from 1 second to 10 minutes. Poor response time is especially common from 9:30 to 11:30 a.m. and 1:30 to 3:30 p.m., the peak processing periods in most mainframe networks.

When you make a mistake on a PC, the effects are limited, but when you err as a member of a mainframe network, you may corrupt larger amounts of data and usually affect other network users. Say you intend to initiate a download of 100 records for a part number and then go to lunch. Instead, for the next 2 hours, while you are out having lunch, your PC downloads 543,000 records for the entire inventory. You saturate the network, slowing response time to 15 minutes. Having used an incredible amount of host CPU cycles, you also incur high charge-back billings from the MIS department.

The Future of the 3270 Network

Despite the impact of PCs, it is unlikely that they will replace all existing 3270 terminals. PCs and intelligent terminals are not needed for every application. Two such examples are data entry and simple query applications.

But PCs are changing the face of the 3270 environment. IBM may soon announce an upgraded 3274 control unit that will function as a server to a mainframe-type disk. The control unit is supposed to have enhanced intelligence and be able to accept direct asynchronous input from multiple PCs. This makes the 3274 controller look more like a LAN server with a direct gateway into the 3270.

More significantly, IBM recently announced an addition to its SNA network environment called LU 6.2 (see "Peering Into the Future With LU 6.2" in this issue). By creating a generic logical unit within all IBM systems and software, LU 6.2 offers several advantages in micro-to-mainframe file transfer and promises to bring peer-to-peer processing to a 3270 network. In such a system, any logical unit in the network, including PCs, could communicate directly with another, without turning over control of the session to the mainframe.

Eventually, LU 6.2 and future enhancements might break down the mainframe hierarchy, reduce the load of the mainframe, and negate the need for terminal emulation. More important, innovative software written for the new protocol would help mainframes and minicomputers to recognize the PC's intelligence and share some of their processing duties with the PC, leading to a true distributed processing system.

Several factors keep LU 6.2 from emancipating the PC, however. LU 6.2 is restricted to the SNA environment, which runs on only the larger 3270 networks. And not every application requires file transfer capabilities.

Even if LU 6.2 catches on and changes the PC's role in micro-to-mainframe communications, it won't happen soon. In the meantime, if you want to get at that mainframe data, you'll have to learn, adapt, and be patient with the mysteries of terminal emulation. ●

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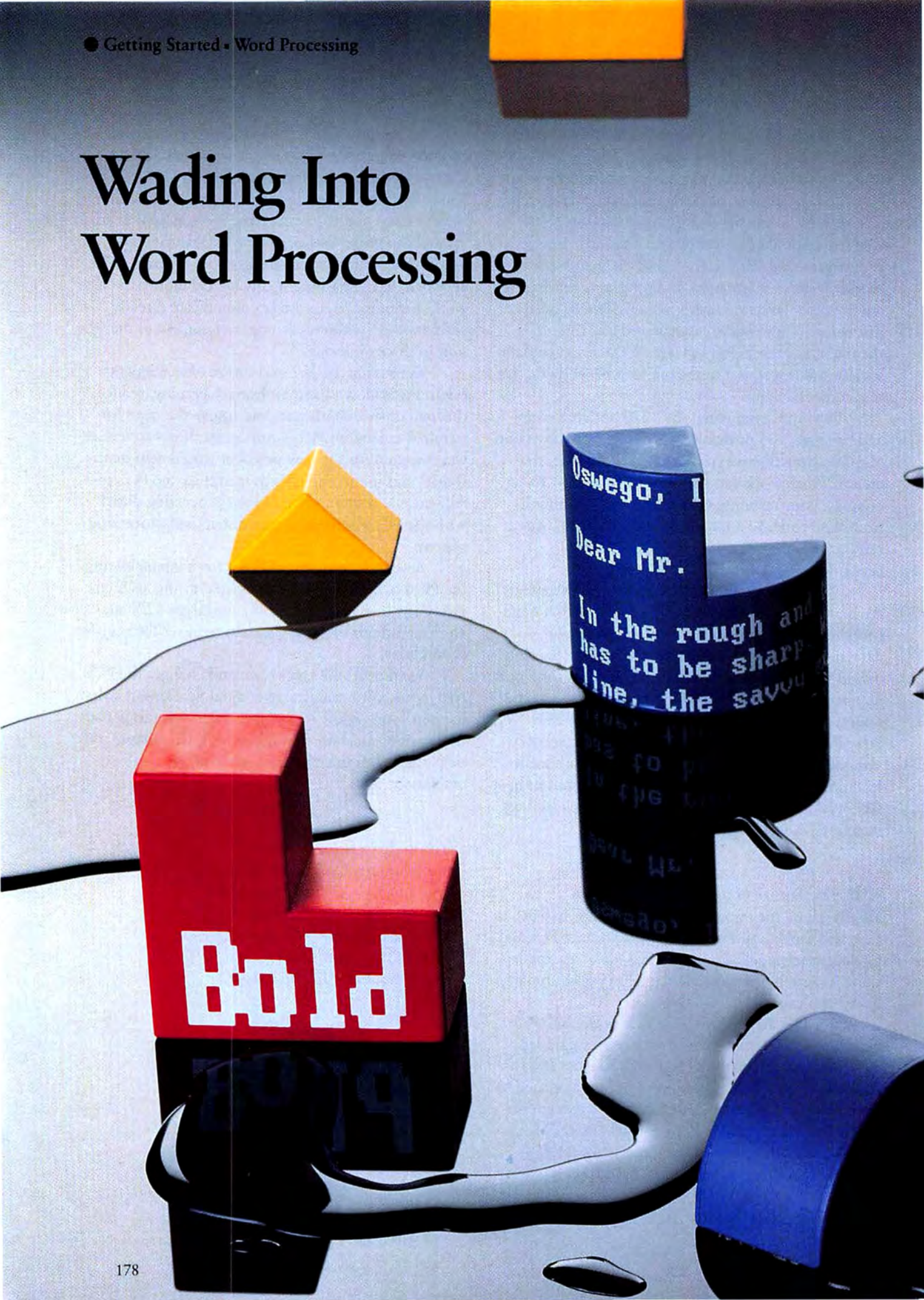
Wading Into Word Processing



Wading into the word processing deep end can be an exhilarating or intimidating experience. Will you plumb the depths or find yourself gulping for air? The following is a primer on how to keep your head above water with some powerhouse word processing features.

Robert Luhn

You've outgrown *pfs:write* and you're ready to move up. Or maybe you're new to word processing but are determined to forgo "easy" programs for something with more punch. The product names–*WordPerfect, WordStar 2000, THOR, Volkswriter Deluxe*–are enticing. The imagery of power, precision, even perfection, is irresistible. And the features–

Fred Stimson

windows that look into other files, style sheets, built-in outlining—are just the ticket for doing the annual report or building a business plan that will persuade Sevin-Rosen to part with some venture capital.

Although making the leap to Microsoft Word *or* WordPerfect *may seem akin to swapping a Cessna for a 747, a little familiarity will breed cozy dependence.*

Such word processing *miribilia* are not being concocted in some hush-hush Xerox lab. Most professional word processing packages come with many of these advanced features as standard equipment. Although making the leap to *Microsoft Word* or *WordPerfect* may seem akin to swapping a Cessna for a 747, a little familiarity will breed cozy dependence. This brief guide is intended to introduce some of the new features prevalent among top-of-the-line packages that are changing the face of word processing.

Writing in the PC Age

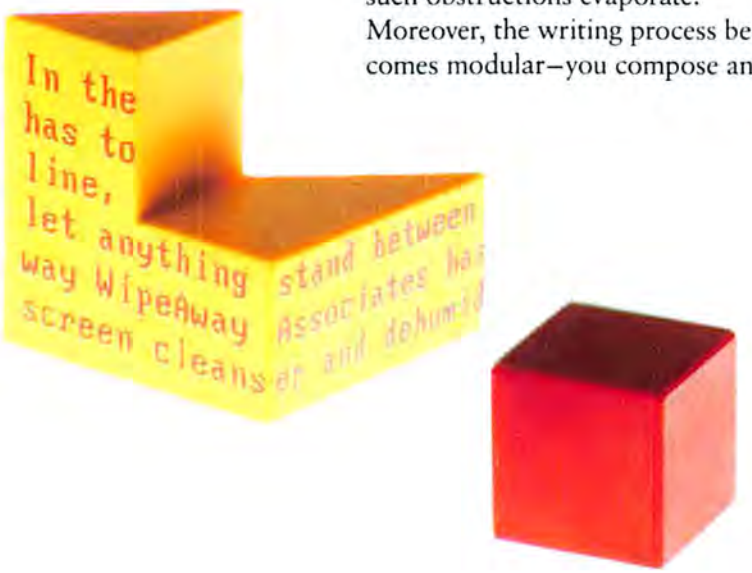
The quill was decidedly a word-oriented tool—dip the point into an inkwell, scratch out a few characters, and dip again. Well suited for contemplative screeds, perhaps, but not for generating stacks of reports, letters, or legal documents. The typewriter, which along with the photocopier unleashed America's paper fetish, is essentially a line-oriented device with all the attendant limitations. Speed and fluidity of composition are constantly hampered by the nature of the beast. You are forced to cope with a painfully slow process for correcting typos and the distracting rat-a-tat-tat of a typing element slapping a platen. Oh yes—the beast must be fed paper every 67th line, usually just when inspiration strikes. With the PC and word processing software, such obstructions evaporate. Moreover, the writing process becomes modular—you compose and think in blocks and paragraphs, and juggle them for maximum effect.

Until recently, accomplished word processing programs largely focused on making these basic manipulations easier. But writing involves more than zooming the cursor around or toting lumps of text from one place to another. Structuring ideas, collating research material, and formatting the appearance of a page are just as vital. Luckily, the new breed of word processing software greases these cogs, letting the windmills of your mind spin more productively.

Face to Interface

The old maxim "The first impression is the most lasting" has fresh currency among PC users. For example, when you climb into the *WordPerfect* cockpit, there's not much to hold onto: a blank writing area and a status line noting document name, page, and cursor coordinates. This spare writing environment is not unlike the blank page you roll into a typewriter—which may be either comforting or intimidating. Program commands are anchored to the function keys, alone or in combination with <Ctrl>, <Alt>, and <Shift>; menus are largely absent, program prompts minimal, and on-line help present only when summoned.

An opposing school of design believes the more help the merrier. With programs such as *WordStar 2000*, you flip through menus and

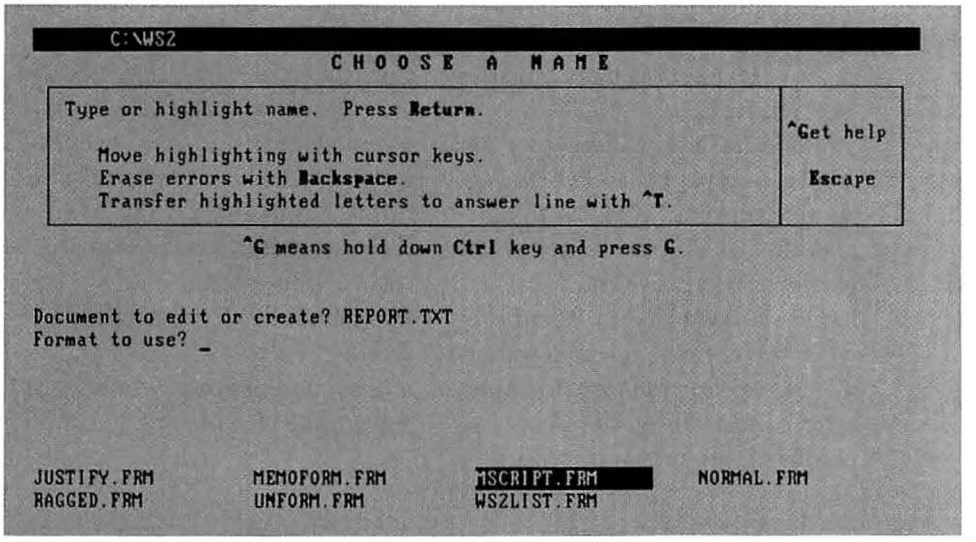


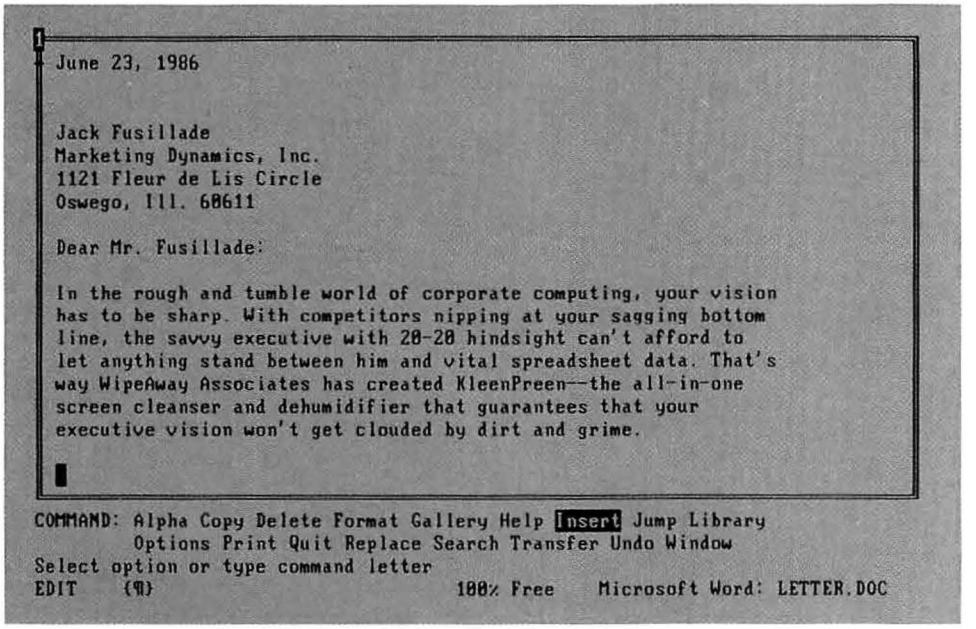
pick commands; the learning experience is continually buttressed with copious on-line advice. Although such hand-holding is useful in the early days of learning a powerful program, plowing through menus every time you need to move a block of text does get tiring (see Screens 1 and 2).

Compromises between these design philosophies abound. *Microsoft Word*'s lean editing slate shares a portion of the screen with a *1-2-3*-like menu and prompt line. Many programs give you the option of selecting commands from a menu or issuing them from the keyboard. And some programs allow you to suppress menus and program prompts as you gain expertise.

Bold Is Bold!

Whatever set of controls you choose to grapple with, chances are you'll like one feature that's considered de rigueur among high-end word processors: WYSIWYG—what you see is what you get. In other words, displayed documents resemble their printed counterparts. Older programs often displayed only true-to-life





Screens 1 and 2: Beauty is in the eye. WordStar 2000 supplies the user with copious menus and prompts, while Microsoft Word devotes four lines to command and document information.

line spacing. Not surprisingly, getting a document to look right sometimes took several printouts—a page might not break in the right place (stranding a heading at the bottom of a page), or an entire paragraph (instead of a word) would print out in boldface.

The new clan of potent word processors extends the concept. If a phrase is marked bold, the text appears brighter on screen; underlined text is underscored; and with some programs, such as *Microsoft Word*, italic text leans to the right like its printed peer. *Microsoft Word* even displays small capital letters, double-underlined text, and subscripts and superscripts (see Screen 3). On a PC with a color monitor, such enhancements may be automatically assigned colors.

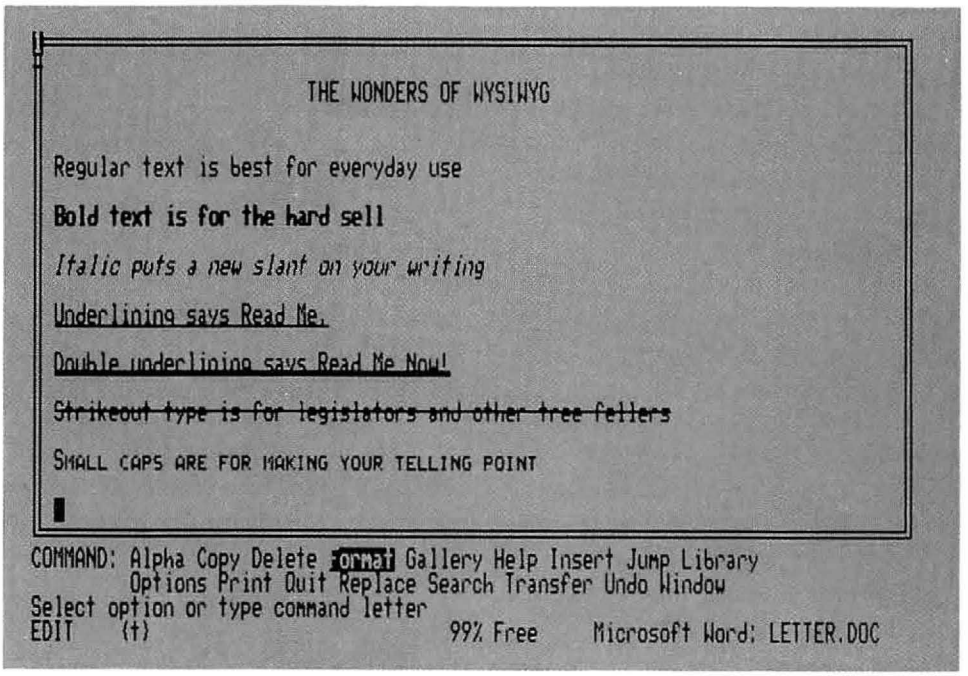
Windows on Word Processing

"Does it do windows?" is one of the first questions people ask about a new word processor, followed quickly by a peek at the price tag. Advertising hyperbole aside, windows provide a handy way to look at several files at once. Opening a window means splitting the screen into two or more horizontal or vertical partitions. Some programs enable you to do more than simply view another file—you can insert additional text or swap text between documents (see Screen 4).

If nothing else, windows let you spread your papers and notes out on an electronic "desk" without making a mess. For example, on a particularly creative day you might sit down at your PC and write key phrases, opening statements, executive summaries, and miscellaneous insightful paragraphs for an upcoming report. The next day you could sketch out an outline, and later still, begin work on the formal body of the report. The notes, outline, and report are each relegated to separate files. As you write the report, you can open a window on the outline and refresh your memory on structure, then open a notes window and pull in material written the previous day.

The number of possible open windows depends on the largesse of the program at hand. *Microsoft Word* generously sets the limit at nine; *WordStar 2000* confines windows in use to three. The latter is a more logical and manageable number. At *Microsoft Word*'s theoretical limit, equally sized windows would each own 8 square inches of the screen—barely enough to display a handful of words.

Even with a dozen windows on screen, the chances of falling



Screen 3: Ital is ital! A sample of how closely Microsoft Word's screen display approximates the printed page.

down an electronic rabbit hole are slim. Navigating from window to window is generally foolproof because the cursor is always in the active window and never hidden by another window. Closing a window is the same as closing a file: changes can be saved or not.

Sizing windows is similarly straightforward once you get the hang of it. *WordStar 2000* simplifies the process for the user by fixing window size and splitting the screen at set locations. *Microsoft Word*, however, enables you to open a window full screen or just a crack and partitions the screen horizontally or vertically wherever you place the cursor.

Be sure to consider how closely a program's approach to windowing jibes with your work habits before you buy. For some people, viewing two files at once is distracting. *WordPerfect*, for example, offers the option of flipping between two full-size windows; you could display a report and then, with the touch of a key, replace it with an outline. For other people, the option of vertically bisecting the screen is more appealing (although it's not a highly recommended practice, since an entire line of text cannot be seen in either window).

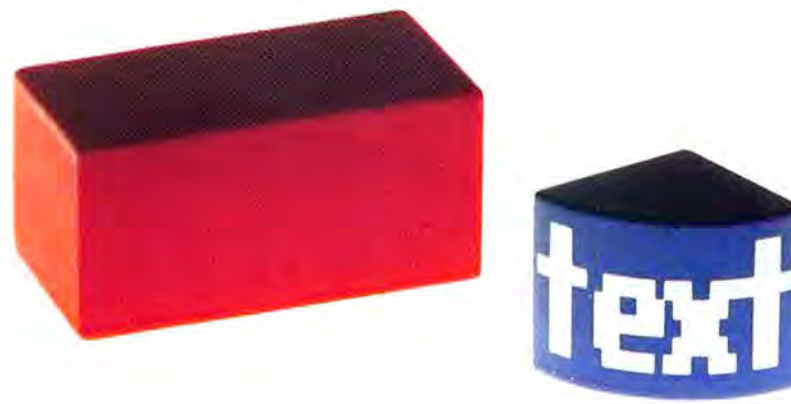
Keep in mind that windows can also look into different parts of the same file—a convenient way to keep tabs on a large document. Some programs, such as *Microsoft Word*, allow you to swap data between these internal windows, while other programs (notably *WordStar 2000*) enforce a "look but don't touch" approach.

The beauty of the Microsoft Word *approach is that once a document is formatted with a style sheet, it can be globally modified in a few seconds.*

Formatting With Style

Forms are the backbone—and some say, the bane—of the modern office. Forms abound for health insurance, sick leave, supply requisition, repairs—in short, for almost anything under the bureaucratic sun. Business documents—letters, memos, marketing reports, and so on—all follow established layouts. When *WordStar* ruled the word processing roost, document layouts could not be created once and then used over and over again like a template. Writing a report meant formatting it on the fly. If a citation had to be single-spaced and centered on a page, you had to issue a gaggle of individual commands. The rise of macro processing programs such as *ProKey* and *SmartKey* greatly reduced these keyboard gymnastics, because a string of commands could be stored and issued with one or two keystrokes.

One of the most significant developments in document formatting is the *style sheet*, which is a collection of macros that control the look and placement of a line, a paragraph, a page, a table, or an entire document as embodied in margins, indents, spacing, page length, columns, character fonts, and so on. With style sheets, formatting specifications can be stored, retrieved, and superimposed over the documents you create.



As with windows, style sheets are implemented in varying ways. In keeping with its solicitious nature, *WordStar 2000* provides six formats designed for creating business letters, memos, proposals, and manuscripts. For example, to write a memo, you would open a new file and select *WordStar 2000*'s memo style sheet. This format is laid over the blank editing screen and inserts standard headings (To:, Fr:, Date:, and Subject:) and automatically single-spaces and right-justifies any entered text. To create a custom style sheet, the program poses 13 format questions covering everything from line height to page number placement; *WordStar 2000* then generates the appropriate style sheet.

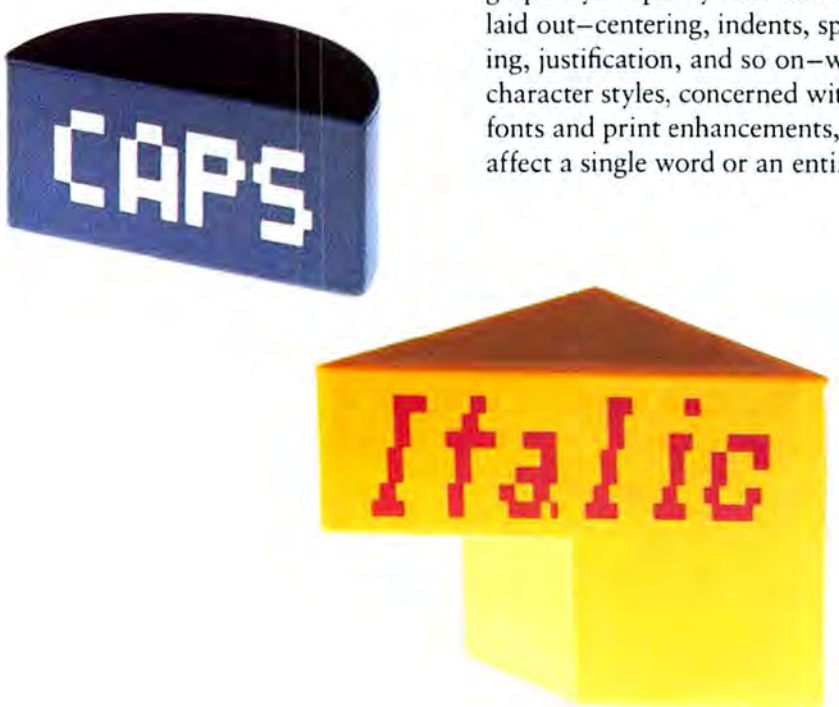
Microsoft Word represents a different approach to style sheets. Instead of pouring words into a mold à la *WordStar 2000*, you can create a document first, attach a style sheet, and then tailor the text. (See "Getting the Word," *PCW*, Vol. 2, No. 4 and "Dress Up Your Documents," *PCW*, September 1985 for more information on *Microsoft Word* style sheets.)

The outline is project management for the writer—a tool for succinctly organizing a series of thoughts, tasks, or procedures.

A *Microsoft Word* style sheet is programmed for different elements in a document. A division style controls the look of a page, handling such issues as page length, margins, and footnote and page number placement. Paragraph styles specify how text is laid out—centering, indents, spacing, justification, and so on—while character styles, concerned with fonts and print enhancements, can affect a single word or an entire document (see Figure 1). Each style is labeled with and triggered by an <Alt>-*key* combination. For example, <Alt>-SB could be programmed to single-space a paragraph, center it on the page, and make text bold. Issuing <Alt>-SB at any place in a paragraph in the document effects the change and tags it with this control sequence.

Designing a style sheet is relatively easy. Consider the steps involved in creating a simple invoice. The invoice's address block containing customer name and address is single-spaced, two lines from the top of the page, and indented five spaces. This information is considered a paragraph format and might be labeled <Alt>-CU. On the same line as the customer name but flush to the right margin is the date in mm/dd/yy format. This format is labeled <Alt>-DA. The phrase "Customer Invoice," which is underlined, boldfaced, and centered on the page nine lines below the address block, is labeled <Alt>-TI.

The beauty of the *Microsoft Word* approach is that once a document is formatted with a style sheet, it can be globally modified in a few seconds. For example, if you want to change bold text to italic in paragraphs tagged with <Alt>-SB, you don't have to open the document and change every occurrence of <Alt>-SB. Merely display the style sheet, redefine the attributes linked to <Alt>-SB,

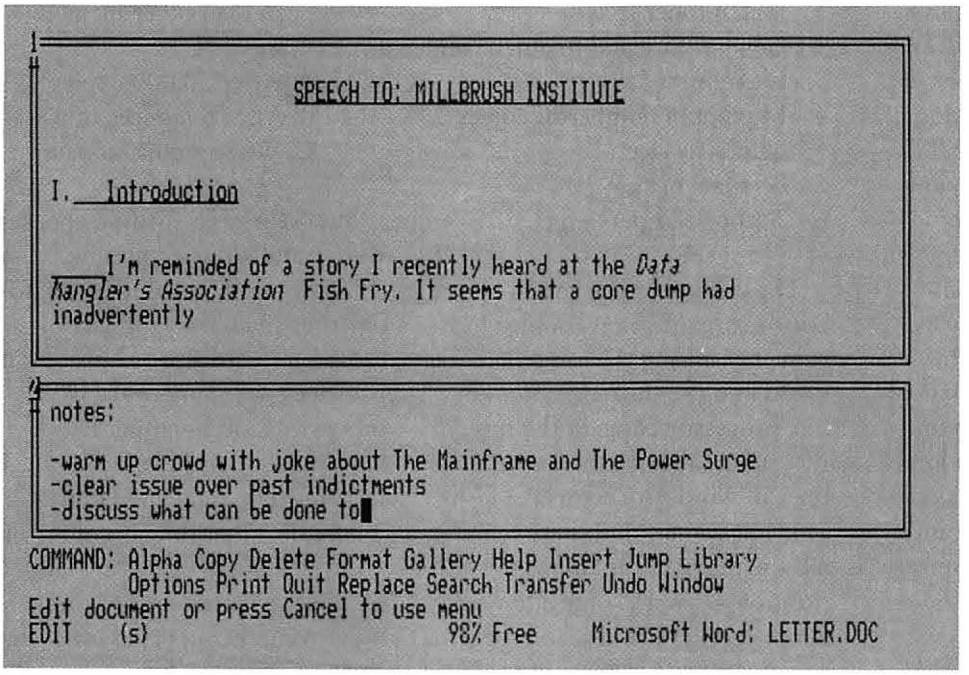


and the change flashes throughout the document. Better still, you can create a document under the aegis of one style sheet and print it under another. Once you build a library of style sheets, you can change document formats as easily as trying on a new coat.

If nothing else, style sheets force you to structure document design. As you tap the other capabilities of a powerhouse word processor—multiple columns, footnotes, and fonts—style sheets become nearly indispensable.

Hatching Ideas

The outline is project management for the writer—a tool for succinctly organizing a series of thoughts, tasks, or procedures. Most of us learned outlining in school with pen and paper, which tended to rigidify ideas rather than allow them to flow unfettered. Word processors eased the technique some, but since they're primarily designed to manipulate text and not ideas, they naturally fall short. Hence the healthy sales of outline processors from *ThinkTank* to *MaxThink*—which enable you to expand and collapse outlines and quickly reorder items—



Screen 4: Windows enable you to look into other files and swap data between documents. In the top window a speech is being written while notes are referenced in the bottom window.

```
1 L Division 1                                    Columns
      Page break. Page length 11"; width 8.5". Folios
      Arabic. Top margin 1"; bottom 1"; left 1.25"; right
      1.25". Top running head at 0.5". bottom running head
      at 0.5". Footnotes on same page.
2 H Paragraph 1                                   Headlines
      HELV (modern i)  12. Flush left.
3 T Paragraph 2                                   Basic text
      TMSRMN (roman a) 12. Flush left.
```

Figure 1: A Microsoft Word style sheet. The column of numbers on the far left notes sequence of entry; the letters L, H, and T are <Alt>-key labels assigned by the user. You can specify whether the style is for a division or a paragraph and append a short comment (Columns).

and the continued success of *Framework*, one of the first major integrated programs to embrace the outline metaphor.

Canny developers of professional word processing packages have not shut their eyes to this profitable phenomenon. Rudimentary outline processors are already sneaking into camp. *WordPerfect*, *WordStar 2000*, and *Volkswriter Deluxe*, among others, offer some form of outlining, often in the guise of generating a table of contents or an index. Though none offer the versatility of *ThinkTank*, all can automatically number indented phrases in the traditional I.A.1.a.(1)(a) fashion and renumber an entire outline if you move or delete a section. Some programs, notably *WordStar 2000*, also feature manuscript, compound, and legal outline styles.

Microsoft Word version 3.0 was one of the first programs to incorporate a relatively powerful outline processor. You can randomly jot down whatever thoughts come to mind and with the program's finely honed cursor commands cut, paste, and generally rearrange ideas in record time. Better still, you can insert text between outline headings; if the heading moves, its annotations follow.

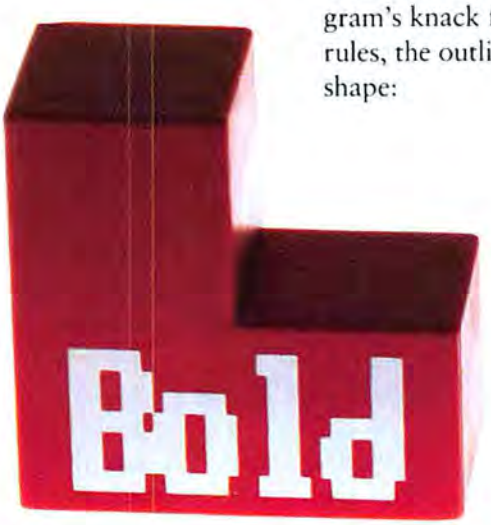
Word 3.0 may not be up to planning a project (see "Project: ThinkTank," *PCW*, November 1985 for such an application), but it's helpful in planning a report or even a memo. For example, you might start an outline thusly:

0 OFFICE COPIER MEMO
1 Watch toner level
2 General care and maintenance
3 Cleanliness
4 Maximum number of copies before service
5 Personal use
6 Authorized personnel

The essential ideas are in place, but the organization could stand some reworking. Here's where the speed and the shortcuts of an outline processor come to the fore. Instead of laboriously rearranging lines in word processor-like fashion, you can point to item 6 and tell the program to "move this to position 1." With some additions, a few deft keystrokes, and the program's knack for imposing some rules, the outline begins to take shape:

I. Authorized personnel
   A. Secretarial staff
   B. Sales personnel
   C. Department heads
   D. Advertising dept.
II. Personal use
III. General care and maintenance
   A. Watch toner level
   B. Cleanliness
      People are leaving all kinds of junk around the machine. A clean area is a happy area. Offenders will be forced to read other memos.
IV. Service calls
   A. After 50,000 copies
   B. After 6 months of use
   C. When smoke appears

Two years ago spelling checkers were stand-alone programs. Though hardly revolutionary, today they're an integral part of most competitive word processing packages. Contemporary word processors, on the other hand, have yet to include an outlining feature comparable to *ThinkTank*'s, but that time is not far off.



Of Macros and Merges

Mail merge programs, like spelling checkers, have been with us for several years. But these humble utilities, once barely able to combine names and addresses with form letters, are acquiring a dollop of intelligence. For example, *Microsoft Word*'s Print Merge includes programming-like statements ("IF Income>50,000, INCLUDE Document2") that can sift data, ask the user questions, and respond with formfit letters and boilerplate documents. *Word-*

Perfect's merge function lacks these conditional statements but is clever enough to extract data stored in several files, perform calculations (to determine hours worked overtime or average income), and print out different reports based on the extracted and collated information.

Feet First

Since its earliest days, word processing has hovered between typing and typesetting, but a move is on. The ascendance of style sheets, windows, and outlining signal a fundamental shift in the orientation of word processing. The emphasis is no longer limited to manipulating words but now focuses on the page and even the document.

Hand-holding is useful in the early days of learning a powerful program, but plowing through menus every time you need to move a block of text does get tiring.

Although mail merge programs have often been intimate partners with word processors, macro processors were afterthoughts—and a means of enhancing a program or overcoming its deficiencies. But macro processing is now an increasingly common option on word processing menus. Capabilities naturally differ from program to program. As noted earlier, style sheets (a variation on the theme) are mostly confined to formatting commands; while key glossaries, as they're often called, can provide many of the functions of a *ProKey*, such as inserting swatches of text or playing back program commands. With *WordPerfect*, macros and mail merge functions judiciously unite. *WordPerfect* macros can not only conduct a series of merges but also work like errand boys, fetching text from files engaged in a merge.

In the meantime, don't hesitate to take the plunge. You can learn to paddle around in the deep end in short order; with a little effort, you'll find the water's fine.

Robert Luhn is an Associate Editor for PC World.

Microsoft Word 3.0
Microsoft Corp.
16011 N.E. 36th Way
Box 97017
Redmond, WA 98073-9717
206/882-8080
List price: $450

ThinkTank
Living Videotext
2432 Charleston Rd.
Mountain View, CA 94043
415/964-6300
List price: $195

Volkswriter Deluxe
Lifetree Software, Inc.
411 Pacific St.
Monterey, CA 93940
408/373-4718
List price: $295

WordPerfect 4.1
Satellite Software Int'l
288 W. Center St.
Orem, UT 84057
List price: $495

WordStar 2000
MicroPro Int'l Corp.
33 San Pablo Ave.
San Rafael, CA 94903
415/449-1200
List price: $150

AST's Multifunction Success Story

AST Research doesn't fit the PC industry's success-story mold; its three founders are neither hard-boiled venture capitalists nor enfants terribles. They're low-profile engineers who mind this high-quality operation themselves and aim to keep things that way. What lies ahead may test that resolve.

Kathleen Mackay

Just when you thought you were safe from any more "business on a shoestring begets hi-tech empire" stories, here comes another one—with some interesting twists.

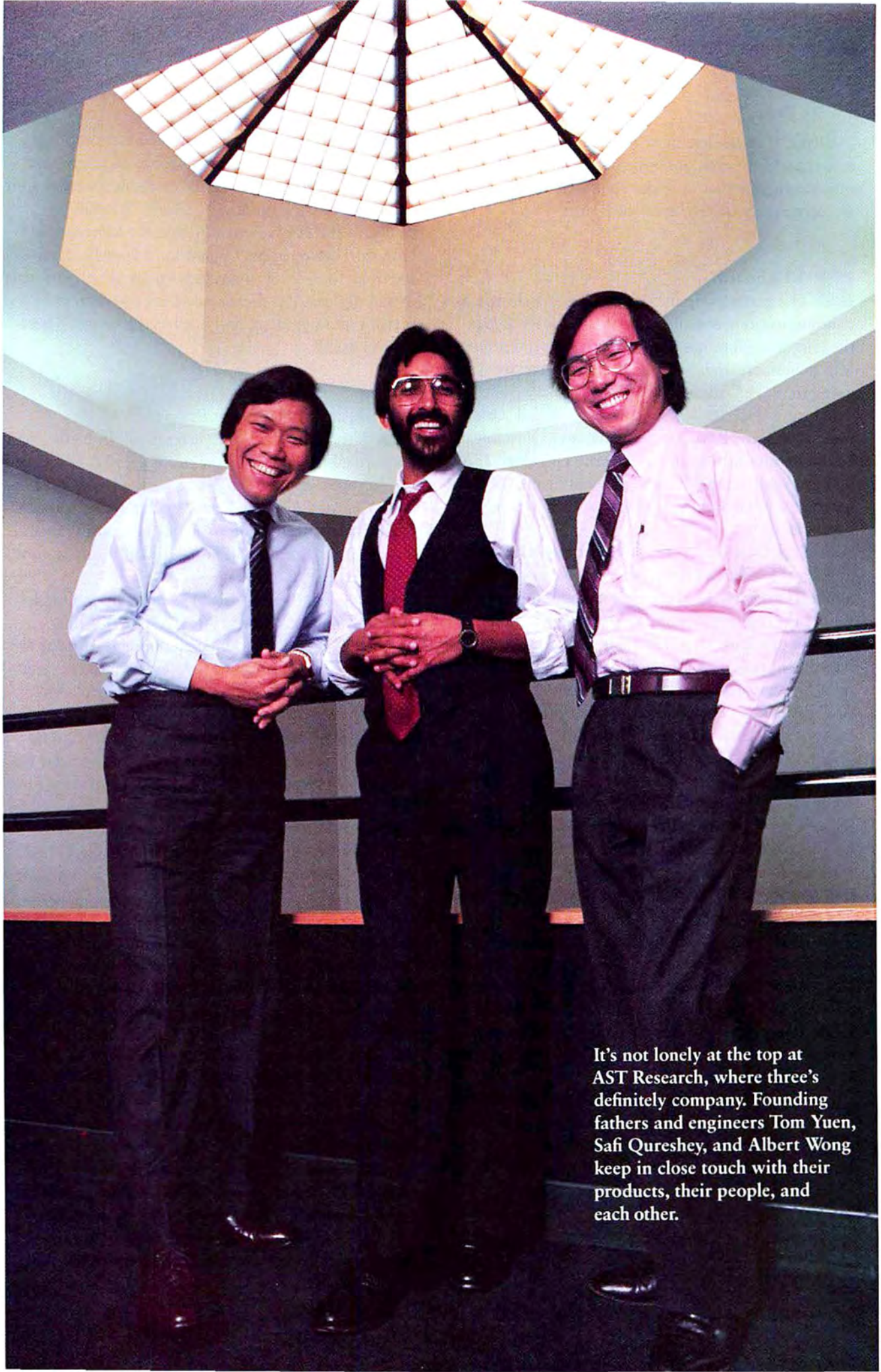
The year is 1975. In Orange County, California, Tom Yuen, 24, and Albert Wong, 27, both from Hong Kong, share student digs while attending junior college. The two splurge on an occasional Saturday night on the town; Yuen drives a Ford, Wong, a Honda. Both look forward to a future in engineering. After graduating from the two-year college, Wong transfers to a nearby state college, and Yuen chooses a local branch of the University of California. But the friends keep in touch.

The scene shifts to 1978. Yuen and Pakistan native Safi Qureshey, both 27, work as design engineers at Computer Automation, a minicomputer company in Orange County. Over brown-bag lunches, they confess to feeling stymied in their careers and dream of forming a company of their own. Perhaps Yuen's former roommate, Albert Wong, would be interested ... But what kind of company can come of an association of three rookie engineers who have negligible management experience, no business plan, and a bare-bones budget?

A very hot one. Eight years later the three partners' company—AST Research—has proven itself a major force in the computer industry. At a time when many high-tech firms face layoffs, cutbacks, and heavy losses, AST reported a 262 percent increase in net income for the first fiscal quarter of 1986—a figure that puts the firm among the fastest-growing publicly held companies in California.

By dint of quality work, smart merchandising, a coherent product strategy, and a dash of moxie (invariably well timed), AST has managed to capture some 40 percent of the expansion board business, shake up a few industry habits and standards, and break cleanly into new markets.

At the ripe age of five, AST is embarking on a return to its roots in data communications. That sentimental journey figures once again to be perfectly timed, coinciding with a softness in the multifunction board trade (owing to the abundance of PCs saturated with cheap memory). But even with its solid reputation, market presence, and brimming product line, AST may find the coming eight years no less a



It's not lonely at the top at AST Research, where three's definitely company. Founding fathers and engineers Tom Yuen, Safi Qureshey, and Albert Wong keep in close touch with their products, their people, and each other.

Judy Lane

challenge than its first eight. The company's mission is to transform its technophile image into one befitting a company that provides solutions in the form of an increasingly diverse array of wares.

All Aboard

The partnership initially hung out a shingle as a communications consulting company. After a year, the trio decided to use a small capital reserve to move into manufacturing. "We didn't know what we were going to make," admits Wong.

Enter Goliath and an idea that clicked. One night in August 1981, Yuen, Wong, and Qureshey held a marathon session to settle on a product. IBM had just released the PC, and the significance of the machine's open architecture was not lost on the partners.

Says Qureshey, "We looked at the PC's expandability—it felt like a pretty safe risk. We knew that application software always wants more memory." Before the night was over, the partners had abandoned a previous proposal and opted to make enhancement products for the PC. Using the initials of their first names—Albert, Safi, and Tom—they formed AST Research. (They rejected the various permutations of their last names as "too weird.")

AST's first home filled 800 square feet in Irvine's Skypark Circle—a breeding ground for start-up companies. In front was the company office, at the back, a small manufacturing operation. Each partner had his bailiwick: Qureshey took charge of administration; Yuen, marketing and sales; Wong, engineering. Members of Wong's family rolled up their sleeves and helped assemble boards.

The responsibilities still line up essentially the same way. As AST president, Qureshey oversees company operations. Yuen is executive vice president of strategic planning and new business development, while Wong serves as executive vice president of advanced technology development. There is a real sense of collegiality among them.

But some significant changes have ensued since the days of brown-bag lunches and improbable plans. AST products are omnipresent, with roughly 1 million having found their way into, or next to, PCs; half of that million are SixPakPlus multifunction boards. PC and Apple II owners can select from some four dozen different products, and the catalog fattens a bit with each passing month. Yuen and Wong have traded in the Ford and the Honda for Mercedeses; Qureshey swapped his Datsun for a Porsche. Each of the three founders is today reportedly worth upwards of $14 million. But there's not a rock festival impresario among them, and back at the store it's business as usual.

Business, Not Show Business

Although "the store" itself is still in Irvine, AST corporate headquarters now occupy 230,000 square feet in three separate buildings, with international facilities located in Hong Kong, England, and Canada. Earlier this year, the company began scouting in and around Irvine for an additional 300,000-square-foot manufacturing facility.

Sales in 1985 topped $138 million, and the Irvine staff numbers nearly 700. Despite this phenomenal growth, the founders themselves appear to have kept all six feet on the ground. There's no indication these meteoric successes think they're the whole show.

Says Wong, "Early on we realized we had no experience in running a company. For day-to-day operation we brought in the pros." AST's top team today includes MBAs, industrial managers, and quality control and sales personnel from companies like Arthur Andersen, Beckman Instruments, and Hughes Aircraft—professionals like Bruce Edwards and Tom Stickel.

Edwards, vice president of finance, was controller/treasurer of Amdax, a local area network supplier, before joining AST. Stickel, recently promoted to senior vice president of sales, logged 20 years of marketing experience with firms like Beloit Corporation and Ingersoll-Rand. Other members of the inner circle include Don Williams, managing director of AST Far East, and Leo Beaulieu, vice president of manufacturing. And there's also Bob Kutnick, visionary and strategic planner who was the brains behind *Ovation,* the ballyhooed integrated product that never made it to market. Kutnick, director of strategic products, has been the driving force behind AST's moves in the expanded memory and software bundling arenas.

AST's unassuming, no-nonsense style carries through to its products, foremost of which are the

George Stemmet

On the front lines, three pillars of AST's success. From left: Tony Paradiso, Leo Beaulieu, and Mark Stieglitz.

top-selling SixPakPlus and RAMpage multifunction boards. The company seems to have an aversion to flashiness, as if acknowledging that even today performance and dependability could be sacrificed on the altar of glitz. AST's unobtrusive add-ons are tucked inside the PC where you forget about them—they silently expand your work space or bolster your graphics capabilities or enable you to converse with other systems and other users.

But these low-gloss products have put quite a sheen on the AST name. The company's reputation as a quality manufacturer spread quickly through the industry in the early days. "IBM had its own memory board and serial products," says Qureshey. That presence didn't deter users and dealers from rallying behind an upstart capable of delivering first-rate products on time. Adds Qureshey, "Buyers went to ComputerLand looking for AST rather than to IBM Product Centers"—and IBM took note. Opting for strategic hospitality, IBM invited AST to sell its boards through the Product Centers. That invitation, according to Qureshey, signaled a "stamp of quality approval" for AST.

Mark Stieglitz, AST's director of resource-sharing products, attributes the company's leading position in the market to a tightly focused product

line: "We don't get hung up on raw technology but seek to understand why someone wants something, and perhaps take a little longer to get there with a product."

Generation or Stagnation

Ironically, the phenomenal success of AST's board-level products poses a potential obstacle to the company's continued growth. Explains AST senior product manager Tony Paradiso, "Any time the majority of business comes from one area, there are dangers. We are not going to ignore multifunction and memory boards—they will probably always supply us with the majority of our income—but we want to become strong in other areas so if we were to lose some market share in the multifunction area, the company would not suffer significantly."

Embarking from the multifunction board arena to uncharted waters naturally implies risk, but AST appears ready to assume the challenge. Says Kutnick, "The founders are willing to test the unknown, believing that once a product works, it will define its own profitability."

Adds Paradiso, "You have to sell a lot of boards to become a billion-dollar corporation, but you don't have to sell as many printers or other peripherals to reach that mark. It's a formidable task, but this is the time—we have the recognition and the resources." Indeed, with the price of memory falling through the floor and PCs everywhere pushing their memory limits, diversification looms as an increasingly attractive and necessary option.

AST shows no sign of mincing steps en route to the billion-dollar club; with the financials looking good, the company is now facing the build-or-buy decisions common to thriving ventures. Says Yuen, "An acquisition has to work, not simply be done for the sake of increasing revenue or growth. It must conform to our culture." That attitude is, in Yuen's words, "strategic" rather than "tactical," emphasizing the long term rather than any temporary market advantage. AST tipped its hand earlier this year, buying both a neighboring firm and instant stature in the minicomputer enhancement market. AST's acquisition of Camintonn Corporation, a Santa Ana developer of memory expansion devices for DEC minis, exemplifies Yuen's dictum. (AST may know whereof it acquires: Early on, the company bought a DEC mini to keep track of its own business.)

As the company grows, its real strength may lie in the continued ability to design and package pieces that work together—constellations of products, with one star added at a time. While not every AST product complements every other, the company has demonstrated an uncanny knack for creating solutions rather than technological quick fixes.

Last year's announcement of the AST Resource Sharing Network (RSN)—a faster, less expensive alternative to IBM's Token-Ring LAN—is a case in point. RSN was preceded by the company's release of Colossus, which combines a 74MB hard disk with a 60MB tape backup, an ideal local area network file server. Major follow-on products include a high-end laser printer and LAN-to-mainframe gateways. The in-house buzzword is "connectivity"; the practical result is products that mesh. The hard disk supplements the LAN, the LAN works in league with the laser printer, and so on down the product line.

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In this cautious way, say both Stieglitz and Paradiso, AST can broaden its scope without undue risk. "AST is conservative," Stieglitz observes. "Building Colossus enables us to understand how to make a powerful, reliable disk subsystem." Ditto for the firm's laser printer. Says Paradiso, "We're trying to understand markets better. We first must build the recognition that we're a viable printer company, viable beyond the board level."

ASTute Timing

In high-tech ventures, as in stand-up comedy, timing is crucial. The founding fathers of AST are not looking to challenge Steve Martin or Robin Williams, but in their impeccable sense of synchronism, which has contributed in no small measure to the company's success, they are either very lucky or very astute. They have repeatedly predicted market requirements and responded with what the market was looking for. How do they do it?

Each time IBM announces a new product, "We look at its purpose, its delivery date, and its price," says Qureshey. "Our management examines what IBM is saying, and we ask ourselves, 'Do we agree?' We don't use market research focus groups, but we have several hundred PCs within AST and analyze how they're being used here."

In high-tech ventures, as in stand-up comedy, timing is crucial. In their synchronism, AST's founders are either very lucky or very astute.

And AST does not always agree with Big Blue. When the PCjr was announced, Qureshey remembers, "We had difficulty positioning the machine. We decided not to make any products for it for a year." Lucky or astute? At some level it doesn't matter.

AST's entries don't simply ape IBM's. Consider Legacy, the board that mimics IBM's Enhanced Graphics Adapter—and also supports three other graphics modes. Or its NETBIOS Option, which emulates the IBM NETBIOS on both IBM's PC Network and Token-Ring, thereby making IBM network compatibility virtually a commodity in itself—and, not coincidentally, placing AST at the forefront of LAN standards efforts.

There's that timing again. AST's moves in networking and data communications parallel (perhaps even anticipate) the general growth in linked PCs. "Users are returning to the market for the next level of performance," asserts Qureshey. "The key thing now is to share information and resources." Figures back him up: AST's sales of data communications products grew by 210 percent in 1985. The team's commitment to communications is epitomized in the micro-to-mainframe and micro-to-mini offerings, notably its SNA/Cluster and BSC/Cluster—boards that spare you from having to shell out $25,000 for an IBM 3274 cluster controller that links groups of PCs or terminals to a mainframe.

Fast Friends

Quick response is also an AST watchword. As soon as management is convinced that a proposed product has value, says Wong, "We form specialized task groups. Ten percent of our staff are engineers. We can react very quickly." To wit, the Advantage board took only ten weeks from conception to market; the AST 5250 micro-to-mainframe board took three months. The RSN announcement followed IBM's unveiling of its Token-Ring but hit the market before Big Blue's LAN.

Beaulieu attributes the company's good timing and good fortune in good part to a combination of carefully tended supplier relationships and domestic manufacturing. (AST now does 85 percent of its manufacturing in Orange County; offshore locales turn out products exclusively for foreign consumption.) "We work closely with [our suppliers]," says

George Steinmetz

Hands-on has top priority at AST, where each product undergoes six to seven levels of quality testing.

Beaulieu. "We are partners. And with domestic manufacturing, we have the flexibility to move fast."

Wong agrees that the supplier relationship is key. "We know how fast our vendors can respond," he attests. "We draw a safety margin so that our inventory doesn't get too low." The company appears to have refined inventory balancing to an art: AST turns over its inventory 5 or 6 times annually; the industry average is 2.4 times a year. This stock-on-hand legerdemain approaches the masterly Japanese technique of *kanban*—just-in-time—inventory control.

Wong is not particularly worried that size and success will impede the company's efficiency, and he notes that AST is resolved to maintain selectivity amid product quantity. "We understand what made us successful. Our task groups are very focused; we will continue to have a limited number of products rather than become too scattered."

"Limited" in this case means juggling 40 or so offerings for a variety of general-interest and niche markets; it also means AST won't stray from its fundamental orientation as a peripherals house—from what Wong describes as "enhancement products." In other words, AST has no plans to clutter the shelves with its own PC-compatible computers. Continues Wong, "We're not going to make a PC. We could; not doing so is a conscious decision. You have to decide what you want to be, what extra value you can contribute, what high performance IBM or Compaq does not already bring."

'We're not going to make a PC. We could; not doing so is a conscious decision. You have to decide what you want to be, what extra value you can contribute.'

While continuing to focus on what it does best, AST maintains a lookout for strategic alliances, particularly those that contain the seeds of a solution for PC users. In a recent marketing maneuver, the manufacturer began bundling *SideKick* from Borland International with its SixPakPlus, Advantage, and RAMpage boards.

Good Goods

While engineers need not be marketing naifs, they do remain engineers. When they're at the helm of a company, as at AST, it means that the people in charge are involved with the development and production of the goods. According to Kutnick, "AST's founders truly understand the AST products," because it's the product that's on the line instead of the ego. "I'm free to state my opinion about whether I think something will work or not, and they listen."

From the outset the founders have sought the best available advice. Although their engineering backgrounds gave them an initial edge over garage shop outfits run by hobbyists and hackers, they didn't rely solely on their own training and instincts. "We consulted with Fortune 500 companies and learned that commercial quality was a real issue. We found out how to manufacture a reliable product," says Yuen.

AST has instituted extensive quality control programs throughout the organization. Each individual unit goes through six to seven levels of testing before shipment. To encourage quality support after the product leaves AST, the company bolsters dealer relationships with training programs that feature seminars and videotapes. "You have to believe [the dealers] are your partners," says partner Yuen. Like Compaq, AST knows which distribution buttons to push. As Stickel said at COMDEX, "In networks and data communications, we want vendors to feel safe."

Yuen puts it this way: "When you use quality minds and quality concepts to provide goods and services, quality results will follow." Yuen's faith is borne out by AST's product return rate: An astonishing 0.4 percent of the company's products come back for servicing. The company provides the added safety net of a standard two-year product warranty.

Stirring the Pot

But isn't all this Horatio Alger success through industry and self-reliance a shade improbable? To be sure, AST isn't immune from the occasional stubbed toe. For all its conservatism, the company now and then reveals an iconoclastic streak. Unlike the tendency of big, booming concerns to shun controversy, success seems to have sharpened AST's appetite for the calculated risk—a stance that could brake its momentum in the marketplace, if not its balance sheet.

But isn't all this Horatio Alger success through industry and self-reliance a tad improbable? AST isn't immune from an occasional stubbed toe.

AST's most celebrated gamble is its decision to play hardball with Intel, one of its chip suppliers, over expanded memory specifications (see "The RAM Revolution," *PCW,* January 1986). Last year, AST responded to the Lotus/Intel expanded memory collaboration with a scheme of its own—one that also pits AST's RAMpage against Intel's AboveBoard. Both specs use bank switching to bypass the DOS 640K barrier, but the AST alternative—coupled with the *Desqview* environment manager—enables users to run several programs at once without modification. Explains Paradiso, "We're hoping to whet people's appetite for multitasking—we believe that's the next natural transition for the industry."

AST initially took the unusual step of enlisting Quadram Corporation, its foremost competitor, as an ally in the expanded memory wars. AST bundled *Desqview* with the product, and signed up Borland, Ashton-Tate, and Digital Research. Intel countered by adding Microsoft to its spec, packaging *Windows* with AboveBoard, and releasing AboveBoard PS, which the company touted as making "conventional multifunction boards" obsolete—a veiled reference to AST's SixPakPlus.

To date, however, the battle of the boards has generated more sparks than sales. RAMpage and AboveBoard continue to vie for support among power users—and hardware and software developers. Enthusiasm for AST's spec, beyond Ashton-Tate and Quarterdeck, is apparently dwindling. Quadram has acknowledged "major compatibility problems" between the spec and its accelerator board. Other vendors are adhering to the less ambitious Lotus/Intel/Microsoft scheme, in part because RAMpage reportedly won't run with 8MHz ATs. AST has responded by taking its spec on the road, staging a series of half-day seminars around the nation.

"RAMpage [and the expanded memory debate] is seen as an emotional issue," says Yuen, "but for us, it's just a business decision. We're convinced it's a comprehensive solution, even if it's an interim one."

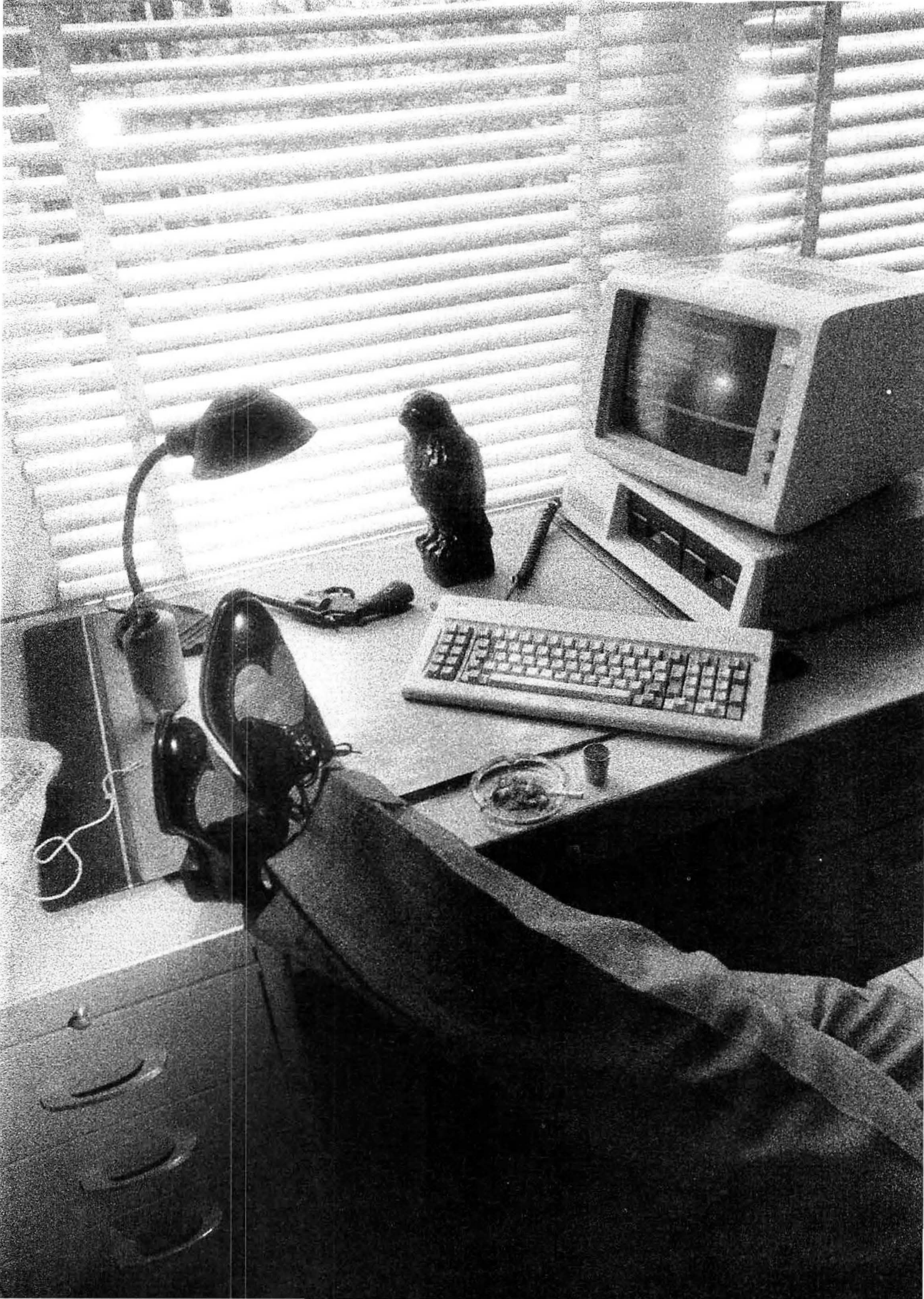
Where to From Here?

AST's three principals are reluctant to tinker with their corporate culture. Although selling out is the usual punch line in Silicon Valley, not so in Irvine. "We've had offers from competitors, chances to cash out," says Qureshey. "But we've thought about those people who joined AST to work with us—how would we face them? We feel this is a long-term business.

"The joy is in going to work. AST really hasn't changed—it's still casual. I used to know everybody's name, but with around 700 people, it's harder. The biggest challenges are internal—the external things are opportunities."

Horatio would have approved.

Kathleen Mackay is a Los Angeles journalist and author whose work has appeared in Time, People, *the* Los Angeles Times, *the* Washington Post, Working Woman, *and other publications.*



Magnum, PC

Today's successful private investigators no longer fit the image of the hard-boiled gumshoe. Instead of pounding the pavement, they're apt to be tapping away at a keyboard—firing up the most powerful new weapon in the PI's arsenal, the PC.

Linda Williams and John Grissim

Sam Spade didn't need much more technology than a .38 and a phone. Philip Marlowe needed those plus a car—but then, he lived in L.A. Neither was the kind of guy you'd expect to find gazing at the screen of a PC. But times change. Progress has caught up with Spade and Marlowe. They're being forced on line.

What can a computer offer the private eye that a beautiful (or handsome) secretary and a shiny Selectric can't? Information, of course—the common currency of the investigators' daily grind. It's the product they buy and sell and live by. On TV they catch bad guys; in real life, they collect information.

Information is also the PC's stock-in-trade; private investigators are finding that time spent pounding the keyboard saves time pounding the pavement. And because theirs is a business in which time is money, quicker is definitely better.

But not everyone's gotten the message—on TV or in real life. In fact, computer-literate private investigators must still be considered a brave vanguard. Yet, those who have joined it are convinced that the future is theirs. As Jack H. Reed, operator of J.H.R.I., one of the country's largest privately held investigative firms, puts it, "Those who don't have computers in five years are going to be left behind. They simply won't be able to compete." He estimates that only about 10 percent of the approximately 25,000 PIs in the U.S. now use computers in their work.

Reed, an elegantly attired, silver-haired man, should know. He runs the International Research Service of California (I.R.S.C.) as a division of J.H.R.I. Together, the businesses occupy an 8000-square-foot building in Fullerton, California. The country's largest data base service for investigators, I.R.S.C. serves approximately 450 subscribers, all of whom must be licensed private investigators or attorneys. Subscribers without PCs can order data base searches by mail or phone. Those with PCs and modems can make their requests and receive data on line.

Just the Facts, Ma'am

Reed knows that information is power, and data bases like Reed's are aimed at making subscribers powerful in a great variety of fields. I.R.S.C. offers its subscribers access to more than 700 data bases, including sources

Jeffery Newbury

of information on corporations, law, medicine, business, legal history, and the whereabouts and financial status of individuals. Subscribers can get information on chemicals, patents, engineering, and all kinds of technology. They can request searches of articles and abstracts in newspapers, magazines, law reviews, and *Who's Who* and other people indexes.

Many of today's investigations involve highly technical information of the sort that would scare off the PI of yesteryear.

The data base service is handled by operators at eight workstations, each with an IBM PC or a PC-compatible TeleVideo.

Apart from investigating accident reports, one of the most frequent assignments a PI tackles is digging up background data on a client's potential business connections—information that can be worth big money. Reed recalls one client who asked his firm to check on an investment banker with whom the client was planning to invest several million dollars. Using Securities and Exchange Commission (SEC) records, newspaper indexes, and several business files available in its data base service, Reed's firm discovered that the banker was in hot water with the SEC. The client invested his money elsewhere; the banker was subsequently indicted, and investors who had trusted the banker lost their shirts.

Reed points out that many of today's investigations involve highly technical information of the sort that would scare off the hard-boiled PI of yesteryear. He cites the case of an investigator assigned to prove that an airplane manufacturer was responsible for injuries to passengers when a pilot made an error during takeoff and bumped the ground with substantial force. Going on line with Reed's service, the investigator requested engineering data bases that detailed the plane's construction and discovered that although the standard distance from seat to frame was 9 to 11 inches, the manufacturer had redesigned the fuselage and moved the seats to within 3 inches of the frame. Those missing inches cost the company dearly.

Given mounting evidence that a PC and a good data base amount to a lot of firepower, why haven't more PIs gone on line? Reed believes that it's primarily a matter of time constraints. "Most agencies are one- to five-person operations. They don't feel they can afford the time to learn to use the computer. Once they take the time, they find that the investment pays off in many ways, but the initial commitment is difficult."

Reed plans to reduce the learning time for his colleagues, just as he's already helping with the job of getting information on line. He is working to customize a data base program that includes an accounting system to meet the specific needs of the private eye. Reed's program will provide an invoicing structure, time records, case logs, indexing and cross-indexing, a case numbering system, and reporting formats—everything the private eye needs, except the clients.

PCs Under Oath

One PI who's figured out his own uses for a PC is George E. Posner of Albany, California. A genial man with snowy white hair and an open, friendly manner, Posner could easily be taken for a professor emeritus rather than a seasoned PI. That impression is reinforced by the small office behind his home: Half the office is devoted to a photo lab and half to a library—stocked with hundreds of volumes of legal codes, reference books, telephone books from all over the country, and numerous software manuals.

On Posner's desk sits a new IBM PC, and across the room on a second desk sits his original PC, reportedly one of the first 64K PCs sold in the San Francisco Bay Area. Posner, who specializes in accident cases and is an expert in forensic photography and typewritten forgeries, says he's still discovering new uses for the PC within his specialized field.

Recently, for example, he was asked to analyze a note to determine whether it was written by a defendant in a criminal case. Besides relying on the usual forensic tools, Posner added a new twist to his techniques and put his PC to work on the case. He entered the suspect note into his computer and then keyed in a number of other letters that he knew the defendant had written. He then used two software programs, *Grammatic* and *RightWriter*, to analyze the syntax of each document.

The programs can't confirm that two documents were or were not written by the same person, but they can analyze two writing samples' relative style, readability index, frequency of passive voice, use of adverbs and adjectives, jargon, and unusual words. If a number of stylistic similarities show up, there's good reason to believe the documents could have been written by the same person and to send the samples to a psycholinguistics expert for further analysis. If similarities are not present, the client can save some money.

Posner has also found that his PC is a reliable partner in accident investigations. For instance, he notes, there's a time in the late afternoon when the sun can turn your car's windshield into a glaring wall. A lot of fenders seem to get bent then, and pedestrians put their lives on the line. Judges and juries understand what it means to have the sun in your eyes, but they want proof that the problem really was the sun and not simple carelessness. That's where knowing the exact angle of the sun at the moment of impact comes in.

There are several ways to calculate sun angles, but a computer is the fastest. Posner uses a PC program called *Astrocalc* from Zephyr Services to compute the sun's exact position at the time of an accident. He uses the same program to calculate illumination from the moon for accidents that occur at night.

Working with computer programmer Don Wood, Posner has developed a PC program to analyze accidents—very helpful when

Jeffery Newbury

Despite the pose, investigator Nancy Hicks is faster on a PC than on the shooting range.

a client and a police officer differ on the client's estimate of how fast he was traveling when he hit that Buick. The program uses four variables: initial speed, final speed, rate of change (or coefficient of friction), and distance. Give the computer three of those figures, and it comes up with the fourth.

Even though the computer can generate the necessary information, it doesn't qualify as an expert witness. The private eye must still round up a human being with the right credentials to confirm the calculations and testify in court.

In George Posner's experience, the expert and the PC agree 100 percent of the time. The court may not trust the computer, but Posner does. It assures him that the facts of the case justify hiring an expert.

On Line Replaces On Foot

Nanci L. Hicks of Nan-Lee Attorney Services and Investigations in Hayward, California, is a more recent convert to computers. Hicks' is a one-woman operation, and her Panasonic Sr. Partner, purchased just over a year ago, has become her faithful assistant. She says it makes reports easier to prepare, helps with billing, and gathers some of the information she needs via I.R.S.C.'s data bases. It doesn't quite play Watson to her Holmes, but, she testifies, "It makes my own time much more valuable." Assignments that once took several days now require mere hours when she puts her computer to work.

"Let's say I have reason to believe that someone has been involved in a court proceeding in a distant county," says Hicks, a statuesque woman with the carefully manicured appearance of a charm-school teacher, which she was. "In the past, I would have had to travel to the county seat to search the records. That could take a day, at least; and my client would have to pay the time and transportation costs," she explains. "With the computer, it takes about 5 minutes to request the information from a data base, and in 6 to 36 hours I'll have a response."

Hicks points out that not all counties have computerized records. In addition, if she wants a copy of the record, she must still write or travel to the county to get it. But knowing the record is there is a big part of doing the job.

Hicks specializes in personal injury and family law cases. Last year she and her computer raced the clock to save a client's wedding. Two weeks before the big day, the client discovered that she still needed her previous husband's signature on a document for her divorce to be legal. She had his name and last known address but no idea of his present whereabouts.

A name and an old address aren't much to go on. A couple of years earlier, Hicks would have spent days interviewing everyone who'd known the husband. Instead, she went on line to use the National Identifier Search, a data base that can take a name and previous address and cough up a current address.

Nothing's perfect; although the search turned up a new address in another state, that address was out of date. However, a call to the motor vehicles department (DMV) in that state netted a birth date and the information that the subject had renewed neither his vehicle registration nor his driver's license.

Hicks figured the man had left the state, and suspected he might have returned to California. She now had his date of birth in addition to his name, so it was back on line to query the California authorities through I.R.S.C. This time the address she turned up was current. The search began on Tuesday. By Friday she was standing on the husband's front porch with the necessary papers.

The Private Eyeballing of Public Records

Naturally, the use of enormous data bases containing information about innumerable individuals and corporations has raised some public concern about violations of personal privacy. What kind of information can PC-equipped investigators like Hicks and Posner legitimately pry into? They can find individuals' current addresses, death and marriage records, driver and voter registration information, bankruptcy records, and history of prior civil and criminal cases. They can also dig up any businesses under another name and the value of any property owned.

For data on companies, an investigator willing to pay the data base fees can obtain public domain information filed with the secretary of state—the names of officers and directors of the company, whether it issues stock, financial statements, and so forth. The Dun & Bradstreet business profile is also available.

Of course, a lot of government and public data on individuals, such as a person's credit, banking, Social Security, and medical records, is protected by the Privacy Act and the Fair Credit Reporting Act. Such information is available only with written permission from the individual in question or by court order.

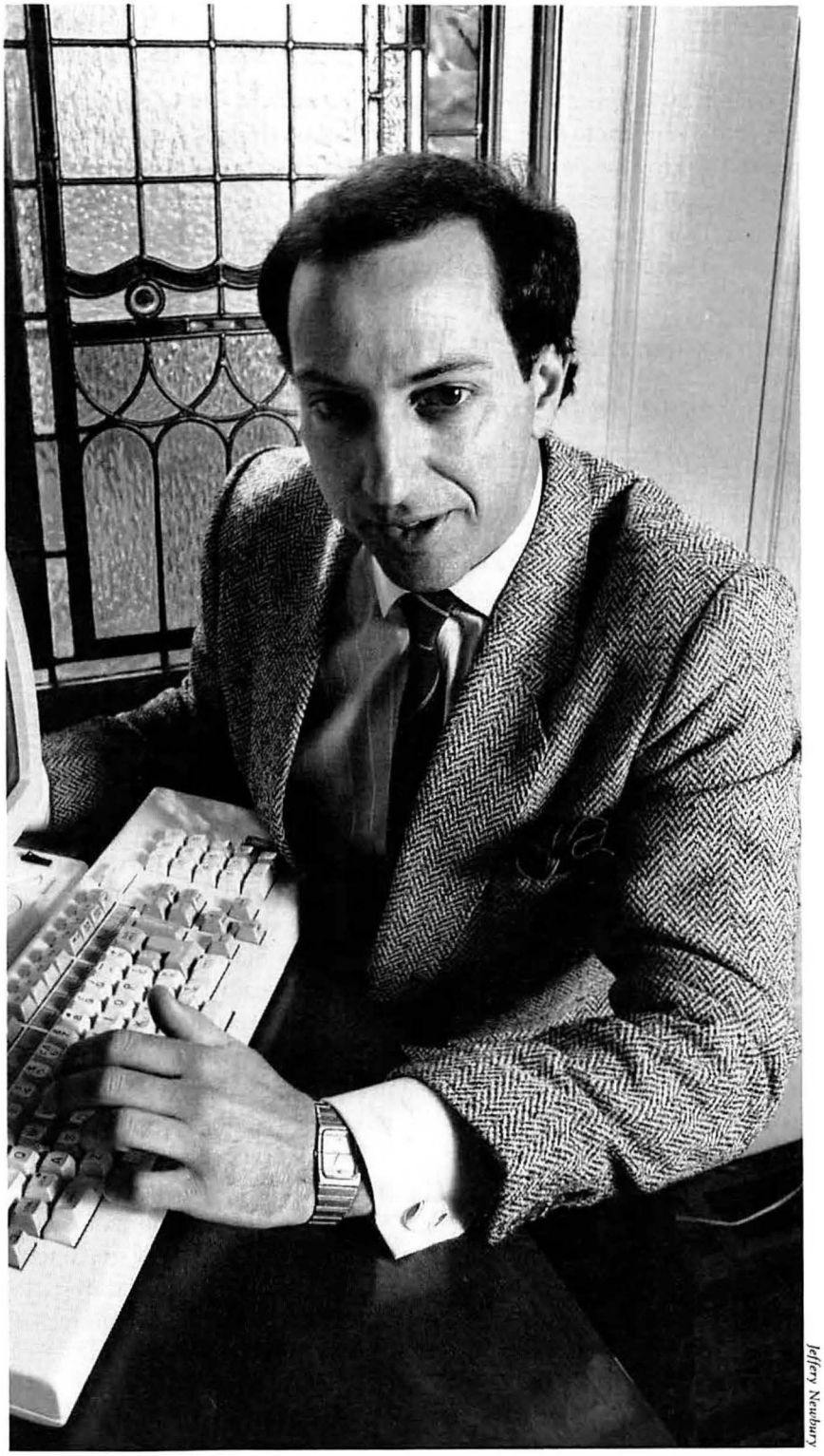
Subscribers to Jack Reed's I.R.S.C. data bases must sign a contract promising to comply with all provisions of the laws protecting personal privacy. Reed is serious about the privacy issue. Any user who violates the contract is permanently kicked off the system.

But the potential for invasion of privacy exists, says San Francisco PI Paul Palladino, whether or not a PC and a modem are used by an unsavory investigator. "In this business, there isn't any information that can't be bought," Palladino says.

For instance, if an investigator wants to do a credit check on someone, he or she need only cultivate a helpful clerk at a retail store or bank. "I could go to someone at a department store who does dozens of credit checks daily. For the price of a drink and 20 to 40 bucks, they will meet me after work and deliver a hard-copy report," says Palladino.

Palladino, a partner in Palladino and Sutherland, a firm that played a key role in the defense of automaker John DeLorean, speaks from wide experience with electronic and other types of theft and snooping in Silicon Valley, which he characterizes as "a jungle in ferment."

He says that his own firm, which boasts nine workstations linked to a minicomputer system,



Jeffery Newbury

Private investigator Paul Palladino's high-tech sleuthing frequently takes him into the Silicon Valley underground.

is "definitely planning to go on line with a modem to take advantage of the growing number of public record date bases." But he cautions that "there's a downside to on-line status that we must always consider. That's our own security. Once you have a telephone line going into your computer and your data base, you have to be damn sure no one can hack into you, especially when people's lives are at stake.

"If we don't have bulletproof security on our end, someone working for the prosecution could hack into our computer and electronically spy on details of the defense strategy, including planned testimony and lists of witnesses. It could be devastating."

Another PI who's given more than casual consideration to the privacy issue is San Francisco's Josiah "Tink" Thompson, who brings heady credentials to the subject. A Yale graduate with a Ph.D. in philosophy, Thompson studied at Oxford, wrote two books on Sören Kierkegaard, and is a former tenured professor of philosophy at Haverford College in Pennsylvania. A desire for more adventurous work led him to San Francisco in the mid-seventies, where he went to work for the noted sleuth Harold Lipset, the real-life model for the high-tech PI in the Francis Coppola film *The Conversation*. Thompson, a specialist in criminal investigations, branched out on his own seven years ago and became an early convert to personal computing. He now owns an AT.

'A PI with on-line access to information could be the difference between a successful defense and a stay behind bars.'

Thompson foresees a time in the near future when "an electronic blizzard of information will be available to the PI with a PC and a modem." He notes that already, "more and more counties are computerizing their public records. There may come a time when the counties themselves may offer, for a fee, on-line access to their data bases." More likely, he says, is a mushrooming of private companies bidding for the rights to electronically copy county records, and eventually a shakeout will result in a dominant data-distribution company in each geographical region.

Does Thompson, the philosopher-sleuth, see a danger in this blizzard on the near horizon?

"At this point, I'd say no. Since it is the courts and legislatures that have determined which records shall be public, I see no ethical problems. The reality here—and one that I find fascinating—is that there has not been any change in either the kinds of records or the public's right to examine them. What's changed is the technology and the use of such powerful tools as indexing software that can provide information with blazing speed.

"What would not surprise me," he adds, "would be to find someone someday arguing that the very ease of electronic access to public records constitutes an intrusion on a citizen's constitutionally protected privacy. I don't agree with that contention, but it should be interesting to see if any movement develops to restrict access, and from which end of the political spectrum it arises."

In fact, Thompson concludes that a PI with electronic access to public records could be an individual's "greatest ally when the full weight of the state, with its enormous resources, is arrayed against the little guy. Consider that in a criminal case, for example, the police and the prosecution have access to, and control of, worldwide data bases. Given this scenario, I see a time in the near future when a PI with on-line access to key information could well turn out to be the crucial difference between a successful defense and a stay behind bars."

Spade and Marlowe would no doubt have had clever, sardonic comments on the role of PCs in modern life. On the other hand, they were both smart cookies. Odds are they'd have been shopping the PC swap meets with the rest of us.

Linda Williams is the author of Easy Writer II System *(John Wiley & Sons, New York, 1985) and an as-yet-unpublished mystery novel. John Grissim is a writer based in Marin County, California.*

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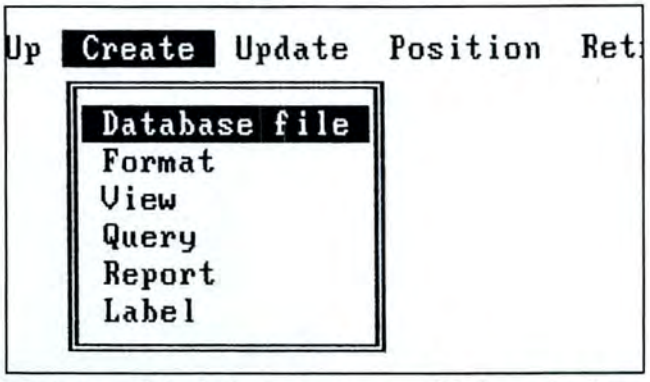

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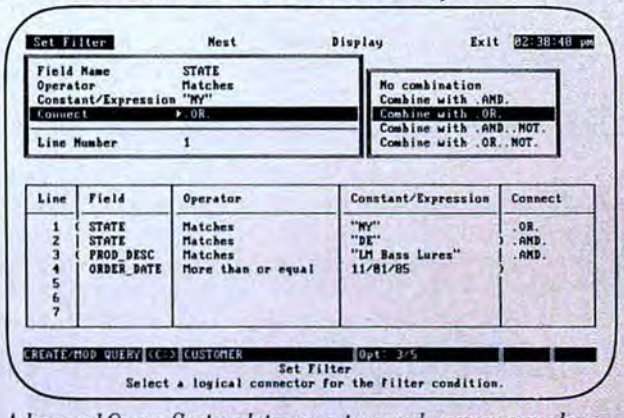

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The Emulators

Sometimes you've got to get smart to play dumb. PC World evaluates five top 3278/79 coaxial terminal emulation boards and accompanying file transfer software. Products from DCA, CXI, Forte, IDEAssociates, and AST show their stuff.

Sanjiva Nath

To establish a communications link between a PC and a mainframe, you have to start with terminal emulation. The mainframe won't recognize your PC unless it mimics a specific terminal. What you need is a fast, versatile terminal impersonator.

Reviewed here are five products that facilitate communications between PCs and IBM mainframes via terminal emulation: the IRMA from Digital Communications Associates (DCA), the PCOX/Plus from CXI, the Forte PJ from Forte Communications, the IDEAComm 3278 from IDEAssociates, and the AST-3270/Coax from AST Research.

These products enable you to emulate the IBM terminals of an IBM 3270 network, including the popular 3278 monochrome and 3279 graphics terminals. All five packages establish a coaxial cable link with a locally or remotely connected IBM 3274/3276 cluster controller operating under the IBM 360/370, 43XX, or 308X series mainframes (see "3270: IBM's Extended Family" in this issue for an introduction to terminal emulation in the 3270 environment).

In addition to terminal emulation, the products offer data exchange facilities, such as screen capture to a PC disk and high-speed bidirectional file transfer between the PC and the mainframe. Although some of these terminal emulation packages have been around for a while, the latest offerings have improved considerably in performance and features.

Trying to Be Terminals

At the most basic level, terminal emulation products consist of an expansion board and accompanying software that emulates the features of a particular terminal, such as the screen display format (number of lines and columns), display attributes (color and resolution), special function keys (commonly referred to as the PF keys), and support for the keyboard. But the new breed of emulators can do much more. They transform the representation of characters from the ASCII format used by PCs into the EBCDIC (Extended Binary Coded Decimal Interchange Code) format used by IBM mainframes, and they can link with a communications controller via the appropriate protocol, either BSC (bisynchronous) or SNA/SDLC (Systems Network Architecture/Synchronous Data Link Control).

The enhanced emulators can also manage unique screen display formats. For example, in addition to the status line, the 3278 terminal displays 24

Table 1: File transfer performance

	Product	Transfer time (in secs.) 4726 Bytes	Transfer time (in secs.) 54,572 Bytes
File transfer rate when downloading a text file from CMS to the PC	IRMA	12	44
	CXI PCOX/Plus	17	61
	Forte PJ	4	14
	IDEAComm 3278	9	28
	AST 3270/Coax	38	85
File transfer rate when uploading a text file to CMS from the PC	IRMA	10	
	CXI PCOX/Plus	128	
	Forte PJ	4	
	IDEAComm 3278	8	
	AST 3270/Coax	46	

lines for the Model 2, 32 for the Model 3, and 43 lines for the Model 4. Unless you have a high-resolution graphics display adapter, such as the IBM Enhanced Graphics Adapter (EGA) or the Hercules Graphics Card, you will be able to display a screen only in the 80 by 25 format. (All five packages reviewed handle screens longer than 24 lines by scrolling between the two halves of the screen.)

Software: Resident or Transient

Each emulator operates in two modes: memory resident and transient. In memory-resident mode, the software becomes an extension of PC-DOS and remains in memory until the PC is reset. In this mode, you can pop up the emulator program and exit to DOS or any application using "hot key" combinations. Resident mode is convenient when you access the host frequently but still need to pursue your work on the PC.

Using emulation software in the transient mode is similar to invoking other applications that, upon termination, exit memory and return control to the operating system. You'll find this mode useful if you access the mainframe infrequently and would rather not monopolize the extra memory.

File Transfer: Speed Is the Key

The chief feature that distinguishes terminal emulation from the early days of read-only access is the ability to transfer files between the PC and the mainframe. Bidirectional file transfer is available with all the products reviewed, either as part of the package or as an option. However, the Forte PJ requires that you load software on the mainframe in order to run its optional file transfer program.

The products enable you to transfer files between specific environments—PC-DOS at one end and CMS (Conversational Monitor System) or TSO (Time Sharing Option) at the other. You can use this facility as an intermediary step in your own applications, such as transferring data from a VSAM (Virtual Sequential Access Method) data set to a *dBASE III* file for local report generation. If these basic file transfer capabilities aren't sophisticated enough for you, you can always purchase more specific data extraction and conversion software packages that work with these terminal emulators.

Most of the emulators allow transfer of binary files from the PC to the host. Because binary files

have no significance to host-based applications, they are translated into an intermediary form. This feature is useful for archival purposes, such as storing PC programs or data files on a mainframe for later retrieval.

File transfer commands can be presented in a menu-driven or question-and-answer format, or you can execute them on the command line. To automate file transfer, you can create DOS batch files that contain frequently used commands.

Application Interface

The products permit varying degrees of access to their inner workings so that programmers can modify the functions of the terminal emulation system or create applications. They can use this application interface to develop new file transfer routines that perform various data exchange activities. You could write a program to transfer files directly into a CICS (Customer Information Control System) application, for example. Some programs also provide access to the PC memory location where the currently displayed screen is stored so you can manipulate specific fields on the screen.

Screen Capture

Although file transfer may answer most data transfer needs, it is restricted to CMS or TSO environments. If you are in CICS or another application, you will have to save screens of data at a time. Screen capture simply records the contents of the screen into a PC disk file. It is convenient when you are working with data entry screens or using applications that don't provide a means for recording your sessions with the host.

Installation and Documentation

All five products include add-on boards that are installed in one of the available slots inside the PC and software that can be tailored to specific needs. Hardware installation is generally simple, and software installation should be fairly straightforward, but manufacturers always seem to find a way to intimidate first-time users by including vague and unnecessarily technical details in the documentation.

Although software customization is a job for the more technically oriented user, most people will be able to use these products right out of the box. Customization usually consists of setting unique display attributes and assigning special functions to specific keys to remap your keyboard.

Documentation is a critical factor in determining how effectively software can be used by nontechnical people. A manual should include a step-by-step installation guide, a tutorial section, a reference section, a glossary, an index, and a section on troubleshooting and error messages. Since these packages emulate specific terminal types, many vendors also include quick-reference charts and keyboard templates.

Performance

The five products offer comparable file transfer facilities but differ in their data transfer rates between PC and host. For *PC World*'s test, two text files were taken from a CMS library. The first test consisted of 171 variable-length records of up to 80 characters (4726 bytes); the second involved 451 fixed-length records of 120 characters each. The test environment consisted of Compaq Deskpros accessing files from a 20MB hard disk, and CMS running under the VM/SP operating system at the mainframe end. The tests were performed locally within the same time period, when no other users were logged on to the mainframe (see Table 1 for a performance comparison).

IRMA

One of the oldest terminal emulators, DCA's IRMA board enjoys both widespread use and support from third-party application developers. It emulates IBM 3278 and 3279 model display systems, connecting via coaxial cable to local or remote 3274, 3276, or Integral Terminal controllers having Type A adapters.

The IRMA's highlights include emulation of the 3279 color display station, with its seven colors and 80 by 43 display format; support for IBM's 16 keyboard types; a screen buffer for storing up to nine screens of data; support for the IBM APL-I character set (a programming language used in scientific and statistical applications); and a facility for data entry into the mainframe using character serial devices, such as optical character readers (OCRs).

The IRMA package includes a full-size expansion board, two program disks, a keyboard chart, a template, and decals. Although the spiral-bound manual is filled with technical jargon, the step-by-step instructions for installation and initiating terminal and file transfer sessions are sufficient for nontechnical users. A considerable amount of technical information is available for programmers who want to develop applications around IRMA's link. But the manual lacks both glossary and index and provides little information on troubleshooting.

The PCOX/Plus comes with a custom control program featuring up to four windows containing two notepads, one PC session, and one host session.

The IRMA board is relatively easy to install—there are no DIP switches or jumpers to negotiate. Software installation, on the other hand, requires some technical know-how. The GENX configuration utility offers menu-driven customization of display terminal and keyboard types (see Screen 1). For example, you can customize the software to work on compatible computers with nonstandard display formats, and you can create several custom copies for different PCs and users. If you are using a PC to emulate a 3278 model 2 monochrome display station with a standard typewriter-style keyboard, customization is unnecessary.

The IRMA emulator program can be loaded in both transient and resident modes. When a program is resident in memory, pressing both <Shift> keys simultaneously lets you enter or exit emulation modes. During host sessions, you can print screens or capture them to disk. Once you save a screen, all subsequent captures during a session append to the same file. The IRMA also sets aside a memory buffer for storing up to nine screens for later recall.

The IRMA includes utilities for transferring files between the PC and CMS or TSO environments. To use this facility, you create a brief XEDIT (a mainframe editor) or TSO profile. The utilities prompt you with a series of questions regarding the direction of the transfer, the data format (ASCII or binary), the host and local file names, and whether you want to view the contents of the file as it is being transferred. This process is easy and requires only a little time,

```
        E78 Terminal Emulator Customization Menu Rev 1.42  2 May 1985

 1 - Disable 26th line status display
                                        20 - Select IRMAlette Operation
 3 - Make emulator auto-resident
                                        22 = Non-Standard Display Adapters
 5 - Make 2 color mode default
 6 - Make 7 color mode default          24 - Force E78 to NOT allow APL
                                        25 - Disable EAB
 8 - Make SHOW COLUMNS default

10 - Convert to pre-1.20 keyboard

12 = Select KEYBOARD & SCREEN type
13 = Set LIGHT PEN correction
14 = PC look-alike setups
15 = Setup COM1: input parameters

17 - Disable NON-DISPLAY display
18 - Force dark blue to cyan

                                        99 = Exit GENX program

Your selection: _
```

Screen 1: The terminal emulation customization menu from IRMA—the grande dame of them all

but experienced users may elect to execute the file transfer operations via the command line in batch mode.

The IRMA's file transfer facility in CMS performed quite well, although by no means did it lead the pack in terms of speed (see Table 1). One weakness is its absence of path support for sending and receiving files in other hard disk subdirectories. Another restriction is that you must use the XEDIT host file type if you want to receive variable-length records of up to 255 characters. If you download a non-XEDIT file, all data in excess of 80 characters per line is automatically truncated. If your file has records exceeding 80 characters per line, you must first convert the file type into XEDIT.

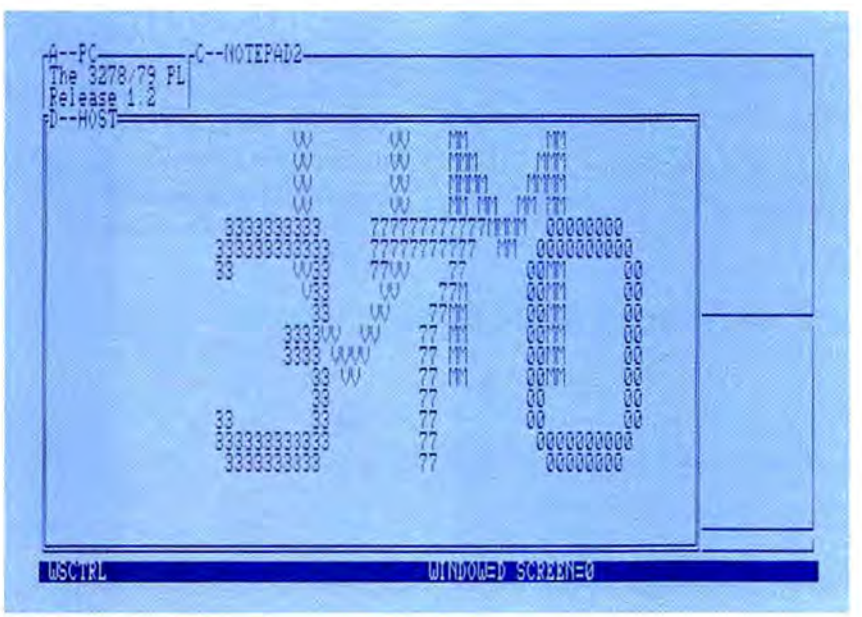
PCOX/Plus

The CXI PCOX/Plus offers a coaxial link to the IBM 3274 local and remote controllers, the IBM 3276 display controller, and the IBM 4321/4331/4361 display printer adapter. It emulates models 2, 3, and 4 of the IBM 3278 monochrome display station, and models 2A and 3A of the 3279 color display station. With a special graphics adapter, the PCOX/Plus can also emulate model 5 of the 3278 terminal.

The PCOX/Plus comes with a custom control program featuring up to four windows containing two notepads, one PC session, and one host session (see Screen 2). The notepads are used for data exchange between the PC and the mainframe. This memory-resident control program requires 320K, compared with 92K for the nonwindowing version, which can be used in either transient or memory-resident mode. You can set up several screen profiles, which define types of windows, their screen positions and sizes, and background and foreground colors. In addition to its unique environment, the PCOX/Plus features IRMA compatibility, which enhances its usefulness considerably if you use one of the many applications that currently support IRMA, such as data extraction and virtual disk packages.

The PCOX/Plus consists of a half-size board and software on three disks. The package also includes a manual in the standard three-ring binder and a keyboard template. The manual is well organized and contains everything but an index. It even includes a separate section on problem solving and a glossary of communications terms. Installing the PCOX/Plus hardware is easy, requiring no adjustments in DIP switch or jumper settings.

Customizing the software involves some familiarity with the characteristics of a terminal type, as well as with the PC's display and keyboard. The configuration program presents a question-and-answer session in which default values are highlighted. Once the software is installed, you choose between the windowed environment or the nonwindowing control program. A keyboard map utility allows you to specify substitutions for the function keys of various terminals.



Screen 2: Like the AST-3270/Coax, the CXI PCOX/Plus features a windowed front end for terminal emulation. You can switch between DOS and mainframe applications and send data using two notepad screens.

The PCOX/Plus offers interactive and command-driven file transfer between the PC and CMS or TSO host environments. Basic and advanced modes of file transfer are available. To use the advanced mode, which is faster, you have to install several files in your mainframe CMS or TSO library.

Both modes are menu-driven and provide a count of records transferred and a feature that captures the current host session screen to disk. For convenience, you can use CXI's batch file generator utility to create batch files for specific types of file transfers.

In the tests, the PCOX/Plus's file transfer rates did not compare favorably with those of the other packages, even in the advanced mode, which is 10 to 15 percent faster than the normal mode (see Table 1).

Forte PJ 3278/79

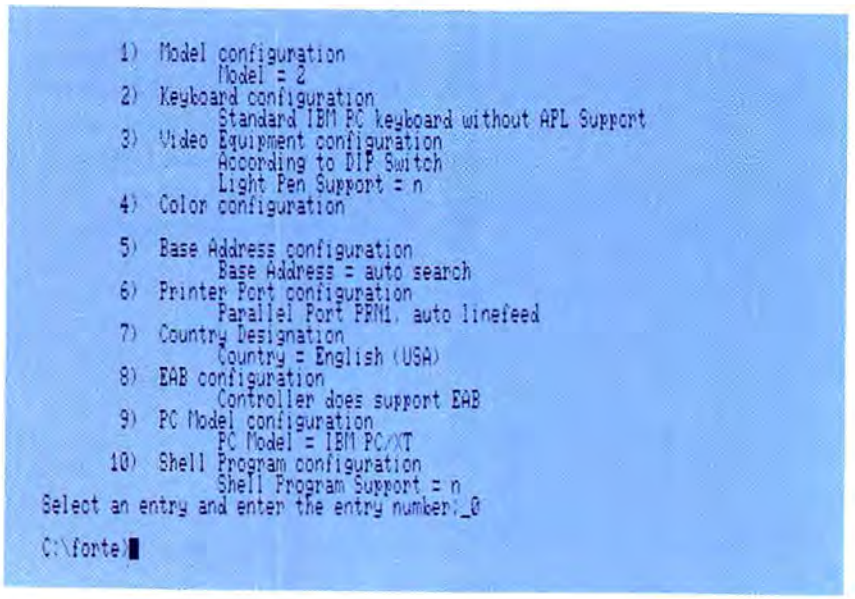
The Forte PJ 3278/79 emulates 3278 (models 2, 3, and 4) and 3279 (models S2A, S2B, and S3A) display terminals. It consists of a full-length board, one program disk, and a keyboard template. The board and software can communicate with both channel-attached and remote 3274 controllers.

The Forte's special features include *TopView* compatibility, light-pen support, an APL character set, and emulation of the top-of-the-line 3279 model 5, which requires a special video display adapter.

Hardware installation is straightforward, and the spiral-bound manual lists the switch settings corresponding to the base I/O addresses, along with possible conflicts that some settings may have with other PC components. To install the Forte software, you load the FDSCONF program, which configures the program for options such as specific terminal type, keyboard layout, monitor, color and attributes, printer port, PC model, and keyboard nationality (see Screen 3). An installation test utility verifies proper operation of the board.

Although the Forte's emulation features are basic, its overall performance is gratifying. In emulation mode, you can capture and append screens of data into disk files and print screens on a local printer.

No file transfer program is included, but two optional mainframe packages—CMS-Fortenet and TSO-Fortenet—are available for high-speed data transfer between the PC and the respective mainframe environments. Using the mainframe programs, the Forte turns in the best speed performance of the lot (see Table 1). The software consists of two files on magnetic tape, which are loaded directly into the CMS or TSO libraries. With these files in place, the file transfer process is invoked, not in PC-DOS but in VM, with the transfer options specified on the command line.



Screen 3: The Forte PJ's configuration screen. Configuring any terminal emulation program to a specific terminal may require the assistance of a technically knowledgeable person.

IDEAComm 3278

The IDEAComm 3278 emulates IBM 3278 model 2 and 3279 models S2A and S2B terminals. It also supports coaxial connection to the IBM 3274 controller or the 3276 remote controller. Featuring IRMA compatibility, keyboard remapping, diagnostics, and local printer support, the IDEAComm 3278 can transfer files between the PC and CMS or TSO environments.

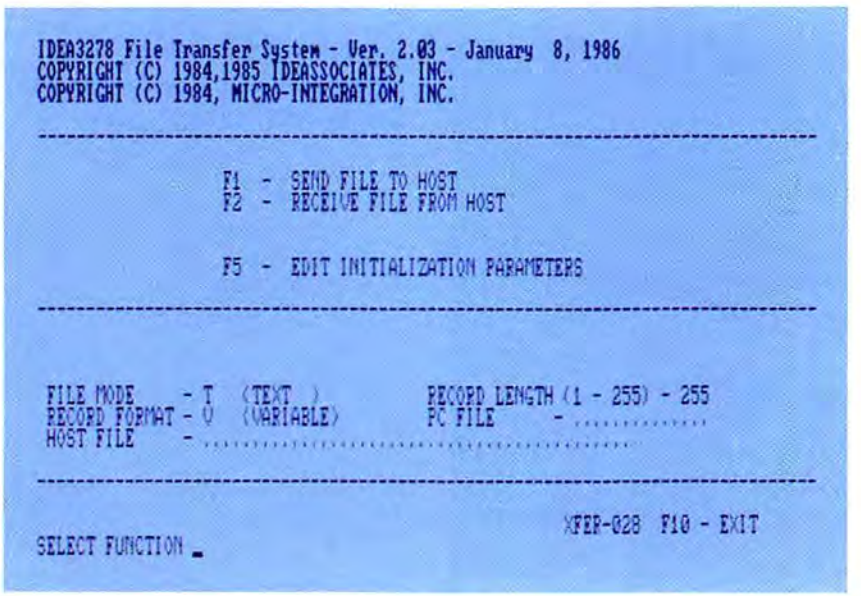
The package includes a full-length board and one disk. An unbound manual provides support for application developers by including BASICA subroutines. Unfortunately, the key assignments are unconventional and there is no keyboard template. Installing the board is easy if you ignore the instructions and just plug it into one of the available slots. Because the board is too long to fit into the Compaq Deskpro, for the test it was installed in the outermost slot, hanging out at the tail end. The diagnostics program checks the board's various components to ensure proper operation.

IDEAssociates includes a utility for configuring various options, such as the printer, keyboard reassignment, keyboard nationality, type of display attached, and compatibility mode. The software operates in native mode, IRMA-compatible mode, or both.

You can load the emulation software into memory in both resident and transient modes. It defines the two <Shift> keys pressed simultaneously as the hot key for switching between the two modes. In either mode, you can perform functions such as capturing a screen, sending a screen to the host, displaying the disk directory, or printing a file.

Using the mainframe programs, the Forte turns in the best speed performance of the lot. The software consists of two files on magnetic tape, which are loaded into CMS or TSO libraries.

While the IDEAComm's emulation mode is not as responsive as the others, its file transfer utility scored high (see Table 1). File transfer is available between the PC and the CMS or TSO environment. The program runs in batch mode or in the menu-driven interactive mode (see Screen 4). Both text and binary files can be transferred between the host and



Screen 4: The file transfer screen for the IDEAComm 3278, which turned in the fastest speed among the PC-based file transfer programs

the PC, although binary files are restricted to one direction (PC to host). The resident program did not work well when the Compaq Deskpro's ENHDISK driver was installed. (This driver is used to create multiple partitions on the hard disk.)

AST-3270/Coax

The AST-3270/Coax emulates IBM 3278 (models 2, 3, and 4) and 3279 (models 2A and 3A) display terminals. It links with 3274/3276 cluster controllers through a coaxial connection.

Like the CXI software, the AST-3270/Coax features a windowing interface, which allows you to run a host session, a PC-DOS session, and two notepads simultaneously. The notepads provide a unique way to transfer several screenfuls of data at once between the PC and the host. Functionally, this process is the same as screen capture, except that the data remains in a window. The contents of the notepads can be saved to a PC disk file or appended to an existing file.

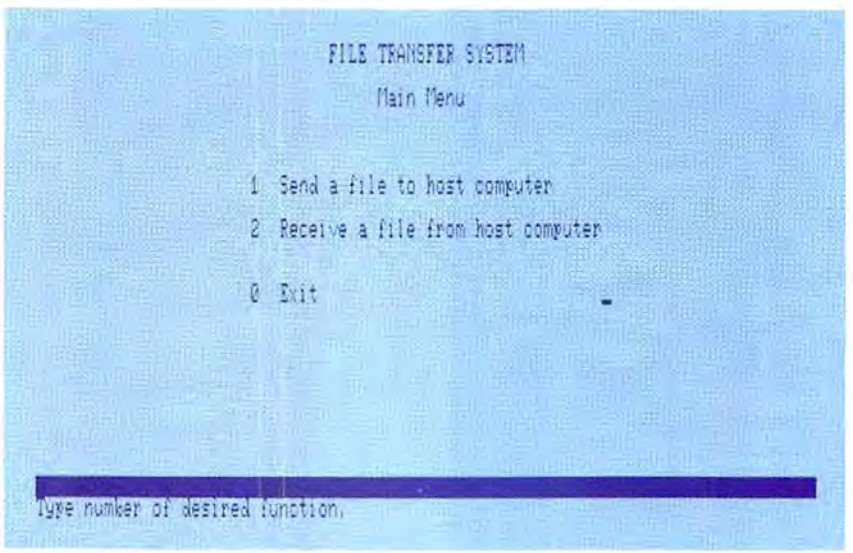
The emulator board is half-size and is accompanied by a keyboard template and three system disks. The well-organized three-ring-binder manual contains detailed sections on troubleshooting, keyboard mapping, file transfer, and application interfaces.

Hardware installation is relatively simple. AST includes a utility that helps you customize the windowed emulator program. You can customize several programs, assembling various combinations of notepads and PC and host session windows as well as different display attributes. The nonwindowing program is adequate for most applications, since it can also be loaded in resident or transient mode and takes up much less memory.

The AST-3270/Coax delivers a sophisticated interface to application programs, and the manual goes into considerable detail about invoking emulator functions through a DOS application. The company also includes sample interface routines written in BASICA.

The AST-3270/Coax allows file transfer to CMS and TSO host environments and works with both text and binary files, although binary files can only be transferred from the PC to the host. You can use the file transfer utility in both interactive and batch modes (see Screen 5).

Setting up file transfer in CMS is simply a matter of copying files to a subdirectory. Unlike other programs, the AST file transfer utility sets up the host environment during the transfer. Unfortunately, this slows the process, because the program has to initialize the host environment each time. Also, if the file transfer process is interrupted, the CMS environment remains altered, and you will almost always have to reinitialize it.



Screen 5: Why complicate things? The file transfer screen for the AST-3270/Coax.

The AST board performed quite satisfactorily. The file transfer program, however, did not work well on the Compaq Deskpro in either MS-DOS or PC-DOS. In more than two dozen tries, we were able to transfer a file only twice. Although we were not able to get any definitive answers from AST's technical support group, it's possible that the problem may have been caused by our using a Compaq Deskpro instead of an IBM PC—the software worked fine on an IBM PC. We tested the program for performance during one of the successful transfer attempts on the Deskpro, and it scored the slowest of all five programs on two of the three tests.

Evaluating the Emulators

The packages are quite similar in terms of emulation, but performance varies markedly during file transfer. Of the boards reviewed, the tried-and-true IRMA board stands out as the best. It features the greatest compatibility with other applications, is easy to use, and offers adequate file transfer.

CXI's PCOX/Plus has an interesting windowing interface and a well-developed application interface, but file transfer is slow.

The Forte PJ's emulation features compare well with the other boards', but a file transfer utility is not bundled with it. Although the CMS-Fortenet mainframe program was the fastest file transfer program tested, that package costs an additional $1000.

The IDEAComm 3278's emulation features equal those of its peers, and the product offers an excellent file transfer facility. If IDEAssociates came up with a better manual and a keyboard template for its unusual keyboard mapping, it might gain the edge over the others.

Like CXI's PCOX/Plus, the AST package boasts a handy windowing interface. You may experience difficulties with the file transfer program, however, if you have a PC compatible.

This delegation of products represents a new generation of terminal emulation boards that offer sophisticated file transfer utilities. When selecting a terminal emulator, remember that in most cases a board is a board—the important factor is the software that's bundled with it.

Sanjiva Nath is a programmer analyst and the coauthor of several books about microcomputer applications.

AST-3270/Coax
AST Research, Inc.
2121 Alton Ave.
Irvine, CA 92714
714/863-1333
List price: $1145

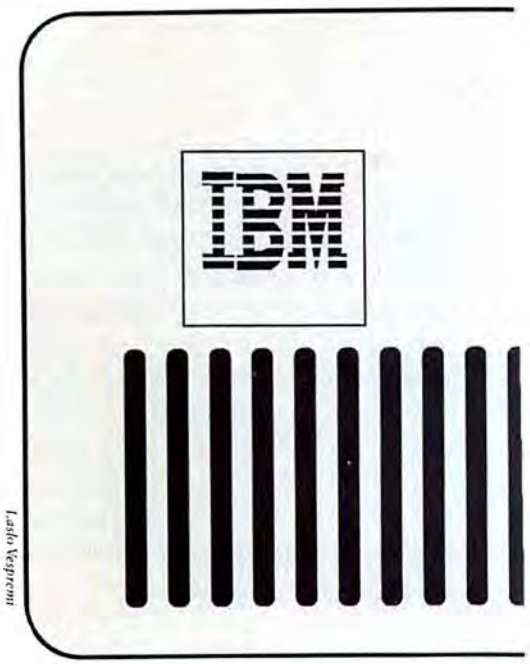
Forte PJ
Forte Communications, Inc.
2205 Fortune Dr.
San Jose, CA 95131
408/945-9111
List price: $1195, CMS-Fortenet or TSO-Fortenet mainframe file transfer software $1000

IDEAComm 3278
IDEAssociates, Inc.
29 Dunham Rd.
Billerica, MA 01821
617/663-6878
List price: $995

IRMA
Digital Communications Assoc., Inc.
1000 Alderman Dr.
Alpharetta, GA 30201
404/442-4000
List price: $1195

PCOX/Plus
CXI, Inc.
3606 W. Bayshore Rd.
Palo Alto, CA 94303-4229
415/424-0700
List price: $1145

The Mainframe as Peripheral



Laslo Vespremi

Mainframe data and mass storage are only a drive away with Free-Link and Tempus-Link, two virtual disk programs that treat mainframes as extensions of your PC.

Sanjiva Nath

Walking into one of those white, air-conditioned rooms where mainframes dwell can be an intimidating experience. The sheer size of the system—chest-high CPU, hulking mass storage unit, and wall of towering tape drives—makes a PC look like a plaything. No wonder the most common form of micro-to-mainframe communications, terminal emulation, has the PC mimicking a mainframe peripheral.

But what if you looked at the link the other way around and treated the mainframe as a PC peripheral? It sounds improbable, yet this reversal is the essential idea behind virtual disks on a mainframe. Tamed by virtual disk software installed on both ends of a micro-to-mainframe link, the mighty mainframe behaves—from the PC user's point of view—like an added set of floppy disk drives.

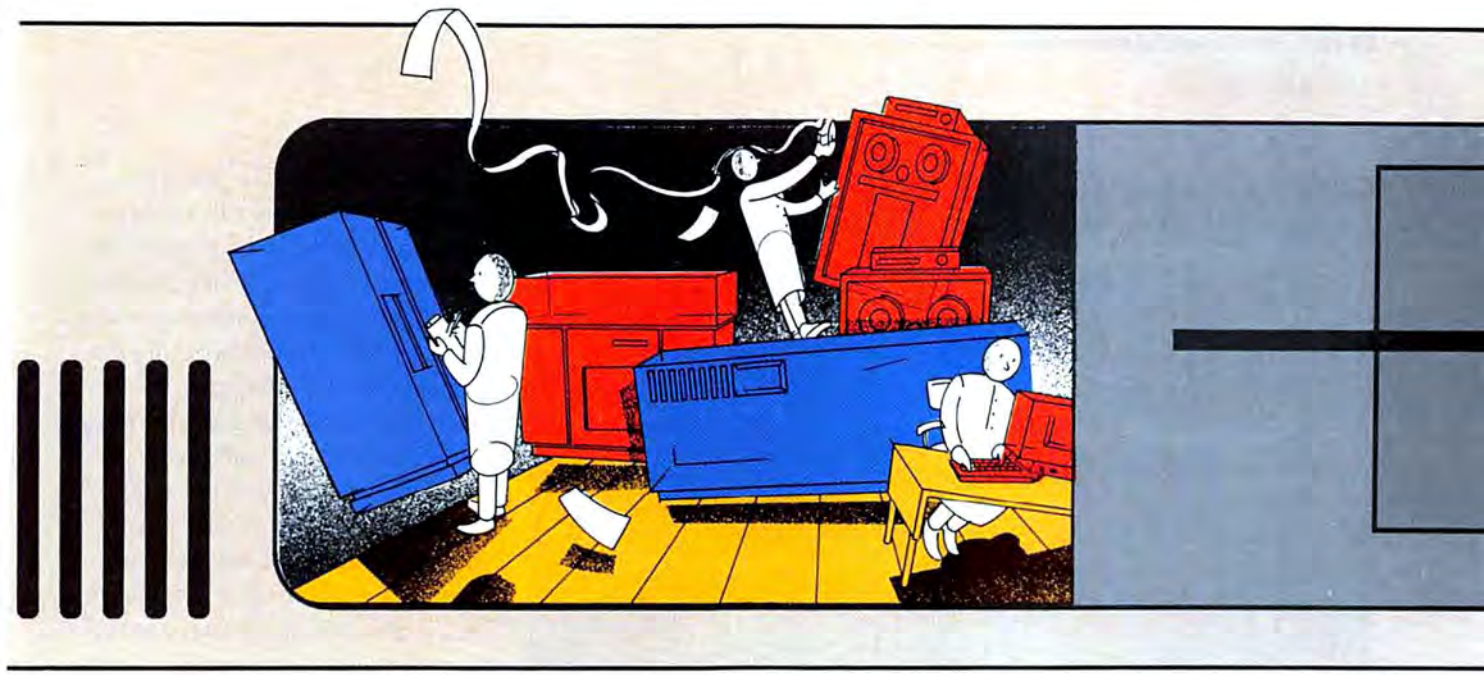
Like a RAM disk, a mainframe virtual disk stores data and responds to DOS commands in a convincing imitation of an actual drive. However, instead of using a segment of your PC's memory to emulate a hard disk, virtual disk programs employ portions of mainframe mass storage to simulate floppies. You can create whole libraries of virtual floppy disks, which you "shuffle" in and out of virtual drives. Data in both DOS and mainframe file formats can be read into virtual disks for easy PC access.

You might think that the main benefit of virtual disks would be mass storage for an office full of PCs. In reality, tape backups or actual disk drives would be both cheaper and faster. The greatest boon of virtual disks is the ready ability to export data to a mainframe, plus convenient access to mainframe data from a PC. With additional programming, mainframe operators can access virtual disk files, while local PCs can share a common data base that incorporates data from both PC and mainframe applications.

Mainframe Machinations

On-Line Software's *Free-Link* and Micro Tempus's *Tempus-Link* offer two divergent approaches to virtual disk implementation. *Free-Link*'s application shell makes mainframe-to-micro file transfer and accessing virtual disk data relatively simple, menu-driven procedures. Using *Tempus-Link* is more difficult—somewhat like performing a series of DOS operations—but the program's open architecture renders it ultimately more versatile.

Both programs require terminal emulation software and a pre-established hardware link. This connection involves either a 3278 emulation board (see "The Emulators" in this issue) or a protocol converter that uses your PC's



asynchronous RS-232C interface. In addition, you'll need a system programmer to set up the mainframe end of either software package.

Although it's hardly necessary to know your way around a mainframe to use virtual disks, a brief overview of the associated terminology can aid you in software selection. To begin with, both *Free-Link* and *Tempus-Link* run under Customer Information Control System (CICS), a mainframe application that supports communications with terminals and controls access to data bases. Although *Tempus-Link* may also be implemented in Conversational Monitor System (CMS) and Time-Sharing Option (TSO) application environments, the PC user interface performs the same way regardless of the mainframe application.

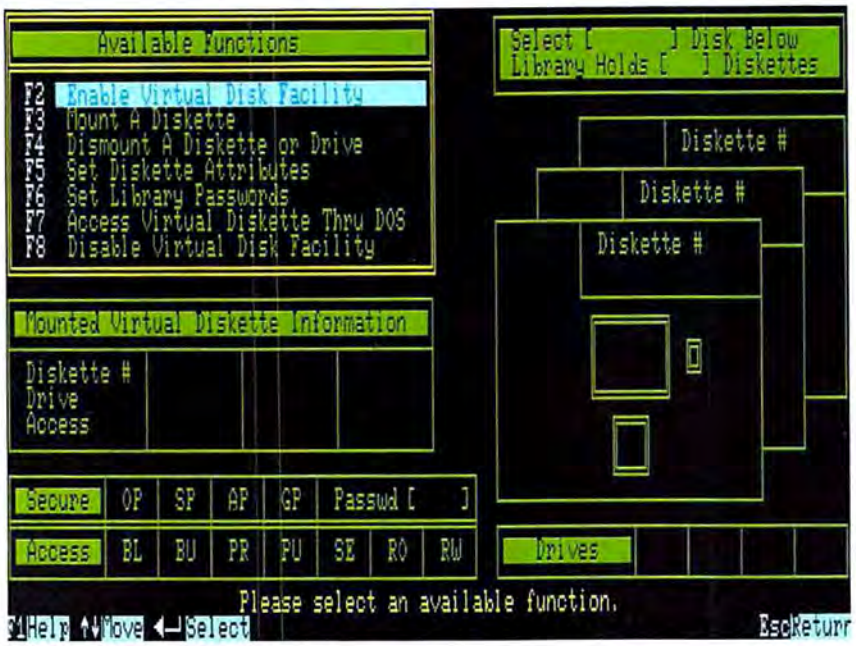
In CICS, both products use the Virtual Sequential Access Method, or VSAM (a common mainframe file management utility), to apportion files for PC data on the mainframe. To a PC user, data within these files appear to be in DOS, but in fact, a multistage translation occurs whenever you execute a so-called DOS command. If you enter DIR D:, for example, the PC virtual disk software must translate the command into a form that both DOS and VSAM will recognize. Via an already installed terminal emulation program, the command is transmitted to the mainframe, where the mainframe virtual disk software executes the VSAM equivalent of DIR D:. The VSAM directory listing is then retranslated into DOS and sent back to the PC.

Depending on how many users are accessing the mainframe, obtaining a virtual disk directory listing can take 10 to 15 seconds, and transferring a 360K file from mainframe to PC can take 20 to 30 minutes. Obviously, the speed liability makes using a virtual disk for frequent floppy-like storage unrealistic. Virtual disks are best employed as an easy way to load PC data onto a mainframe and as a data pool that a network of PCs can dip into using a variety of applications.

Free-Link

An adaptable, easy-to-use program, *Free-Link* supports both the virtual disk interface and mainframe-to-micro file transfer. The program carries the virtual disk metaphor all the way to graphic representations of floppy disks—termed *diskettes* in *Free-Link*'s documentation—which you "mount" in one of four available virtual drives (see Screen 1). The drives are automatically assigned the next highest drive letters after the actual ones on your PC (C:, D:, E:, and F: on a two-drive PC). Although all drives can be used simultaneously, you can only mount one disk in a drive at a time.

Free-Link's file transfer options are quite extensive, enabling you to translate and import VSAM data into formats usable by a variety of PC application software. For example, using the program's File Reformat and Auto Download facilities, a programmer could easily set up the mainframe to translate VSAM files into *dBASE* and transfer them to virtual disks (or directly to PCs) overnight. Programmers can also use *Free-Link*'s Menu Function Builder to create



Screen 1: From Free-Link's virtual disk submenu, you mount and dismount the virtual disks that hold your files. A single virtual disk can hold up to 15MB of data.

foolproof front ends for a variety of office tasks involving micro-to-mainframe data exchange.

The *Free-Link* package comes with three system disks for the PC and a program tape for the mainframe. Two well-organized manuals are provided, one for the PC user and the other for a system programmer. The PC user manual contains separate tutorial and reference sections detailing *Free-Link*'s various functions, and it is complemented by the program's extensive, context-sensitive on-line help. For the system programmer, the mainframe documentation includes complete descriptions of the tape's various program modules.

Mainframe software installation is rather intricate. A system programmer must update the mainframe's CICS tables to include *Free-Link* entries and allocate space for the program's VSAM files. For convenience, the VSAM files include default values for space allocation and record size. The manual does its part to ease the installation process by providing sample JCLs (Job Control Language mainframe batch files).

At the PC end, life is less complicated. Because *Free-Link*'s basic functions are embodied in separate software modules, you can pick and choose the ones you want to install from the setup menu's System Components window. The setup menu also lets you choose from a complete selection of coaxial emulators, protocol converters, PC display adapters, and mainframe controllers (see Screen 1). *Free-Link*'s copy-protection scheme enables you to install the program on a hard disk up to four times.

Using virtual disks. Starting a *Free-Link* session is a three-step process. You begin by loading the emulator program, which should be in the resident mode so you can exit to DOS without breaking the connection with the host. You then load the driver that interfaces with the emulator, and finally, enter the start-up command that loads the modules you specified during setup. On-Line Software provides ready-made batch files to automate the last two steps for selected emulation programs.

Choosing the virtual disk option from the main menu calls up a screenful of file management options (see Screen 2). Selecting <F2> at this submenu kicks the virtual disk software module into gear, setting the stage for mounting and dismounting virtual disks. However, before you begin reading and writing to these ersatz floppies, you must enter the name of the virtual disk library in which they're kept.

Libraries—like real-life disk boxes—provide a convenient way to organize and protect your disks. When you name a library, you also need to specify the number of disks it will hold. *Free-Link* comes with a virtual disk library called Frevirt, which, like any library you set up yourself, can contain from one to 255 disks. If more than one person can access virtual disk data files, *Free-Link*'s password protection acts as a library gatekeeper.

The next step is to establish the amount of data a disk can hold. *Free-Link* allows you to create disks with a capacity of 32K to 512K in 32K increments and of 1MB to 15MB in 1MB increments. The only other limitation is that

different-size disks can't be in the same library.

To read or write to a disk, you must mount it in a virtual drive by entering the disk number, a drive letter, and an access code. To guard against a CICS "abend"—the mainframe equivalent of a system crash—*Free-Link* prevents a PC and the mainframe (or two PCs) from accessing the same virtual disk simultaneously.

Once you've mounted a disk in a virtual drive, you can exit *Free-Link* using DOS's Gate option and start up a PC application. The PC program will recognize any data or compatible software on the disk, reading and writing as though it were the real thing. Using data files on virtual disks in drives D: and E:, *dBASE III* and *Reflex* had no trouble accessing their vastly expanded storage space. However, don't forget that for conventional applications, the VSAM/DOS translation process slows virtual disk access times well beyond tolerable limits. Saving data from PC applications to virtual disks for later access by the mainframe or other PCs makes the most sense.

The file transfer express. For some operations, you may want to extract and translate data from a mainframe data base and read it to a virtual disk or send it directly to your PC.

This data extraction process begins when you define the VSAM files and fields that you want to access. Together, these specifications are referred to in the *Free-Link* manual as a "view." *Free-Link*'s documentation provides a seven-

Screen 2: Free-Link's setup menu lets you select from a wide range of drivers. It also enables you to load the program one module at a time.

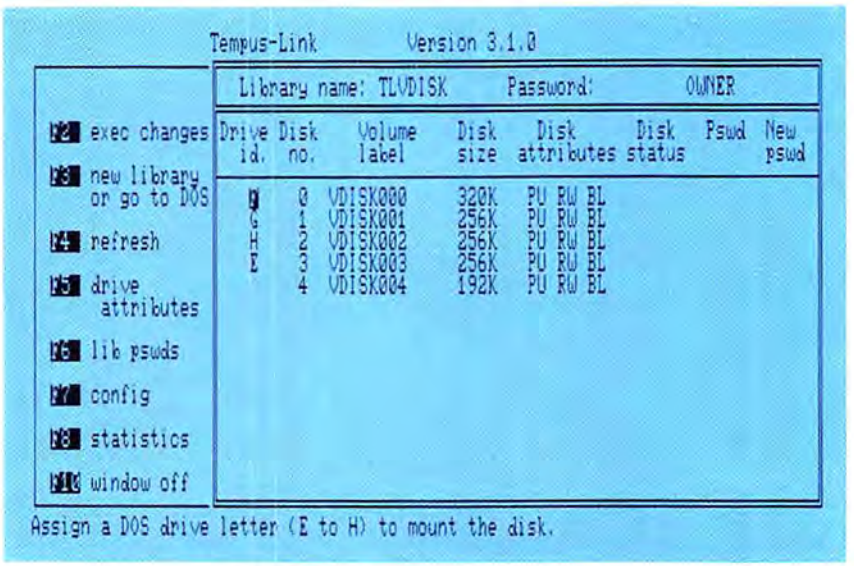
field sample view called Sales to demonstrate the program's selective data transfer capabilities.

The program's "procedure" function narrows down the records to be transferred and provides logical operators for sorting and linking data. The operators are fairly standard data base commands, such as Exclude, Compute, Order..By, Sort..By, Total..By, When, and so on. A limited set of commands also enables you to perform calculations on extracted data, such as adding together or truncating specified fields. While more flexibility in this regard would be desirable, you can still build quite useful data base query procedures.

Using *Free-Link*'s File Reformat utilities, you can read extracted data directly into a variety of PC applications, including *1-2-3*, *Symphony*, *Aura*, and *dBASE II* and *III*. To send files from the PC or a virtual disk to the mainframe data base, On-Line Software offers a number of add-on utilities. System programmers can also access virtual disk libraries through the Olcmdam program in CICS. *Free-Link*'s two-way street—although somewhat circuitous—helps pave the way toward smooth micro-to-mainframe data exchange.

Tempus-Link

In contrast to *Free-Link*, *Tempus-Link* provides a more open, versatile virtual disk interface. This flexibility enables PC users to incorporate many of *Tempus-Link*'s capabilities into their own application software. Like *Free-Link*, *Tempus-Link* handles both virtual disk applications and a wide range of file transfer tasks. However, because *Tempus-Link*



Screen 3: Tempus-Link's library menu appears when you enter the start-up command.

lacks many of the built-in features offered by *Free-Link*, the programmer must flesh out the user interface—especially for mainframe-to-micro file transfer.

The *Tempus-Link* package is a bit skimpier than *Free-Link*. In addition to the system disks and program tape, *Tempus-Link* comes with a single user manual—a brief, technical affair intended for application programmers. The documentation is divided into several sections offering installation procedures, general reference, programmer's reference, and user's guides.

Tempus-Link's PC software is not copy protected, making installation on hard disks a snap. The program is compatible with an array of hardware comparable to that supported by *Free-Link*. Although mainframe software installation involves several steps, system programmers should find the documentation's instructions clear. The manual contains sample JCLs to help smooth the mainframe installation process.

Using virtual disks. Getting a virtual disk up and running is a bit easier with *Tempus-Link* than with *Free-Link*. The process begins the same way, but after you load the terminal emulation program along with its driver, you enter the name of the virtual disk library you want to access on the same line as the start-up command.

Tempus-Link immediately responds with a screen displaying information about the chosen library, including its name, disk status, and disk attributes. Setting up libraries and disks is virtually the same as in *Free-Link*. Disk attribute options are also identical, except that *Tempus-Link* allows you to mix disks with different capacities in the same library.

Tempus-Link offers a choice of entering commands at the DOS prompt or by using menus conjured up by the TLscreen program (see Screen 3). The menus also list transmission parameter options, such as those pertaining to error checking and correction. To mount a virtual disk, you enter the TLuse command plus the disk number and drive letter. With each execution of TLuse, *Tempus-Link* displays the status and security attributes of the active disks (see Screen 4). As with *Free-Link*, primary security is at the library level, and disks are protected from potentially disastrous simultaneous access. Using the Tlop utility, you can change library or disk passwords, initialize a virtual disk, and display a list of current *Tempus-Link* users.

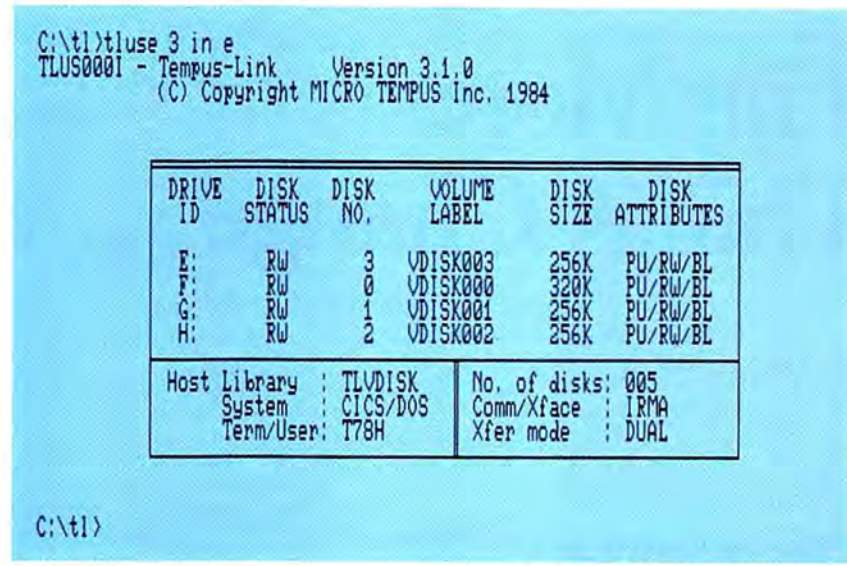
Although using the DOS COPY command is one way to copy files from PC disks to the virtual ones, *Tempus-Link* also provides a Supercopy utility that speeds file transfer. If you interrupt the transfer process, Supercopy can later pick up where you left off. Because saving to a virtual disk is so time-consuming, Supercopy's ability to to check the disk's available file space *before* you save a file is especially welcome.

Tempus-Link's primary advantage over *Free-Link* is the interface it provides PC and mainframe programmers. Referred to as the Host Application Program Interface (HAPI) on the mainframe end and simply API on the PC end, the interface permits tight integration between PC applications and *Tempus-Link* functions.

Any PC program written in IBM BASIC, Macro Assembler,

Lattice C, or C86 can directly address virtual disks and their associated DOS-like commands, plus *Tempus-Link*'s mainframe subroutines. Although the program lacks the menu-driven data extraction capabilities of *Free-Link*, the interface allows programmers to tailor applications to any number of end-user requirements.

For mainframe programmers, *Tempus-Link* provides utilities for accessing virtual disk data during mainframe processing or for sending the data to a local network of PCs. The utilities also enable programmers to translate and import PC data to mainframe data bases. But any way you slice it, programmers have their work cut out for them if they want to fully utilize *Tempus-Link*.



Screen 4: Each time you mount a Tempus-Link disk, a status screen shows the drive, security status, and disk attributes.

Parallel Links

Apart from their user interfaces, *Free-Link* and *Tempus-Link* display far more similarities than differences. From a programmer's point of view, they diverge most in the amount of time and effort required to make them perform effectively. With its menu-driven structure and context-sensitive help, *Free-Link* makes accessing the mainframe data a breeze for users. *Tempus-Link* can perform these data extraction tasks just as well—plus supply the bonus of integrating PC applications with virtual disk functions—but the labor involved may harry beleaguered programmers.

During testing, the products performed equally well, although their access times depended heavily on the number of users on the system and the type of hardware-software link. Hooking up to a cassette recorder would yield much better results than these programs at their best. And although using virtual disks for archival purposes might seem attractive at first, PC-based archival storage devices far outstrip mainframe mass storage in cost-effectiveness.

The best roles for *Free-Link* and *Tempus-Link* are as convenient conduits for micro-to-mainframe data exchange. Furthermore, virtual disks facilitate free data exchange among PCs, both by giving users access to a single virtual disk library and by enabling them to swap disks from one library to another—thus creating a virtual network. Offering virtually endless possibilities for data exchange, these products take you one step closer to uncovering the missing micro-to-mainframe link.

Sanjiva Nath is a programmer analyst and the coauthor of several books on PC applications.

Free-Link
On-Line Software Int'l, Inc.
Fort Lee Executive Park
2 Executive Dr.
Fort Lee, NJ 07024
201/592-0009
List price: for use with one PC under DOS/VSE $6495
Requirements: 256K, hard disk, terminal emulation board and software

Tempus-Link
Micro Tempus, Inc.
440 Dorchester Blvd. W #300
Montreal, Quebec
H2Z 1V7 Canada
514/397-9512
List price: for use with minimum of five PCs under DOS/VSE $6200
Requirements: 128K, hard disk, terminal emulation board and software

The More Things Change . . .

Lifetree Software's Volkswriter 3 is loaded with features that were once considered advanced but now seem passé. Can it survive in this generation of turbocharged word processing?

Janet Crider

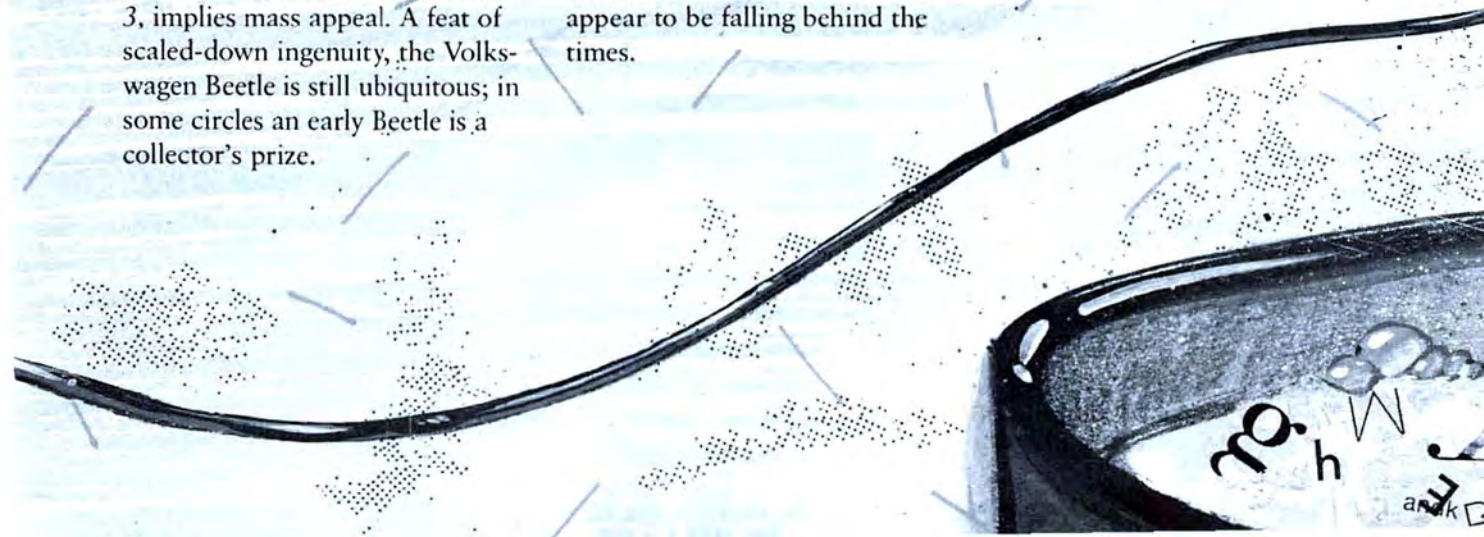
Like the auto industry's Volkswagen, the name of Lifetree Software's latest version of its word processor, *Volkswriter 3*, implies mass appeal. A feat of scaled-down ingenuity, the Volkswagen Beetle is still ubiquitous; in some circles an early Beetle is a collector's prize.

Later versions of the car, however, did not achieve comparable popularity. As beefy engines and tuck-and-roll comfort became the American driver's priority, Volkswagen tried unsuccessfully to adapt the underpowered and under-appointed Beetle to this environment.

Picture a similar situation in the word processing environment, as former industry standards are squeezed out of the market by packages that offer windows, macros, split screens, laser printer compatibility, and what-you-see-is-what-you-get displays. Newer word processors seem to evolve by quantum leaps with each update, but word processing pioneers like MicroPro and Lifetree Software appear to be falling behind the times.

Tiny Steps

Lifetree is advertising *Volkswriter 3* as a powerful menu-driven program that is appropriate for novices (for a neophyte's view of the program see the sidebar "Communing With the People's Word Processor"). At face value, the package has an array of functions that seem to rival the standard-bearers of the word processing front. Look closely, however, and you'll notice that Lifetree has not carried many of these features to their logical conclusion: The package is bound by some of the same limitations that have cut short the lives of fellow word processing pioneers.



While other software publishers have made great strides with the addition of refinements, Lifetree is taking tiny steps with *Volkswriter 3*. The new additions include a 170,000-word phonetic spelling checker and dictionary, automatic hyphenation, and math and sorting–in other words, features that have been standard in other word processors for years.

However, the program lacks capabilities that are considered new standards: an undo or restore feature, an easy method of copying text from one document to the next, an automatic footnoting program, and a macro capability. More significantly, *Volkswriter 3* does not address the limitations of features found in earlier versions.

The *Volkswriter* products have been plagued by small problems that, individually, are only mildly annoying. In concert, however, the flaws in *Volkswriter 3* lend the program an air of oafishness: Reformatting is slow and inelegant, default color choices render the display virtually illegible, and what you see on the screen isn't what you get in hard copy.

Installation

Volkswriter 3 is not copy protected, and installation is fairly easy. As part of the installation process *Volkswriter 3* runs CONFIGUR, a question-and-answer program that customizes *Volkswriter 3* to your system.

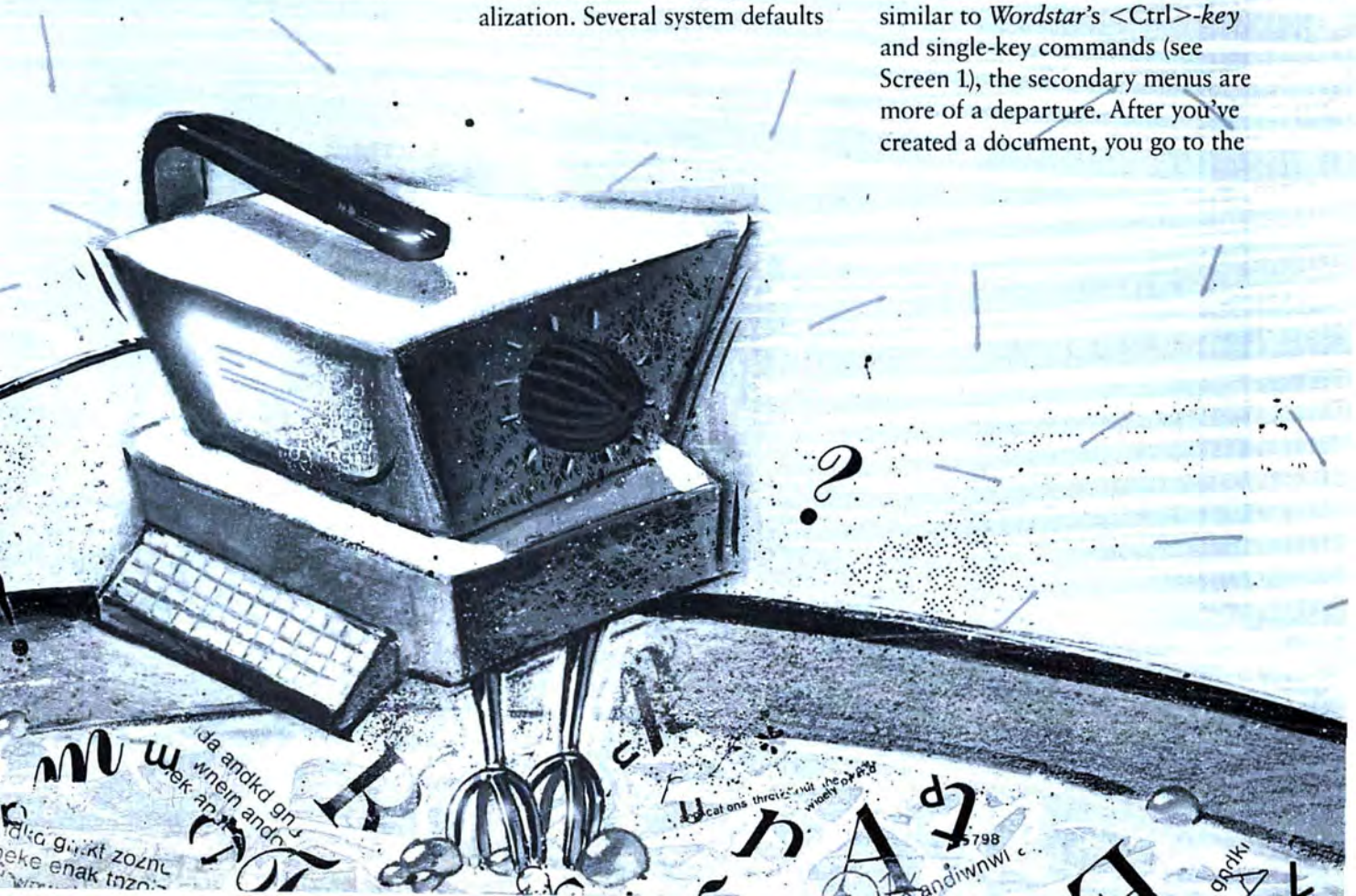
Next, *Volkswriter 3* displays a panel of system defaults, which will be active unless you specify otherwise. To change a default setting, you select the corresponding entry from the CONFIGUR main menu.

Unfortunately, *Volkswriter 3* does not allow enough personalization. Several system defaults are inalterable, the most significant being the overtype mode. Most word processors, and productivity packages in general, default to the insert mode. To insert text in *Volkswriter 3* you must first toggle to the insert mode by pressing <Ins> each time you call up a document. After a file has been saved and brought back to the screen, you'll need to press <Ins> again to get out of overtype.

CONFIGUR also asks you to indicate the type of printer you use. *Volkswriter 3* works with 125 printers, but you must install the program for use with one printer at a time. If you decide to change printers in midtask, you must run CONFIGUR again, but you don't need to reinstall *Volkswriter 3*.

Documenting Style

While *Volkswriter 3*'s main menu uses a command structure similar to *Wordstar*'s <Ctrl>-*key* and single-key commands (see Screen 1), the secondary menus are more of a departure. After you've created a document, you go to the



Communing With the People's Word Processor

James Armstrong

For months, friends had been after me to junk the decrepit Swintec on which I'd pounded out at least a few decent epistles. "You've never written until you've written on a PC," they'd say engagingly. My stock answer, delivered without missing a bone-crushing keystroke, was always a droll "eventually."

Eventually arrived a few weeks ago, and truth to tell, it came a few moments too soon. While I'm a classic candidate for word processing—the professional thrills of life as a travel writer/photographer ensure that I at least *appear* to be multitasking—the transition from ink-soiled ribbons to control keys and formatting codes was laced with frustration.

My new tools of the trade included a Tandy 1000HD and *Volkswriter 3*, Lifetree Software's updated release of the people's word processor. It sounded encouraging. In practice, it was daunting. Although I'm an unabashed novice, my experience yielded lessons that may have value even for accomplished users. Those lessons go something like this: Don't be lulled into assuming that what seems accessible actually is; support is where you find it—but you may need it everywhere, at least initially; always read the fine print; and have among your circle of friends a computer guru or two.

My educational tool kit regrettably consisted of little more than system documentation. Without the patience of two knowledgeable friends and the woman at the other end of Lifetree's help line, I might well be back clacking away on the Swintec.

The *Volkswriter* manual rests on an edifice of assumptions and expertise seemingly beyond my ken. The path that has always been easiest for me—reading—suddenly appeared the most intimidating. I asked questions; my friends responded reassuringly. I plunged into *Volkswriter 3*.

Four pages into a document, control seemed to pass from the muse to the machine. The cursor stuttered, the Tandy 1000 gasped with asthmatic frequency, the spelling checker lost its way, the system froze. My friend the PC savant correctly determined that the 256K Tandy was "dipping into user RAM for 16K of screen memory" that on other systems is tucked safely above DOS's 640K ceiling. The result: My documents were limited to a meager three pages. Given his deduction, I simply acquired additional RAM.

Even though this was, as they say, primarily a hardware problem, it unleashed barely suppressed apprehensions about the program itself. Why

wasn't Lifetree a bit more forthcoming about the program's effective memory requirements, especially for Tandy machines? (I found the warning in the appendix, not emblazoned on the box where it belonged.) After all, with 256K you can generate little more than a glorified shopping list. Naive as it may seem, I expected *guidance* from *Volkswriter.*

Thus, when I returned to the program with RAM upgraded, I felt more at sea than ever. Maddening little glitches continued to plague my initiation into word processing. Why didn't the formats remain intact? Why were the defaults taking over? Why couldn't I move a block of text between files? What demons were responsible for the incessant 'File not found' and 'Invalid directory' messages? Why was the spelling checker so tolerant of typing mistakes? What inspired the cursor, after reformatting, to take off for the bottom of a paragraph—rather than remaining where I left (and wanted) .? Why was printing the same page twice seemingly impossible?

Ignorance may not be a defense, but it's no crime, either. Even the woman handling Lifetree's phone support seemed perplexed and promised to check on my queries. As it turned out, some of these problems were real, others were misunderstandings on my part, and still others the standard frustrations of using almost any word processor.

Still, time and experience heal most wounds, and my biggest revelation to date is that I'm reluctant—even unwilling—to retreat from word processing. The water may not always be fine, but once you've plunged in it becomes addictively comfortable.

positions the margins and tabs on each page before printing.

All style sheets in *Volkswriter 3* are assigned the prefix VWSTYLE. It's up to you to assign a dot extension to it, such as .LTR for a letter format, or .RPT for a report format. To apply the style sheet to a document you must attach the same extension to both files.

Volkswriter 3 provides a universal default style sheet that the program assigns if none has been chosen, or you can design your own. Thus you can create a document and print it without assigning it a style sheet, but if you want to preserve the layout for subsequent documents, you set up your own style sheet and store it.

You retrieve a style sheet by selecting L from the Commands menu and then choosing R from the style sheet menu (see Screen 2). At the prompt you type the file name extension of the style sheet you want, and *Volkswriter 3* will apply the style sheet to the current document.

Expert Layouts

Lifetree deserves credit for *Volkswriter 3*'s layout capabilities. The layout menu, called by pressing <F9>, displays an impressive list of options (see Screen 3). You can set margins and tabs, and control print characteristics such as line spacing and justification. You are limited to 15 layout options per document.

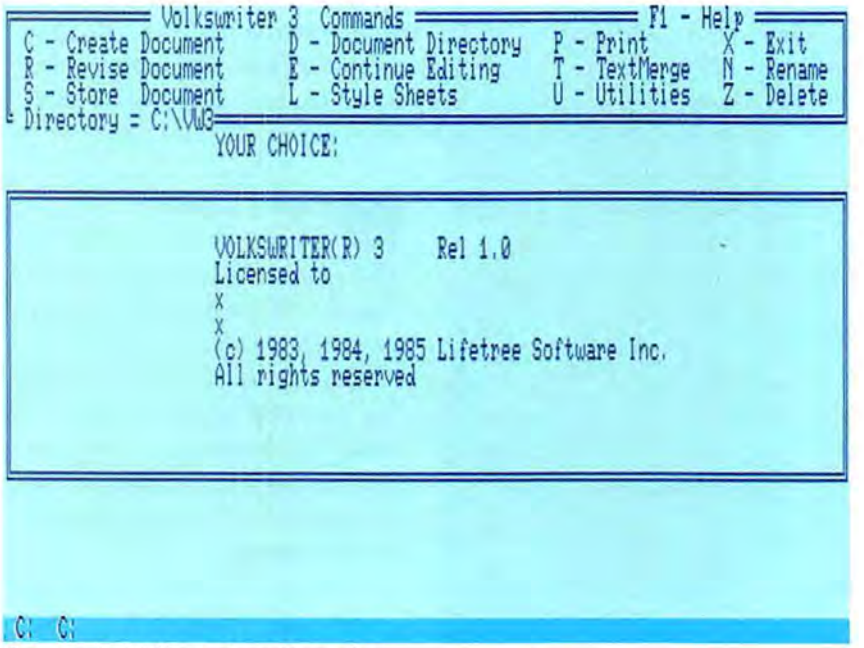
style sheet menu to select a style sheet that automatically formats the document according to a predetermined set of layout commands. For example, if you are writing a batch of letters and want all the margins and tabs to appear in the exact same place, you can write the letters and then apply a single style sheet to them that

The Preferences menu, called by pressing <Ctrl>-<F1>, lists additional editing mode features that you can modify, such as visible line spacing, ruler lines, automatic reformat, automatic hyphenation, and audible beep on command errors.

Despite the wide array of formatting choices, *Volkswriter 3* is so slow at reformatting that you may be conditioned to avoid reassigning formats while working on a document. Any time you change a margin in a document, you must sit through the lengthy process of reformatting, during which *Volkswriter 3* scrolls the entire text across the screen in inverse video as though the program had marked the document as a block of text. Since a simple reformat—changing the margins of a 17K document—can take between 53 and 67 seconds, you may want to wait until you've completed the document before you reformat.

Volkswriter 3 strays from the trend of what-you-see-is-what-you-get and continues to use embedded double-dot commands to control layout features such as headings, page numbering, and page breaks, as well as printing functions. However, the program hides commands for special effects such as boldface, italics, and subscripts, and highlights the text on the screen.

Despite the wide array of formatting choices, Volkswriter 3 *is so slow at reformatting that you may be conditioned to avoid reassigning formats while working on a document.*



Screen 1: Volkswriter 3's main menu bears close resemblance to the main command menu used in WordStar. Volkswriter 3 even uses similar <Ctrl>-key and single-key commands.

It'll Go Around the Block . . .

Working with blocks of text is reminiscent of using *WordStar*'s block capabilities. You mark off a section of text to be moved, deleted, or copied, give the appropriate command, and the block is processed. As with *WordStar*, marked blocks are automatically highlighted on a color monitor, but Lifetree's default highlight colors render the text illegible. Luckily, you can change the combination with the CONFIGUR program.

... But Don't Take It on the Freeway

Once you've moved or copied text, the markers disappear. In order to work with that block again you'll have to re-mark it. If you have to repeatedly manipulate one block of text, you'll spend an inordinate amount of time setting markers.

Volkswriter 3's cursor position for marking the end of a block is also a bit out of the ordinary. For example, in most programs, to mark one line of text as a block you would put the cursor at the beginning of the line, mark it, and then move to the beginning of the next line to mark the end of the block. In *Volkswriter 3*, however, if you move to the beginning of the next line, your marked block will include the first character of that line as well. *Volkswriter 3* is programmed to mark a block to the right of the cursor, regardless of whether you are marking the beginning or the end of a block. Most word processors distinguish between the two and mark the end of the block to the left of the cursor.

Easy Math and Sorting

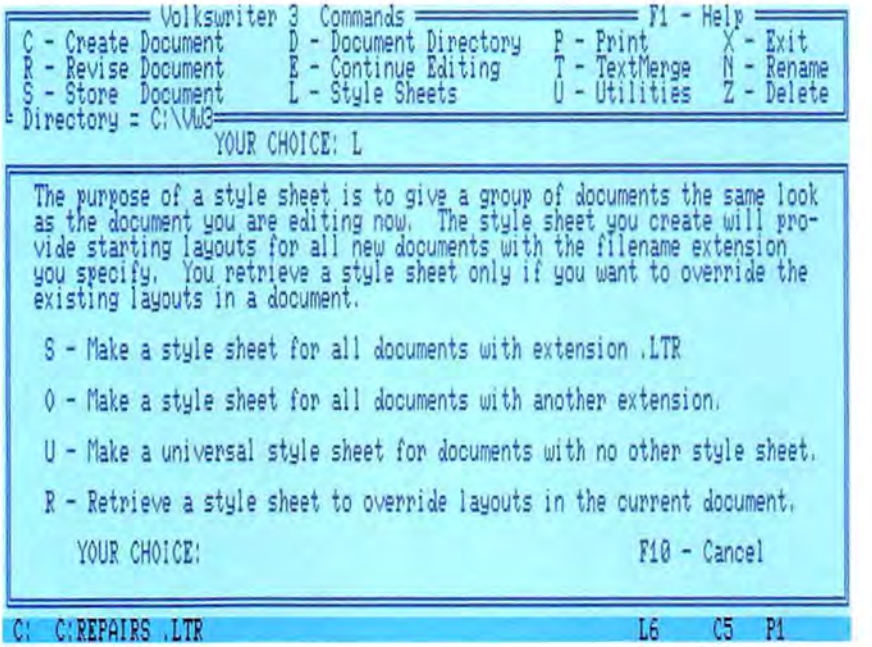
As with *WordStar 2000*, anything you can mark as a block can be calculated. You can add, subtract, multiply, divide, insert subtotals, calculate percentages, and use constants. You can also add rows and columns as if you were working in a spreadsheet.

No spaces are allowed within a number, and you must insert spaces between numbers and arithmetic operators or *Volkswriter 3* won't recognize the statement (for example, 46.91 / 8.2 is valid; 46.91/8.2 is not). Also, numbers in columns must be aligned by decimal place to be calculated correctly. You have to turn off *Volkswriter 3*'s automatic reformatting feature when you work with numbers; otherwise, when you reformat the page, the numbers will be assembled into a paragraph.

To sort columns of text or numbers, you mark the column to be sorted as a block, press the math command—<Ctrl>-<F9>—and specify ascending or descending order. The program can also alphabetize lists. Lifetree claims that *Volkswriter 3* can sort up to 32,000 lines, but you'll grow old and gray if you wait for the program to complete such a task. *Volkswriter 3* takes 17 seconds to sort a list of 200 single names alphabetically; the same list duplicated to 1000 lines takes 4 minutes and 45 seconds. Obviously, a 32,000-entry list would require an unbearable wait.

Finishing Touches

The interactive, 170,000-word speller is the major addition to *Volkswriter 3*. Aside from its size, the spelling checker offers no real surprises. When *Volkswriter 3*

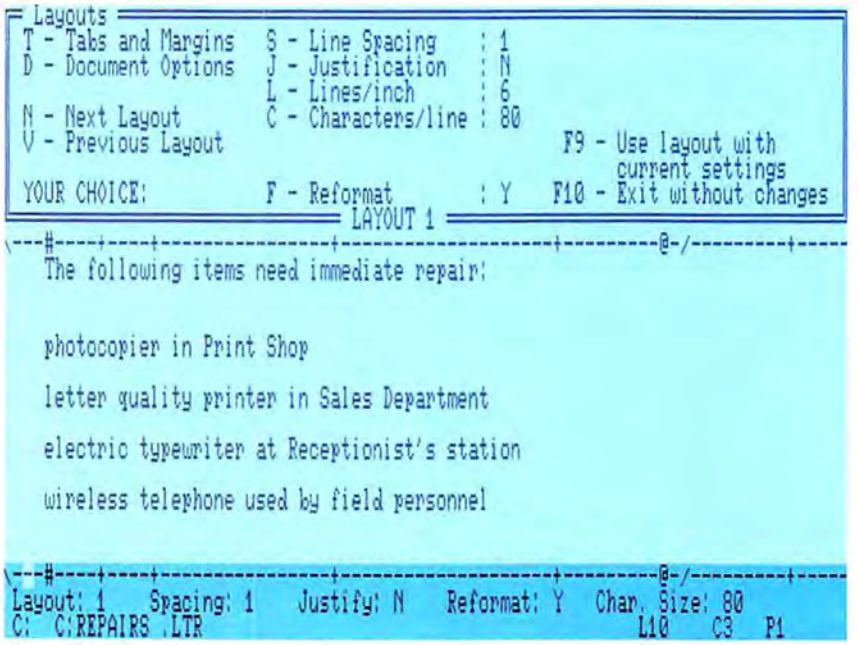


Screen 2: Volkswriter 3's style sheet menu is the most innovative feature in the program. After you compose a combination of layout features, this menu lets you recall the combination and apply it to your current document.

locates a suspect word, you can ignore or accept the suggested correction, type the correct word from the keyboard for insertion into the document, or add it to your dictionary. You can add up to 3000 words.

Like previous versions, *Volkswriter 3* has two different commands for storing a document: one to store, and one to store and return to the document. But when you give the latter command, there is no guarantee that the program will return you to the same point in the document. Sometimes it does, sometimes it doesn't. According to Lifetree, this bug appears only in very early copies of this version and was corrected soon after *Volkswriter 3* was released. Lifetree offers an updated disk that corrects this cursor problem.

Word processing aficionados possess ever more sophisticated tastes, but Volkswriter 3 *remains mired in the past. The program asks you to compromise many times over.*



Screen 3: Volkswriter 3 offers an extensive menu of layout features and options, but you are limited to using 15 options per document.

Running on Three Cylinders

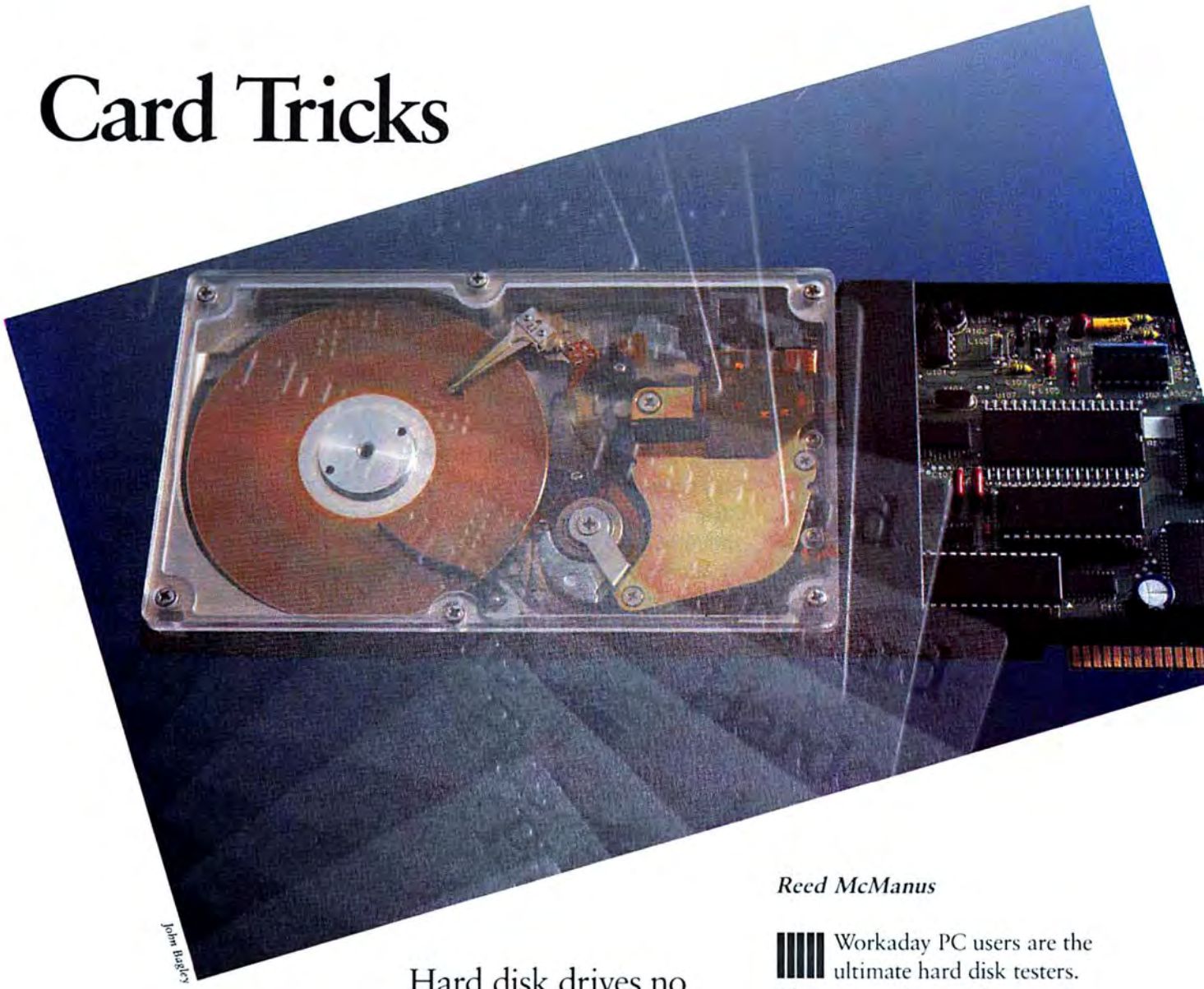
Word processing aficionados possess ever more sophisticated tastes, but *Volkswriter 3* remains mired in the past. The program asks you to compromise many times over.

If your list of requirements includes menus, ease of installation, and extensive printer support, then *Volkswriter 3* deserves your consideration. However, if you start asking for much more, you begin running into walls. Think of *Volkswriter 3* as basic transportation. It will get you around for now, but later you might decide to trade it in.

Janet Crider is a word processing training consultant based in Tucson, Arizona. She is the author of Word-for-Word: A Comparative Guide to Word Processing Software *(Osborne/McGraw-Hill, 1985).*

Volkswriter 3
Lifetree Software, Inc.
411 Pacific St. #315
Monterey, CA 93940
408/373-4718
List price: $295
Requirements: 256K, two disk drives or one disk drive and a hard disk, DOS 2.00 or later version

Card Tricks



John Bagley

Hard disk drives no longer vie with the PC for desk space. Today 10 or 20 megabytes of mass storage can be neatly pasted onto an expansion board and tucked inside a PC or an XT. PC World takes a critical look at hard disk cards from Plus Development, Western Digital, and Mountain Computer.

Reed McManus

Workaday PC users are the ultimate hard disk testers. They want substantial computing power without the complications—they *don't* want to plow through recondite technical manuals or rummage around inside a PC. But power and grace are rarely paired. When 10MB and 20MB internal hard disk drive prices nosedived last year, users who were tired of shuffling floppy disks snapped them up (see "Sensible Storage," *PCW*, August 1985, and "Critical Mass," *PCW*, December 1985). Although they gained swiftness and cavernous capacity, users had to face the somewhat imposing task

Fred Stimson

Save a floppy—and lose one or two slots. But even with the FileCard, DriveCard, and Hardcard cheek by jowl, there's room for a half-length board.

of removing a floppy disk drive and replacing it with a hard disk relative. Not everyone took advantage of hard disk fire sales, either. Compaq Portable owners wisely begged off, sensing that the bumps and bangs of portability were not meant for inadequately shock-mounted hard disks.

Adding mass storage to your machine need not be traumatic or entail the sacrifice of a floppy disk drive. Thanks to the compactness of 3.5-inch hard disk mechanisms, new VLSI (very large scale integration) chips that possess thousands of circuits, and space-saving surface-mount technology, manufacturers have succeeded in squeezing 10MB or 20MB hard disk drives onto a single expansion board. The units reviewed here—the 10MB Plus Development Hardcard, the 10MB Western Digital FileCard, and the 20MB Mountain Computer DriveCard—are but the first commercial realizations of this technology.

Slapping a hard disk card into a dual-floppy desktop or portable computer is as easy as installing a memory board, and the benefits are well worth the minor effort. With a hard disk card, Brobdingnagian applications that normally chug along on a floppy system (and require you to pop disks in and out repeatedly) practically zoom. But before you write out a check, keep in mind that older systems will not recognize the presence of any hard disk unless a new ROM BIOS chip (costing as much as $60) is installed. Worse still, older Compaq Portables may crack under the strain when a hard disk card first starts up.

In our initial tests, starting up a Plus Development Hardcard in a vintage 512K Compaq dealt the system's $350 power supply a fatal blow. The Hardcard, which is hungrier than most hard disk cards, shares some of the blame because at system start-up, the drive gobbles up as much as 18 watts. But the primary culprit is the Compaq's power supply. A spokesperson for Compaq admitted that older units cannot handle power surges that stretch the power supply beyond its specifications, though replacement power supplies sold by Compaq and those used in current machines can take the load.

Pure Simplicity

Installing a hard disk card simply means fitting a board into a slot and fastening it to the PC's back panel with a screw. In the optimum case, as exemplified by Plus Development's Hardcard, you slip off the computer's cover, secure the board in a slot, replace the cover, load DOS in drive A:, and type **C:INSTALL C:**. The disk is already low-level formatted at the factory; software stored in ROM chips on the Hardcard performs

disk partitioning and DOS formatting, then prompts you to create a floppy disk backup of the format files. In less than 20 minutes you are left with a self-booting 10MB hard disk—and both floppy disk drives.

XT Plus

With a hard disk card, XT users can gain the storage clout of an AT without having to replace an existing hard disk drive. Accommodating a second hard disk is a matter of changing jumper positions on the hard disk card, a straightforward process that's explained clearly in each hard disk card's respective user manual. The card is then designated drive D: and, with the exception of the DriveCard, is accessible only after DOS is loaded from the first hard disk (drive C:) or a floppy disk drive.

Although hard disk cards are easy to install and use, they're not always chummy with other hard disk drives. Plus Development pointedly notes that the Hardcard works only with manufacturer-supplied internal hard drives for the XT, the Compaq-Plus, and the Deskpro. Western Digital and Mountain claim their offerings are sociable with most internal and external hard disk drives. You can even daisy chain four DriveCards for a total of 84MB, but at $1195 per drive, that configuration is hardly cost-effective. For that much storage, it's best to buy an external hard disk system with its own power supply and fan.

My PC Runneth Over

A typically configured PC or Compaq contains a video adapter, a floppy disk controller board, and a multifunction memory board, leaving at best two slots free. Although hard disk cards require just one physical connection, their girth often leaves only enough space in an adjoining slot for a half-length expansion board (see Figure 1). Hard disk card manufacturers aren't totally insensitive to this issue. Plus Development's comparatively slim, 1-inch-wide Hardcard won't elbow out most neighbors. The somewhat fatter FileCard leaves clearance for full-length cards on either side, though not in an XT, where slots are .2 inches closer together than in a PC. The DriveCard, however, takes up the space of one and a half boards. The user manual shows you how to reduce the congestion by moving the PC's or XT's speaker and putting the DriveCard in the end slot (see Figure 2).

Although hard disk cards require just one physical connection, their girth often leaves only enough space in an adjoining slot for a half-length expansion board. Hard disk card manufacturers aren't totally insensitive to this issue.

Unfortunately, hard disk cards not only take up more than their fair share of space, they generate heat that may endanger chips and other components on neighboring expansion boards. To better dissipate toasty air, keep hard disk cards away from other PC space heaters such as internal modems and memory boards. PC owners should also follow the XT's example and cover the right two-thirds of their system's lower front air vents; the DriveCard even comes with the necessary tape for the job.

Hardened Drives

Although all three hard disk cards are shock-mounted, Plus Development and Western Digital have taken extra care to protect components and data from damage. Both companies encase the drive mechanism in a metal shell and automatically move the read/write heads to an empty "landing zone" toward the center of the disk when the computer is turned off; the FileCard even parks its heads if the drive is not accessed within 5 seconds. Mountain Computer hasn't been quite

so circumspect: The DriveCard disk mechanism is not totally sheathed, and the read/write heads are merely lifted off the platter and stabilized when the computer is switched off. To park the heads, you must run a separate utility program.

Hardcard can swap computer mates but should be reformatted from top to bottom. Unfortunately, the Hardcard user manual doesn't come with the pertinent directions for low-level formatting—you must contact the company.

And what of reliability? Hard disk cards rely on fewer electronic components, draw less power, and are cooler than their traditional counterparts—all of which should translate into fewer visits to the repair shop.

Depending on the drive, a fully parked hard disk card can withstand a 60g to 100g shock—the latter is the equivalent of pushing a unit off a 3-foot-high desk onto a concrete floor. Even compared to the 40g resistance of the Compaq-Plus's famous triple-shock-mounted hard disk drive, this is extraordinary protection.

Although not designed to be truly transportable, hard disk cards are durable enough to travel—but be careful to protect vulnerable components by transporting the drive in its original shipping carton. Note, too, that a hard disk card installed for a PC can usually be moved to a compatible computer. The only warning issued by the manufacturers is to match the computer's version of DOS (loaded either from a floppy disk or an existing hard disk) with the card's. Only Plus Development hesitates to endorse the practice; according to the company, the

Hard Disk Card Concerns

Despite their potential appeal, hard disk cards have drawbacks. They are more expensive than traditional internal hard disk drives, compatible with but a handful of computers, and for all their shock mounting, fragile.

Cost has been the first obstacle to tumble. Competitive pressures have driven manufacturer list prices down by as much as 20 percent. The 10MB Hardcard was initially offered at $1095; four months later, Plus Development dropped the price to $895. Western Digital quickly followed suit, knocking $200 off the $995 cost of the FileCard. Because hard disk cards are new to the market, don't expect massive mail-order price slashing—yet. But discounters are sharpening their scimitars, and some outlets already offer the 20MB DriveCard for $730. It won't be long before vendors of traditional 10MB and 20MB internal hard disk drives begin to feel the pinch.

Compatibility is a stickier issue. All three hard disk cards have been certified for selected machines in the IBM PC and Compaq families (see Table 1). But as reassuring as compatibility testing sounds, it is not foolproof. Western Digital claims the FileCard works amiably with the Compaq Portable, but the two FileCards available for review could not be formatted, much less run, in the machine. A technical representative at Western Digital reluctantly admitted that three of their nine Compaqs were similarly uncooperative. The company is naturally attempting to correct the problem; in the meantime, Compaq owners beware. Mountain Computer and Western Digital also say their drives work with a number of unspecified compatibles. If yours is one of these "unlisted" machines, contact the manufacturer to see if tests have been conducted. When in doubt, make sure your dealer will refund the purchase price of a hard disk card that proves incompatible.

And what of reliability? To use the cliché, only time will tell. In their favor, hard disk cards rely on fewer electronic components, draw less power, and are cooler than their traditional counterparts—all of which should translate into fewer visits to the repair shop. MTBF (mean time between failure) ratings range from the FileCard's 11,000 hours (typical for hard disk drives) to 20,000 and

40,000 hours respectively for the DriveCard and the Hardcard. Unlike IBM, which covers its PC products for 90 days, all three hard disk card makers back their drives with one-year parts and labor warranties.

Hard Knocks

But warranties don't count for much if a hard disk card can't take a licking and keep on spinning. Accordingly, *PC World* ran each one through a series of battering read/write tests to measure performance, staying power, and read/write accuracy. Each card was tested in a dual-floppy 512K PC with a floppy disk controller, a monochrome display adapter, and Tecmar's Captain memory board.

The test program, developed by David Jenkins and Saul Korduner of Midway Software, created a 100K and a 1MB file filled with 512-byte records of 0s and 1s, then read the records sequentially a set number of times and checked for read/write errors. The program then instructed the drive to read the data from random records on the disk and flag errors. The sequential part of this test was intended to simulate common disk activities such as disk and file copying, while the random seeking mimicked an application's search and retrieval of data scattered across the disk.

All three drives performed without generating any read/write errors, but the drives differed markedly in the time each took to complete its rounds.

Table 1: Three hard cards feature by feature

	Plus Development Hardcard	Western Digital FileCard	Mountain Computer DriveCard
Hardware supported			
AT&T PC 6300	•	•	•
Compaq Deskpro	•	•	•
Compaq Deskpro 286			•
Compaq Deskpro 286 Portable			•
Compaq-Plus	•	•	
Compaq Portable	•	•	•
Corona PC		•	
Epson Equity I		•	
IBM 3270-PC	•		•
IBM PC AT			•
IBM PC/XT	•	•	•
ITT Xtra		•	
Kaypro PC		•	
NCR PC6		•	
Sperry PC		•	
Zenith 150		•	
Operations			
Formatted capacity	10.56MB	10.7MB	21.0MB
Transfer rate (megabits/second)	5	3.2	5
Average access time (milliseconds)	65	147	78
Interleave value	3:1	3:1	6:1
Changeable interleave	yes[1]	yes[1]	yes
Power required (watts)			
Maximum/start-up	18	9.75	14
Average	11	4.95	12.5
Durability			
Shock resistance			
Operating	10g	5g	5g
Nonoperating[2]	100g	70g	60g
Automatic head parking	yes	yes	no
Landing zone	yes	yes	yes
Mean time between failures (hours)	40,000	11,000	20,000
General			
Software included	Hardcard Directory	Xtree	N/A
User manual	excellent	excellent	good
Warranty	one year	one year	one year
Toll-free technical support	yes	no	yes
Price	$895	$795	$1195

[1] Not covered in user manual, but company's technical support staff will provide instructions
[2] When read/write heads are parked and drive is off

The Hardcard clearly outpaced the crowd in both sequential and random modes, dispatching the 100K file in approximately half the time needed by the FileCard, and the 1MB file in 37 percent of the time required by the DriveCard (see Figure 3).

Key to the Hardcard's stunning performance are its efficient disk controller circuitry and sophisticated read/write head positioning motor. The controller circuitry essentially reduces the interleave factor—the number of turns the disk must make for data to be retrieved. For example, the XT's hard disk must turn approximately six times to read an entire track of data; the faster Hardcard needs only three revolutions. Another performance boost comes from the Hardcard's voice coil actuator read/write head. Instead of stepping out a set distance like the heads in the DriveCard and the FileCard, the Hardcard's read/write head locates data magnetically—a far more efficient and accurate method. (For more information see "Sensible Storage," *PCW*, August 1985.)

Plus Development Hardcard

The company that launched the hard disk card craze makes the thinnest, fastest, and most easily installed card on the market. Plus Development's user manual is comprehensive and well illustrated, though it is shy on technical details. It provides a useful introduction to DOS's BACKUP and RESTORE commands, succinctly explains important error messages, and describes procedures for determining whether your PC requires an updated BIOS ROM chip.

Software goodies include Hardcard Directory, a menu-driven file manager for those new to DOS directories; PROGHELP, a file containing step-by-step instructions for installing software on the drive; and LIGHT.COM and

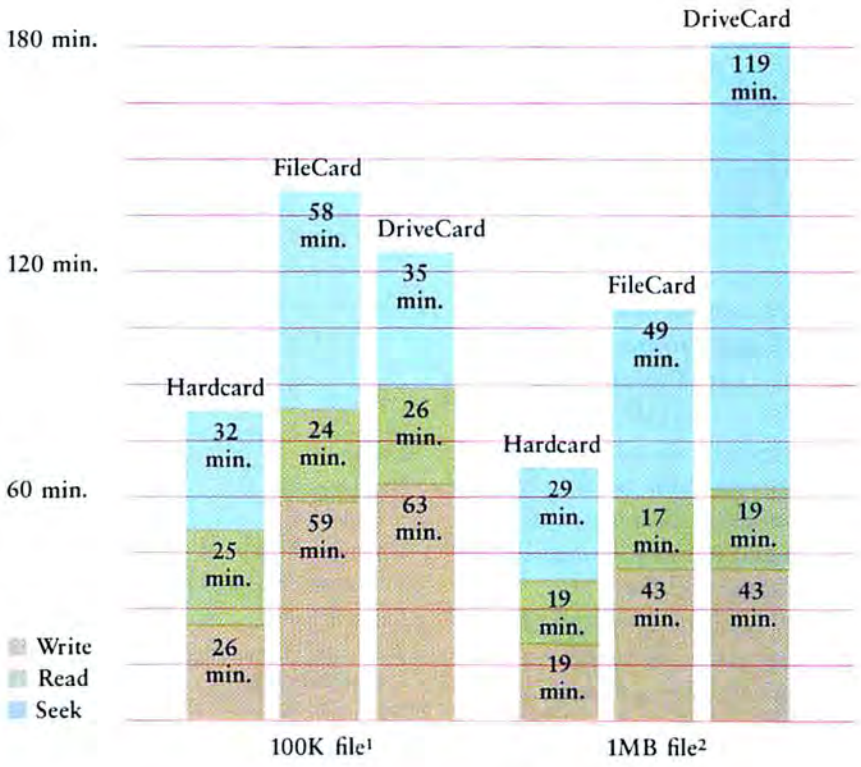


Figure 3: Hard cards at the races. Each hard card was instructed to sequentially read and write a 100K and a 1MB file, then perform a series of random seeks.

[1] 200 sequential file read/writes; 40,000 random record seeks. Each record is 512 bytes.
[2] 15 sequential file read/writes; 20,000 random record seeks

SOUND.COM, two utilities that take the place of a disk access lamp. When you access the Hardcard, LIGHT.COM displays a flashing plus sign in the top right corner of the screen, while SOUND.COM beeps. The Hardcard's one-year parts-and-labor warranty is essentially an exchange policy. According to Plus Development, the company or an authorized dealer will replace a faulty Hardcard at any time during the warranty period. Plus Development's technical support department is available via a toll-free number.

Western Digital FileCard

The company that makes controller boards for many American hard disk manufacturers has produced a superior drive that is almost on a par with Plus Development's Hardcard. Installation procedures are plainly laid out in an amply illustrated manual; first-time hard disk users are further aided by *Xtree,* a menu-driven file manager. Western Digital has also made life easier for slot-conscious portable owners with a 512K memory board that snaps onto the FileCard. This daughterboard uses both 64K-bit and 256K-bit memory chips and can be configured at 128K, 256K, 320K, and 512K. This versatility may not be of much moment to Compaq Portable users, given the FileCard's fluky compatibility with this machine, but both test units worked flawlessly on a PC. Although the FileCard uses DOS 2.00 and later versions, it cannot accommodate UNIX, Xenix, or PC/IX as can its hard disk card peers. Technical support is available, but the number is not toll free.

Mountain Computer DriveCard

The DriveCard is the bulkiest and noisiest drive of the threesome, but it is the only one that offers 20MB of storage and works in 80286 machines such as the PC AT and the Compaq Deskpro 286. Physical installation is a snap, but if you don't use DOS 3.00 or 3.10, be prepared to slog through the company's cumbersome low-level formatting program. (Mountain Computer claims a later release of the DriveCard automatically recognizes the version of DOS in use and reformats the disk accordingly.) The DriveCard's user manuals are not nearly as polished as those of its competitors, but they do discuss interleave values, low-level formatting, and multiple volumes. The company provides a toll-free number for technical support.

Winning Cards

Plus Development's Hardcard, with its swiftness, simplicity, and rugged design, is clearly king of the hill, and Western Digital's FileCard is close to the top. Mountain Computer's 20MB DriveCard won't win any awards from Weight Watchers International, but for an extra $200 to $300 you get twice the storage.

In the final analysis, any of these hard disk cards will be manna to PC users tired of sifting through piles of floppy disks. Without playing computer surgeon, you can install one quickly and leave your current drive configuration intact. But keep in mind that some traits may cause problems down the road. Some units are too thick, too hot, or too hungry for power, and compatibility with existing and forthcoming PC compatibles is hardly assured. You also pay a premium for this artful combination of technologies, but for many computer users, the convenience is worth the cost. ●

Reed McManus is a Contributing Editor for PC World.

DriveCard
Mountain Computer, Inc.
360 El Pueblo Rd.
Scotts Valley, CA 95066
800/458-0300, 408/438-6650
List price: $1195

FileCard
Western Digital Corp.
Enhanced Peripherals Division
2445 McCabe Way
Irvine, CA 92714
800/854-7525, 714/863-0102
List price: $795, with unpopulated memory board $895

Hardcard
Plus Development Corp.
1778 McCarthy Blvd.
Milpitas, CA 95035
408/946-3700
List price: $895

Port-to-Port LANs

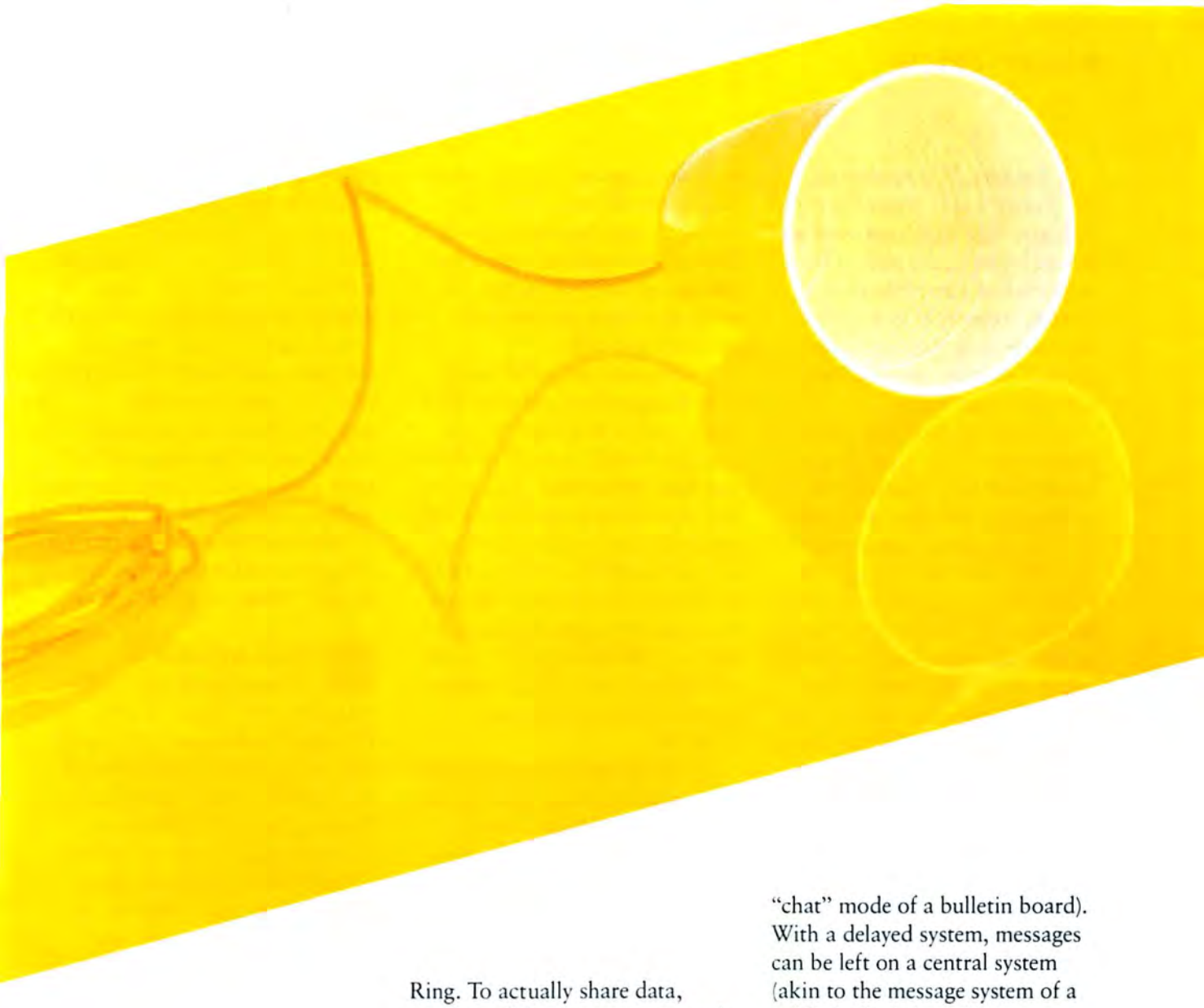
Fred Stimson

Low-cost local area networks are all the rage. Bargain LANs may not be right for every situation, but they promise painless entry into a networked world. The top three—EasyLAN, IDEAshare, and LANLink—bear examination.

Bill Crider

The mavens of the computer revolution are by nature enamored of experimental technology. The untried generates more interest than the proven and the trustworthy. Perhaps because they've yet to fulfill their promise, local area networks (LANs) continue to fascinate computer gurus. Consultants extoll the virtues of sharing peripherals and data; hardware manufacturers rush to produce special boards to tackle the job; and data processing pros are convinced that LANs are the vanguard of departmental computing. Only software publishers have proceeded with caution, and even that may be coming to an end.

Networks perform dual missions—sharing resources (principally printers, plotters, disk drives, and modems) and sharing data. But they tend to be better at the former. Laser printers head the hardware-in-common list, primarily because they have the requisite speed and are pricey enough not to be parked on every desk. Having three computers share a $3000 laser printer beats buying three $1000 daisy wheel printers. Furthermore, networks are usually capable of spooling—that is, storing print jobs until the printer is free.



LANs also enable you to share disks. A LAN offers the opportunity to read and store files or run programs from a co-worker's hard disk, Bernoulli Box, or other mass storage device, lessening the demand for megabytes. In some offices a backup device, such as a streaming tape drive, may also be shared via a network. The same is true for modems and plotters.

If your company uses a large data base that several people need to access, you're a candidate for a multiuser system (in which several users share one computer via terminals) or a conventional LAN, like 3Com's 3+ or IBM's Token-Ring. To actually share data, you'll need data management software that's tailored to a multiple-user environment and that features *record locking* to prevent two people from accessing the same record at the same time. Two users clashing over the same data results in *data collision*—in other words, errors.

Some LANs also boast messaging capabilities. In lieu of playing telephone tag, office workers can leave messages for one another via either a real-time or a delayed electronic mail system. In a real-time environment, one user can interrupt another's program and converse on the screen (much like the "chat" mode of a bulletin board). With a delayed system, messages can be left on a central system (akin to the message system of a public bulletin board).

Lowering Your Sights

Logistical and conceptual problems are native to all networks, and even the best of them have nagging idiosyncracies. It matters little whether you spend $100 per station or $1000; glitches and tie-ups will persist, varying only by degree. Networking may be the most complex area of the personal computer world—it signifies a break with the personal realm and moves into "group computing."

In addition, PC networking technology is still somewhat rudimentary. Even IBM's network offerings haven't quite pushed the industry into standardization. Waiting six months to a year before purchasing the high-priced LAN of your dreams could spare you a few nightmares.

In current parlance, *local area network* describes a tangle of interface boards, cables, splitters, transceivers, repeaters, and hubs. It's a costly assemblage as well: With PCs now hovering around $2000, you can spend up to 50 percent of the system price merely to link machines. And that doesn't reflect outlays for network software, consultants, or aspirin (see "Six Leading LANs," *PCW*, February 1985).

Happily, there's an approach to networking that won't bankrupt you, and it's as near as your local serial port. Serial port networks, which rely on the versatile and almost omnipresent RS-232C interface, exemplify both simplicity and economy. Assuming your PCs are outfitted with the usual complement of serial ports, this networking scheme requires only software and cable.

These more modest networks lack the speed and power of their higher-priced brethren but cost about one-tenth as much. If the serial ports are in place, you can install a network for as little as $90 per computer, and you need not even dismantle the machine to do it. Three LANs in particular warrant your investigation: EasyLAN by Server Technology, IDEAshare by IDEAssociates, and LANLink by The Software Link (see Table 1).

The three are designed to work with PCs rather than dumb terminals and are evaluated here in order of increasing price and sophistication. They could be viewed as "starter" LANs—affordable ways to break into a complex and costly field.

If you plan to share only peripherals, such as plotters or laser printers, you may get by without a formal network at all. Switches often serve admirably in a LAN's place. Software-controlled switches, like the Smart Switch from Western Telematic, can perform numerous network functions without requiring you to flip a switch manually whenever you use a printer or other device (see the sidebar "That's a Switch").

Tenets in Common

All three serial port LANs ostensibly make use of a *server*—a PC, usually equipped with a hard disk, assigned to handle network tasks like file and printer sharing. Even so, EasyLAN follows the *peer* principle, which confers on all networked computers direct and equal access to disks and peripherals. With LANLink and

Table 1: Serial port network costs

		Two nodes	Three nodes	Four nodes
Total cost[1]	EasyLAN	$179.95	$289.90	$619.80
	IDEAshare	$595.00	$644.95	$914.85
	LANLink (1-way)[2]	$495.00	$643.95	$1012.85
	LANLink (2-way)	$544.95	$963.80	$1437.75
	Smart Switch SS-8B	$1094.90	$1144.85	$1194.80
Cost per user	EasyLAN	$89.98	$96.63	$154.95
	IDEAshare	$297.50	$214.98	$228.71
	LANLink (1-way)	$247.50	$214.65	$253.21
	LANLink (2-way)	$272.48	$321.27	$359.44
	Smart Switch SS-8B	$547.45	$381.62	$298.70

[1] Prices reflect the hidden costs of serial LANs. These figures assume that each node is already equipped with 2 serial ports. Adding nodes can require additional serial ports as well as additional cabling and software; for purposes of illustration, 30 feet of cable has been priced at $49.95, a 2-port board at $219.95, and a 4-port board at $495.

[2] LANLink permits two-way connectivity, but at a price: double cabling and the addition of a 4-port board in the server.

IDEAshare, the server performs its traditional role as network delegator. In all cases, servers are *nondedicated*—that is, they perform network tasks and also act as workstations. None of the nets reviewed permits multiple servers—for example, separate PCs designated for file sharing and printer sharing. Likewise, none of the networks enables the server's hard disk to be partitioned into volumes for each user. Although each net provides some means of file security, none supports record locking.

Because several computers clamor for the server's CPU time, the performance of that PC—and to a degree, the network itself—may diminish, sometimes significantly (see Table 2). Processing can grind to a near halt if the server is recalculating a spreadsheet or compiling a program while another PC is trying to copy a file. In many cases, the *satellites*—the PCs benefiting from the server's intervention—are affected to a lesser extent.

Each of the three LANs follows a star configuration (see Figure 1). Each uses basic eight-conductor null modem cable. IDEAshare and LANLink offer password protection for logging on to the net, and assuming a modem is in the loop, all three LANs provide password protection on call-in.

EasyLAN

Of these low-cost LANs, EasyLAN's price tag is lowest by a good measure. Installing the initial two stations runs just $90 per station. EasyLAN's ambitions are limited—the net is primarily intended for peripheral sharing—and it lacks most of the bells and whistles of the other two. But if distributing access to a printer is all you need, EasyLAN could be your best bet.

EasyLAN doesn't permit a satellite to execute a program resident on the server's hard disk, so multiuser packages won't do you much good; program files must reside on a PC to be run. The theme is file swapping, not file sharing. If you want access to data files, you can use EasyLAN to copy a file from the server's disk, edit or change that file, and then copy it back to the server. Although this copying can be performed at an impressive 19,200 bps on a PC or 56,000 bps on an AT (owing to the difference in processor speed), actual performance is somewhat sluggish. EasyLAN engages in *time slicing*, allocating several ticks of the CPU's clock to the server, then a few to satellite requests. Consequently, data does not flow to any network station continuously.

Fortunately, copying can be accomplished as a background (or subordinate) task, thus averting intolerable delays with long files. To curb conflicts in copying, EasyLAN offers a "checkout" file-locking procedure. A satellite can take out a file as you would a library book. While the file is checked out, it is renamed, and no other computer—not even the server—can access it. When the user finishes, the file is copied back to the server and "checked in," freeing it for others to access. No provision exists for reserving a file that has been checked out.

EasyLAN's password protection is particularly important if you want to take advantage of the

Table 2: Serial port networks data transfer rate tests[1]

	IDEAshare	LANLink	EasyLAN[2]
Server to satellite			
hard disk to floppy disk	3993.6	3993.6	723.6[3]
hard disk to hard disk	5861.7	6743.1	799.6[3]
Server to server			
hard disk to floppy disk	5423.0	6525.3	7199.4
hard disk to hard disk	11,236.0	9013.1	8810.6
Satellite to satellite			
hard disk to floppy disk	7299.3	7987.2	8216.9
hard disk to hard disk	12,091.9	15,898.3	16,542.6

[1] Tests consisted of copying a 100,000-byte file from one disk to another; results are in bytes per second.
[2] On a stand-alone, nonnetworked PC, hard-disk-to-hard-disk transfer rate was 16,269; hard-disk-to-floppy-disk rate was 7722.
[3] Capable of slower transfer rate in background mode to free computer for another task. Actual rate then depends on current foreground tasks' demands on both server and satellite.

network's digital PBX support. If your company has such a PBX, EasyLAN enables any number of PCs (depending on PBX capacity) to access the server via phone lines. Remote sites can also call up the PBX and share the server's physical resources.

If a PBX isn't handy, you can link a maximum of 18 computers. Each of the 18 can have up to five printers attached and available to the network. In my experience, however, four PCs is optimum for EasyLAN and its RS-232C cousins. Note that daisy chaining isn't in the cards; PCs on an EasyLAN network must be tied directly to the server. Mindful that you may run out of RS-232C ports quickly, Server Technology sells a $295 short board with two additional serial ports.

Although some EasyLAN network commands are simple variations on their DOS counterparts (EZDIR, EZPRINT, EZERASE), others are only vaguely mnemonic and not "EZ" to use (EZCHGP, EZCHGBP, EZCHGC). Like the commands, the network's configuration files suffer from exceedingly similar names, making it tough to remember which is which and what each does. Scanning a directory filled with monikers like SRVCOMM.COM, SRVCOMM-.CFG, SRVPUSR.COM, SRVFUSR.COM, SRVPSRV.COM, SRVFSRV.COM, and SRVUSRV-.COM swiftly caused my eyes to glaze over. This absence of variety and imagination earns EasyLAN software the distinction of being the most difficult to learn among this trio.

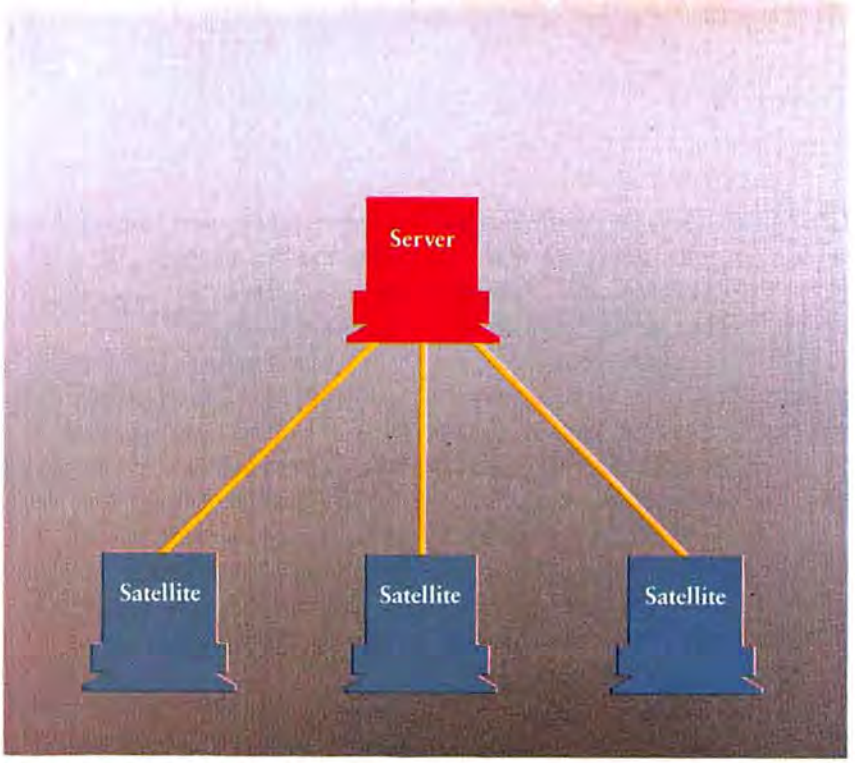


Figure 1: In a star network, each satellite is tethered to a central server.

While other networks assign logical drive and printer names to the devices attached to satellite computers, EasyLAN instead assigns a name to the line connecting two PCs. The line name serves as a path added to the beginning of the file specification. For example, to view a directory of text files on a PC connected to your machine via a line named John, you would issue the command EZDIR JOHN:A:*.TXT.

EasyLAN is not without its quirks, even in the realm of printer sharing, its intended forte. Curiously, no printer offered to the network is directly available to the computer to which it is attached. To access an otherwise "local" printer, the user must issue the awkward command EZCHGBP /BPID:1 /ACT:Y. In addition, while a server's job is being printed, no other network user can use that printer. To return the printer to the network, the server operator must issue the command EZCHGBP /BPID:1 /ACT:N. (You can circumvent this awkwardness by using a *ProKey* macro to redefine the commands.) The EasyLAN print spooler merely holds satellite files until the server has relinquished the printer; at that point, the satellites' spooled files will be printed. This procedure makes it difficult to use EasyLAN with programs that don't permit you to exit to a DOS shell and issue the requisite commands to reassign the printer.

Server Technology initially provides owners of EasyLAN 30 minutes of free phone assistance and then access to a 24-hour bulletin board system (BBS) running on EasyLAN. In fact, EasyLAN itself can be used as a sophisticated BBS. Once a phone connection is made, the caller can copy files and perform other DOS-like tasks on the remote system. Password protection is included, rendering the BBS virtually inaccessible to anyone using a conventional telecom-

munications program. When EasyLAN is so employed, however, the network's bps rate must be slowed to match that of the remote user's modem.

Although EasyLAN disks are not copy protected, each carries a serial number that ensures no two computers can run copies of the same disk on a single network; each networked PC must start from its unique EasyLAN disk. In any event, the net's price and the inclusion of 30 feet of cable with the purchase of additional copies should prove adequate deterrents to piracy. Because the documentation expressly states that PCjrs can be used in the network, EasyLAN might be an ideal choice for a school or other organization that relies on such inexpensive computers. The main concern in that case is whether an audience of novices can tolerate the product's needlessly technical documentation.

In the interest of giving EasyLAN a bit more horsepower, Server Technology recently agreed to couple the net with Digital Products' sub-LAN, a hardware switching unit that links clusters of PCs and peripherals. EasyLAN remains available separately.

Even with its flaws and foibles, EasyLAN is a bargain for those who need only a simple network to share peripherals among three or more computers.

IDEAshare

While EasyLAN is appropriate for printer sharing, IDEAshare offers a panoply of additional features for your additional outlay. And it provides something else: elegance. IDEAshare is easy to use and boasts unusually literate documentation, marked by appropriate and comprehensible illustrations. Both the operations guide and the technical reference are written in plain English—a disarming approach. I detected just one minor oversight in the manual: It fails to mention that the line DEVICE = NETUSER.SYS is required in the server's CONFIG.SYS file.

Although easy to use, IDEAshare—like all networks, serial port or conventional—was scarcely a snap to set up. There simply is no free lunch: Installing the network on PCs already equipped with serial ports required nearly 4 hours. Pinpointing trouble amid ports, cables, and software can mean sifting through a few hundred possible scenarios; I traced one problem to a faulty null modem adapter. If you know something about RS-232C interfaces, count on 3 hours to install a serial LAN; if you don't, block out time on your calendar.

While EasyLAN is appropriate for printer sharing, IDEAshare offers a panoply of additional features for your additional dollars.

After the initial configuration, normal DOS commands perform almost all IDEAshare functions. The network's own LOCK and UNLOCK commands reserve (and release) up to 15 server-based files for a satellite's use. This capability enables IDEAshare to work with the multiuser versions of a number of popular programs. RESERVE sets a printer aside for a specific user. Otherwise, when printing is a primary, not a background, task, two users trying to print at once may be rewarded with mixed output. The IDEAshare spooler prevents this by automatically performing the RESERVE function and printing in the background mode; spoolers can, however, be logistically cumbersome. Finally, NETUTIL handles specialized network functions, such as viewing the status of the network and initiating electronic mail.

Electronic mail consists of a two-way conversation between the server and a satellite, using a split screen. E-mail is available only between the server and users, however, not user-to-user. A user can "broadcast" a message that will appear on the screens of PCs throughout the net. As with a RAM-resident utility, messages can interrupt a user's work but do not cause programs to crash.

IDEAshare supports logical names as a way to access remote devices. If your PC includes drives A: and B:, for instance, the first two drives available on the server will be defined as C: and D:, although the server operator will continue to treat them as local drives A: and B:. Using logical

(continues on page 246)

That's a Switch

Setting your sights at ground level, consider using switches as an alternative to the serial port networks evaluated here. Even as a rudimentary solution, a switch may do the job nicely.

A "dumb" switch is one whose settings must be adjusted manually; they cannot be manipulated by software. Using a normal dumb A/B switch, sharing printers on a limited basis is an easy and reliable process. With two or three computers sharing one fast, high-quality printer, an otherwise unaffordable resource becomes cost-effective.

Unlike a LAN, physical switches aren't very mysterious: You can literally see the PC attachments. Switches require no additional RAM, need no batch files, and eliminate data collision. Limited file swapping can be accomplished via a simple telecommunications program and null modem cables connected to the serial ports. Switch networks cannot, of course, execute software remotely, which the better serial networks do easily. Because the variety of switches is mind-numbing, installation of a switch network should be planned carefully.

Not all switches are blissfully ignorant, however. "Intelligent" switches respond to software commands to redirect the switch's input/output ports. Among these more capable switches is Western Telematic's Smart Switch, which comes in one 16- and two 8-port versions. Via a simple command transmitted to the Smart Switch, you can specify the other port to which you want to connect. In this way, you can select a modem connected to a port on the Smart Switch, download a file, then select a serial printer connected to the Smart Switch and generate output. Alternatively, two computers could connect to each other and send files across the cables using a telecommunications program. The result is a simple network nearly as powerful as EasyLAN.

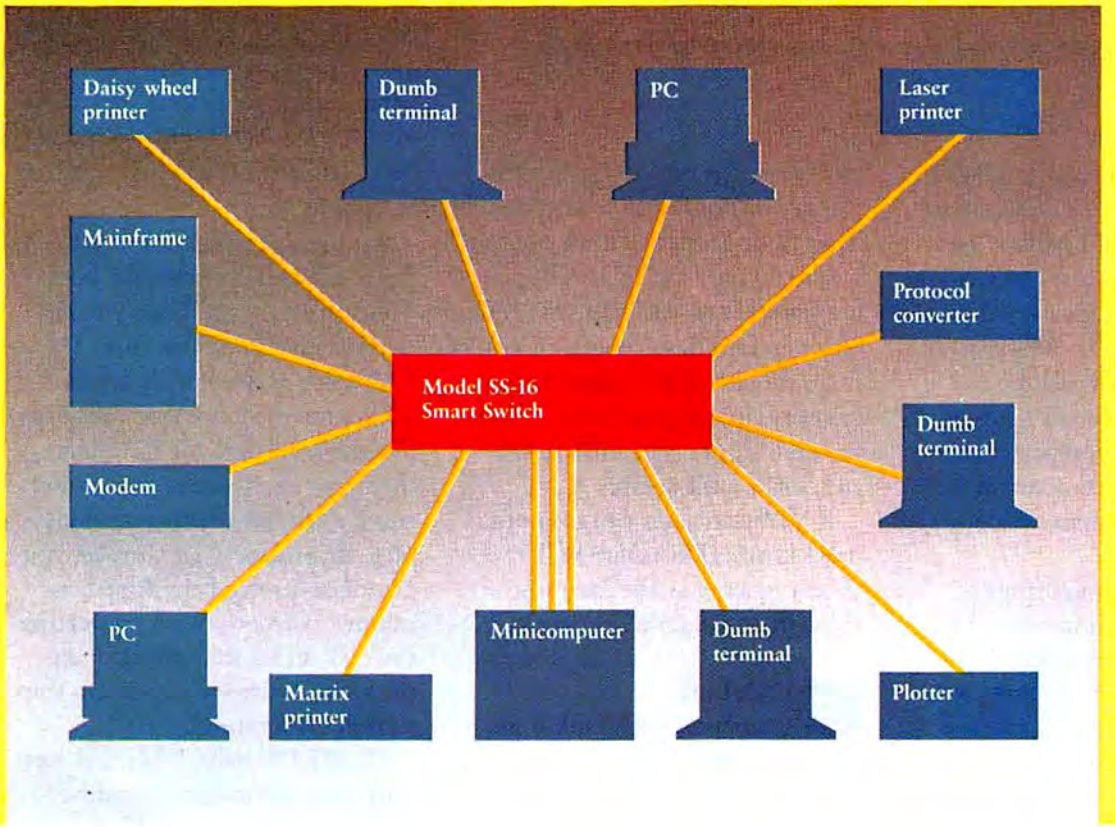
You must designate one of your PC's serial ports as the link to the switch; the other serial port remains free for your use. Smart Switch software enables you to select the switch port you want, name that port, and set the data transfer rate. The Smart Switch's primary liability is its inability to address parallel printers.

The Smart Switch models SS-16 and SS-8B are enhanced versions of the original 8-port model, the SS-8. You can configure the latter to operate at data transfer rates from 150 to 9600 bps; once the rate is set, all ports must operate at the same rate. Not so for the SS-16 and the SS-8B, which you can push to

19,200 bps and which include "spooling" buffers that enable any port to communicate with any other, whatever their data transfer rates. All eight pairs of SS-16 ports can operate concurrently (see Figure A).

The Smart Switch provides no cost advantage if it serves just two computers. But the more PCs you attach, the more economical the product becomes. Contrary to what common sense would seem to dictate, serial port LANs cost more per user as the number of users increases. The reason concerns the need for additional cables and serial ports as the network grows. In normal circumstances, the PC, the XT, and the AT support just two serial ports. To add workstations to the network, you need to buy boards that contain additional ports. As Table 1 shows, the cost per user on a Smart Switch decreases with each additional user.

Figure A: The 16-port Smart Switch can link peripherals connected to as many as 8 pairs of ports.



drive names and the usual DOS commands, you can open files or run programs remotely.

While any satellite can use devices attached to the server, the satellite cannot return the favor. All shared resources must be tethered to the server; for instance, no user can print on a device attached to another satellite.

IDEAshare supports only four stations per star-shaped network—one server and three satellites—but it can be used in conjunction with IDEAnet, IDEAssociates' more expansive Ethernet product. If you follow that course, you can link as many as 28 PCs. One IDEAshare user can access the network by dialing up on a password-protected line via a 300-, 1200-, or 2400-bps modem. Passwords can be assigned as read/write or read-only; password protection pertains only to disk, not printer, access. Like EasyLAN, IDEAshare welcomes PCjrs.

Every silver lining brings a cloud. For all its impressive features, IDEAshare tended to crash more often than its counterparts. It froze both the server and the satellite when printing *Framework II* graphics on a Corona Laser Printer; other *Framework II* files were printed without a hitch. It also refused to respond when I used *Copy II PC* to duplicate several public domain program disks.

A few minor complaints add to the gloom under this black cloud. For reasons known only to the gods, you occasionally must press the server's <Space> bar to begin printing from a satellite. Activity by a satellite can cause an annoying flicker on the server's screen if that unit is equipped with an RGB monitor. When using a batch file to install the network, the program looks for a disk in drive A: and issues the typical DOS error message if no disk is present or the drive door is open—an irksome situation if you want to install the network via an AUTOEXEC.BAT file on a hard disk. Finally, IDEAshare should curb its appetite for memory; in one installation it consumed 63K of a satellite's RAM and 56K on the server.

If IDEAssociates can iron out these kinks, IDEAshare will clearly emerge as the foremost value in an RS-232C network.

Of the three serial port networks, only LANLink permits a two-way server/satellite relationship. The price you pay for its enhanced capability is measured in cash.

LANLink

On paper, LANLink is a more impressive offering than IDEAshare or EasyLAN. It features the same star configuration, but each server can host up to 8 satellites (provided you can afford the additional serial ports). Even without using The Software Link's proprietary data compression technique, LANLink can operate at speeds of up to 115,200 bps. (In addition, each LANLink satellite can act as a server to 7 other satellites. Each of these satellites can also be a server to 7 more satellites, which can in turn act as servers to even more satellites. Increased usage, however, taxes network performance—65 PCs is the maximum practical LANLink population [see Figure 2].)

Of the three serial port networks, only LANLink permits a two-way server/satellite relationship. Two PCs equipped with two cables and two serial ports each can act as server and satellite to each other; two users can thus access each other's disk drives, printers, and modems interchangeably. The price you pay for these enhanced capabilities is measured in cash: A LANLink network can cost almost three times as much as its simpler kin.

Taking a network for a test drive is usually impossible, but The Software Link gives you an opportunity to do just that. The LANLink package includes an evaluation program that runs just like the real thing for 15 minutes, then crashes. You can restart and run it again for another 15 minutes. If you like what you see, you can open a sealed envelope containing instructions on converting the disk into a fully functioning program. Otherwise, you can ship it back for a refund.

Like IDEAshare, LANLink not only joins computers, it can be paired with a more sophisticated sibling—in this case, MultiLink

Advanced. That network enables you to link dumb terminals to XTs or ATs; when joined with LANLink, the result is a blend of LAN and shared processor technologies. It's therefore feasible to create a sizable network of computers and terminals at minimal cost. The Software Link is serious about bringing both products fully into the network fold; both support DOS 3.10 and are said to be IBM NETBIOS compatible.

LANLink relies on normal DOS commands and logical drive names. The documentation claims compatibility with 95 percent of PC packages on the market, so you might want to spend the LANLink evaluation program's free 15 minutes testing your favorites to determine whether they're in the luckless 5 percent. During this evaluation, *1-2-3* release 1A, *dBASE II, ProKey, 1-DIR, PC-Talk III*, and *Smartcom* ran flawlessly. I was unable, however, to get *1-2-3* release 2 to work with LANLink.

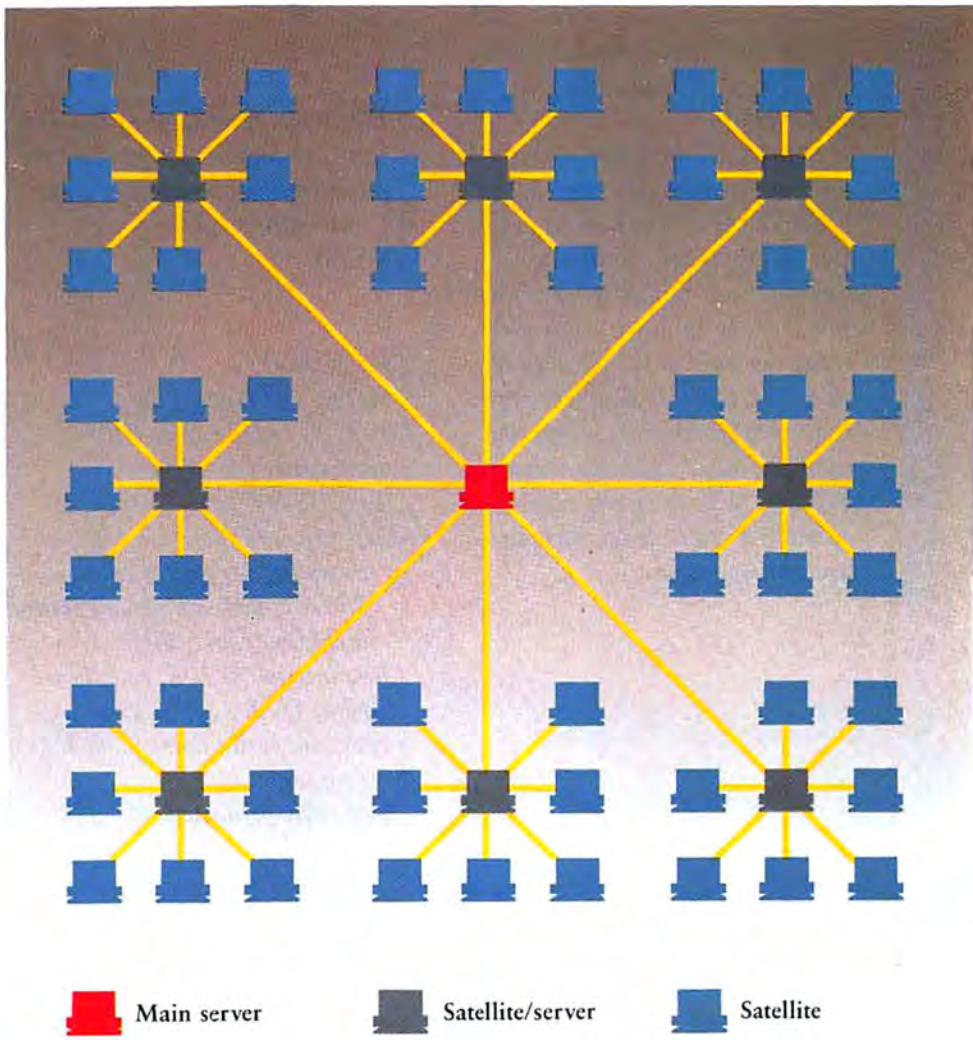
Once the physical connection is made, system software installation requires about 5 minutes. Optimizing the network, however, can take a good deal longer. I labored on one installation for several days before getting it right. The key is setting up batch files to automate network initialization, but fine-tuning their contents and order is no picnic.

LANLink documentation is strangely silent on the net's file-locking capabilities, giving IDEAshare a decided edge on security. Password protection only approximates that kind of control; LANLink supports read/write and read-only access, and satellites can be locked out of a given drive or subdirectory. The print spooler handles printer locking, but not particularly well. When using the net with the Cordata laser printer, programs occasionally experienced data collisions. Indeed, I had trouble getting LANLink to work with the Cordata at all.

My skepticism was increased by attempts to confirm the vendor's claim that LANLink can use common twisted-pair telephone wire. After 8 hours of trying to eradicate data errors, I settled for the safety of shielded cable. Last on my short list of grievances is program size; LANLink servers must surrender up to 64K of RAM.

LANLink doesn't quite match value for price, although it delivers a good deal of flexibility and carries a tab far lower than many supposedly high-performance LANs.

Figure 2: At its practical maximum, LANLink can join 65 PCs. At the center of the star is the main server, which supports 8 combination satellite/servers—each of these, in turn, supports 8 satellites.



Comparison Shopping

In deciding among these alternative networks, it's essential to keep their ambitions in focus.

EasyLAN was not designed to replace conventional networks; IDEAshare and LANLink aim higher and are more elegant in their execution. They both come close to full-function LANs in style if not in power; perhaps the widespread use of fiber optic cable will one day deliver adequate speed to serial port networks. None of these networks was intended to handle multiple users of a single file; printer and disk sharing is their game. Remember, too, that there's precious little evidence that any of these products works with a conventional LAN (other than the aforementioned IDEAnet and MultiLink Advanced).

Which LAN is right for you? Is an inexpensive LAN right at all? None of these programs is perfect, but all are useful. To decide among them, compare more than just cost. Serial port LANs cost more per user as the number of users increases. If you need more than two serial ports, costs rise precipitously. Generally, the more PCs you link, the more you'll spend per connection. Switches are the exception.

For simply sharing peripherals within a work group of two or three computers, switches may suffice. An organization with more than three PCs that wants to share peripherals will find EasyLAN sufficient. Users who need remote program execution can narrow the choice to IDEAshare or LANLink. Of the two, IDEAshare is my recommendation when the net does not exceed four PCs, but if you're dealing with five or more (or need to link dumb terminals), LANLink is your safest bet.

While this economy-oriented trio isn't the last word in LANs, if money matters, you could do worse than to make a call at any of these ports in the network storm.

Bill Crider, president of the Tucson Computer Society, is a computer training consultant and a Contributing Editor for PC World.

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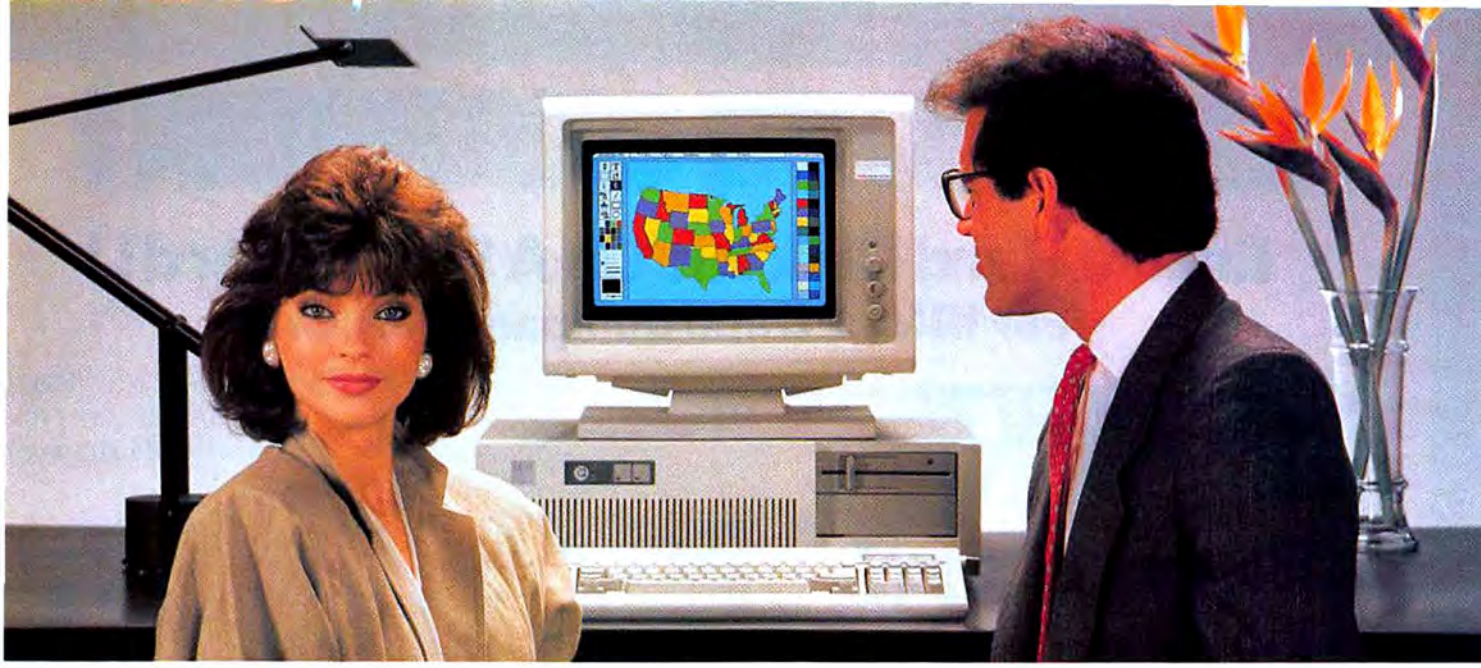

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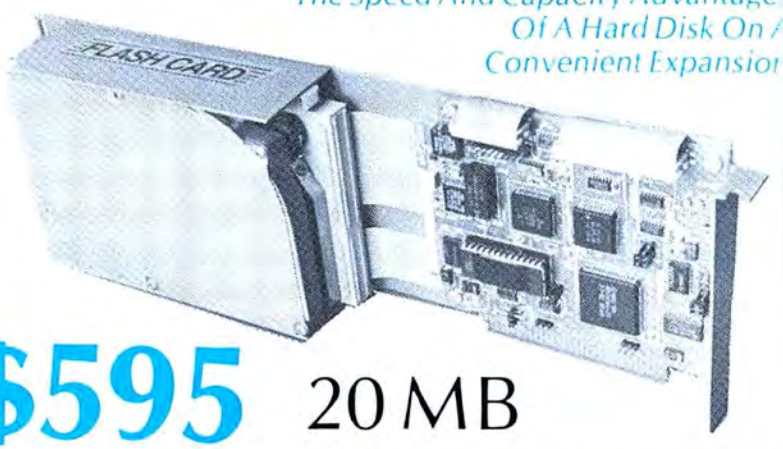

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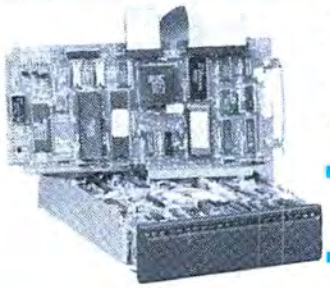

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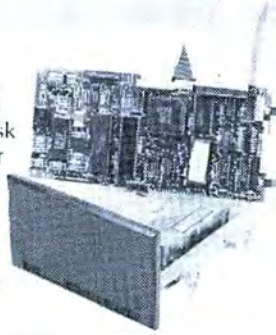

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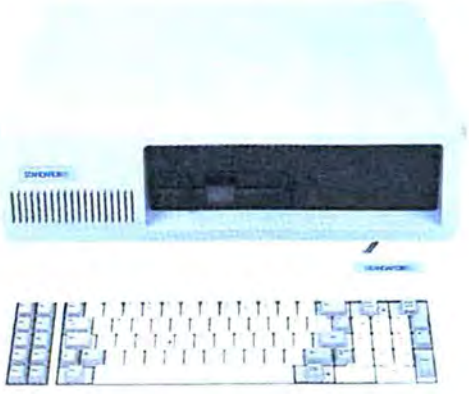

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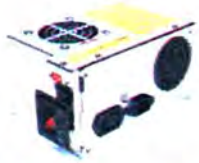

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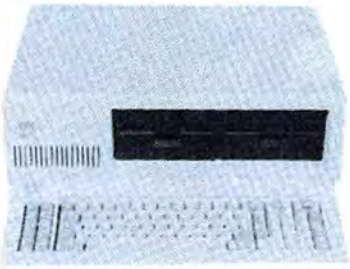

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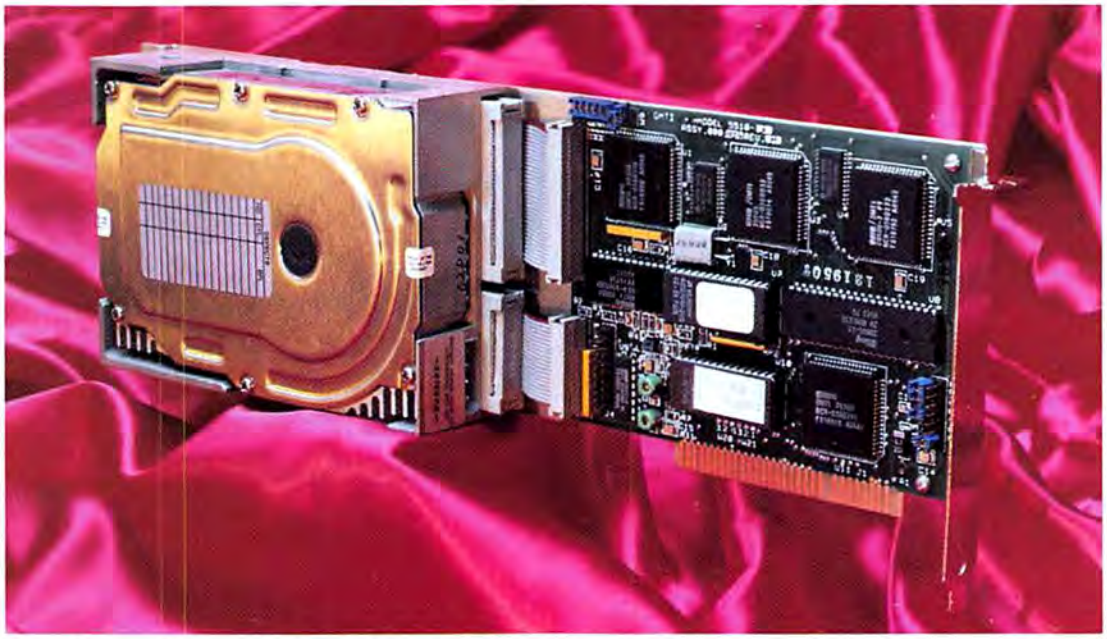

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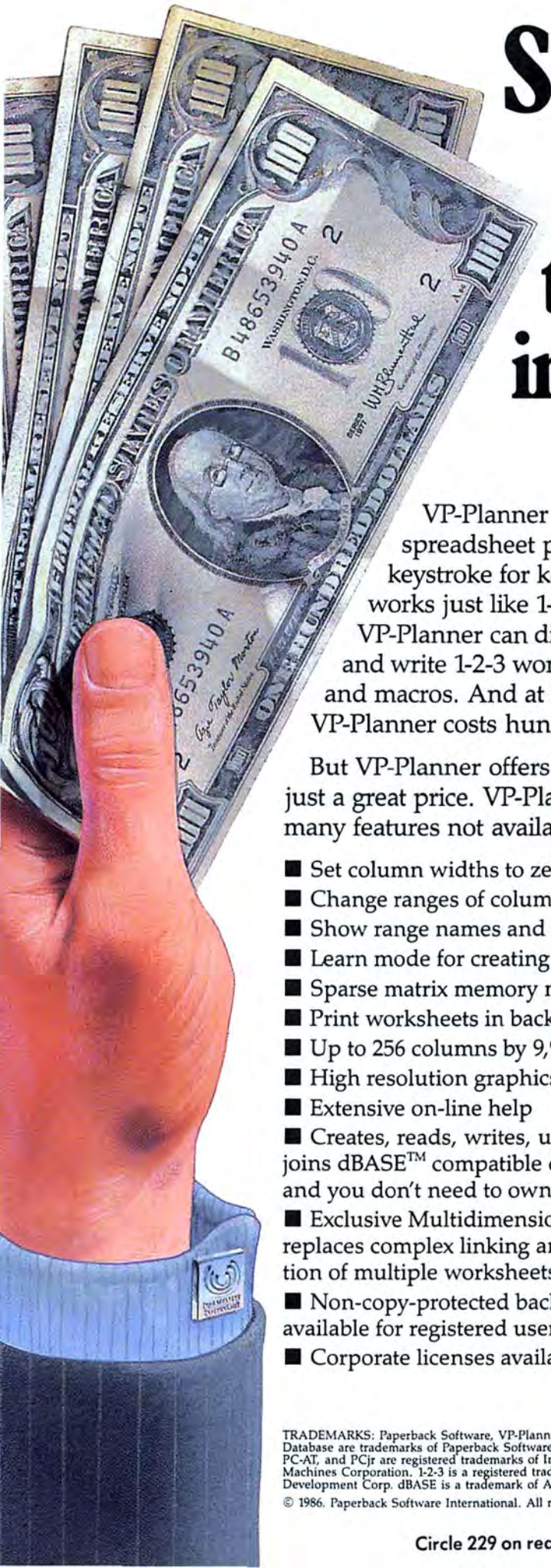

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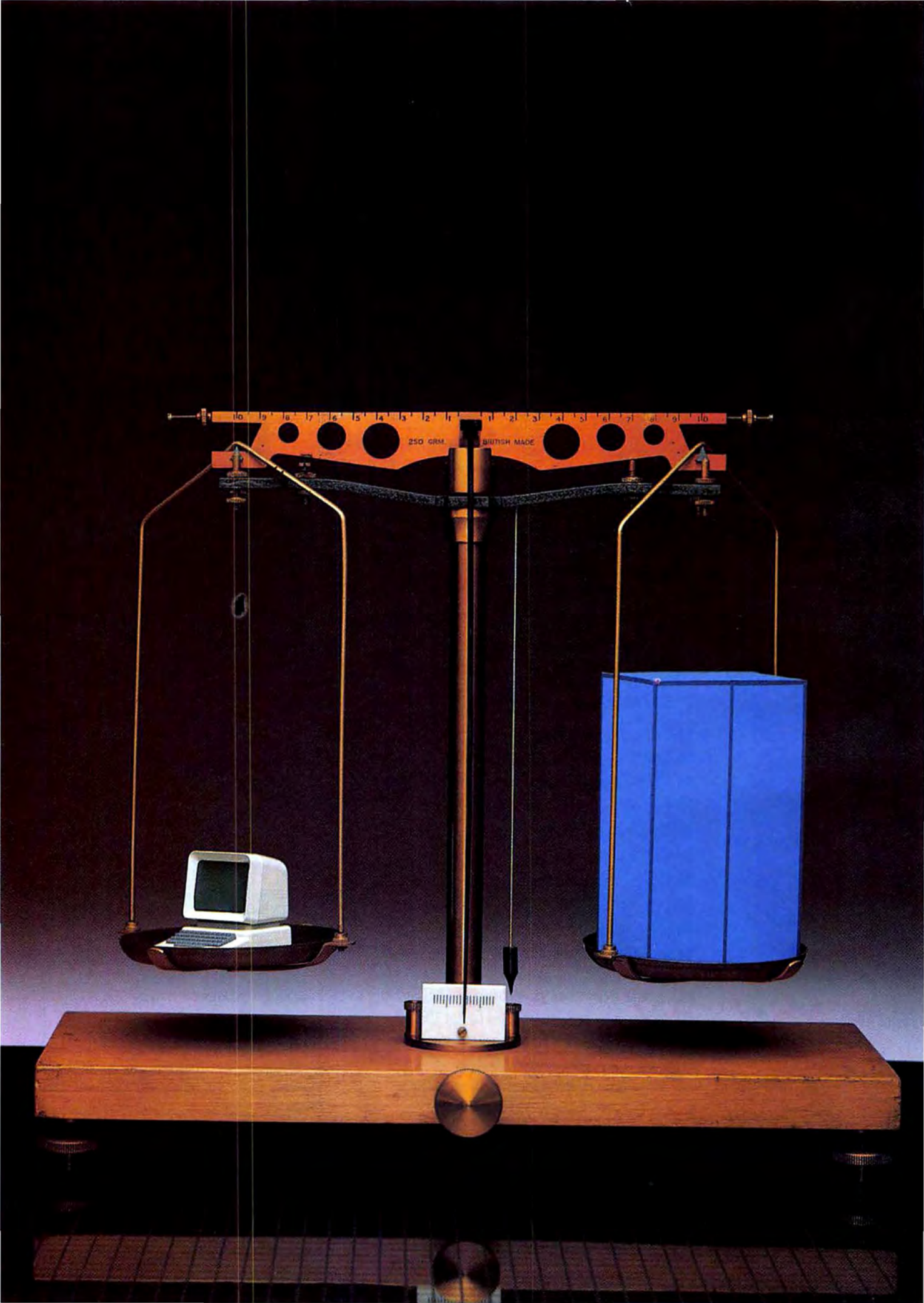
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Peering Into the Future With LU 6.2

IBM's latest additions to its SNA protocol—LU 6.2 and PU 2.1—may change the face of micro-to-mainframe links and bring peer-to-peer communications to the IBM environment.

Sharon Fisher

It doesn't matter how powerful your PC is. It doesn't matter how powerful your software is. Despite the megabyte of memory, the 40MB hard disk, or even the sophisticated software that manages your company's entire budget, any mainframe computer you communicate with treats your personal computer like the dumbest of dumb terminals. The mainframe isn't at fault. The blame lies squarely with Systems Network Architecture (SNA), the protocol that controls the way that information is transmitted between IBM computers. SNA was developed in 1974 and released in dribs and drabs through the 1970s, when nobody suspected that PCs would even exist, much less become as popular as they have. People used dumb terminals that lacked the power to do anything besides display data. SNA designers had no reason to assume otherwise.

Consequently, SNA was designed with a master-slave orientation rather than the peer-to-peer approach of PC-to-PC communications. In the master-slave environment the terminal cannot initiate transmissions, and the IBM mainframe controls all aspects of a communications session. In peer-to-peer communications the two communicating devices treat each other as equals, and either machine can initiate or halt transmission. However, the latter method assumes some intelligence on the part of both machines—intelligence that wasn't available in the dumb terminals of the past.

Even when users began connecting PCs to mainframes, the PCs weren't powerful enough to do much. Rather than rewriting SNA, IBM developed software and hardware so the PCs would appear to the mainframe as terminals, a process called terminal emulation. The mainframe computer, also known as the host, remained in control.

But with the advent of powerful microcomputers such as the AT and the blurring of distinctions between mainframes, minicomputers, and PCs, this situation has become untenable. As increasing numbers of PCs become integrated into the mainframe en-

David Bishop

vironment, they are making so many demands, usually in the form of large downloading requests, that they degrade the performance of the host system. One PC can tax a mainframe as much as 100 terminals would.

In addition, PC software packages are becoming more popular than the complex programs available on mainframes. And there's the rub. To make full use of PC software, corporate users often need data from the mainframe. But because the mainframe doesn't know how to respond to the PC's intelligence, getting the data into a form usable by the PC software becomes the most difficult part of the process.

The need for a peer-to-peer system is evident both to MIS managers, who are concerned about decreasing mainframe performance, and to users who crave easier mainframe and minicomputer links.

Data extraction/retrieval products such as Cullinet's *Infolink* and Informatics' *Answer* series can handle such a conversion, but because there's no PC application standard, these products must be written from scratch for each PC software package. If you don't have a conversion package designed for your particular application, you may face the frustrating task of manually reentering mainframe data into the PC application.

Thus, the need for a peer-to-peer system has become evident both to MIS managers, who are concerned about the decreasing performance of mainframes, and to PC users who crave an easier method for communicating with mainframes and minicomputers.

The Push for Peer-to-Peer

Late last year IBM announced two developments that hinted that the end of this inequity might be near—an amendment to SNA called advanced program-to-program communications (APPC) for the PC, and the long-awaited Token-Ring network, the first IBM product in the PC arena that supports APPC. Third-party vendors trampled each other in their haste to announce that they, too, would support the APPC standard and the Token-Ring.

APPC has been available on System/36 and System/38 minicomputers since 1982. Now APPC provides the framework to allow PCs to communicate interactively on a peer-to-peer basis with other PCs, IBM 370 mainframes, System/36 and System/38 minis, and Series/1 computers.

APPC encompasses two new SNA protocols that govern message transfers: PU 2.1 and LU 6.2. PU, for physical unit, provides resource and network control services within hardware; LU, for logical unit, specifies the communications protocols used in software. The PC marketplace is primarily concerned with the LU 6.2 protocol, and vendors and analysts often use the term LU 6.2 interchangeably with the marketing term APPC.

Formerly, PU and LU specifications usually defined protocols for particular IBM devices. PU 2.1 and LU 6.2 are the first specifications that can be applied generically to all IBM devices. PU 2.1 allows two processors to communicate on a peer-to-peer basis, and LU 6.2 does the same for application programs. Previously, LUs usually enabled communications between an application program and a device such as a keyboard or printer.

LU 6.2 specifically defines the logical interface between a communicating program (known as a transaction program) and the SNA network. In IBM terminology, this logical interface is called the protocol boundary. A program that wishes to communicate sends a request to the LU asking for use of the communications session, known as a conversation.

Access to the protocol boundary is defined by functions called control operator verbs, which initialize and control the LU 6.2 services. Basically, control operator verbs allocate and cancel conversations, transmit and receive information, and request that the

other program transmit and receive information. LU 6.2 defines two additional types of verbs: basic conversation (used for service programs) and mapped conversation (used for general application transaction programs).

In essence, the verbs provide the basic methods that programmers can use to write LU 6.2 programs, which can then be included in application programs.

Computer companies are keenly interested in LU 6.2 as a quick way to talk to IBM without switching over to full IBM compatibility.

Once LU 6.2 is implemented in software on all systems in the network, the result could trigger far-reaching changes in the way PCs communicate with their more powerful siblings. First, you would be able to communicate directly with any node on the network, bypassing the mainframe and its traffic cop, the Virtual Telecommunications Access Method, or VTAM. (VTAM stops, starts, and monitors all sessions between computers.) In bypassing the host you could improve the response time of your communications, and you would become immune to the all-too-common mainframe malady—downtime.

Eventually, the concept of the host may disappear entirely, although that won't happen for some time. In fact, many companies may switch to LU 6.2 without initially taking advantage of its peer-to-peer capabilities. The tradition of the IBM mainframe hierarchy is too entrenched to be razed overnight.

Under LU 6.2, programs on different computers would interact directly, regardless of their operating system and programming language. Anticipating the increased popularity of multitasking, LU 6.2's provision for concurrent communications would allow you to carry on parallel conversations between several systems. In addition, LU 6.2 transmits compressed packets of data instead of the pages used in terminal emulation, thereby speeding data flow.

The average user will see little of this complex process, however. David Ferris, chairman of Ferrin Corporation in San Francisco, says that LU 6.2 will make transmitting data to a program on another computer "like writing to a disk. Users won't see the difference." Users may have to set up a modem connection to the mainframe computer and may sometimes have to wait, but generally, according to Ferris, they "will have more access to data, but they won't know how. Users can forget about LU 6.2."

For example, you might be able to run *1-2-3* and download information directly from the mainframe into your worksheet without tiresome conversion or transmit your worksheet to automatically update a master worksheet on a mainframe. The PC could even back up data automatically to a mainframe. If the PC was part of an SNA network, the network management system could quickly find out which computer contained the information you wanted, set up a session with that computer, and transmit the information to the PC.

Using gateways, the network might even be able to communicate with systems on other networks. Anticipating future gateways to an LU 6.2 network, Digital Equipment Corporation, Apple, and other computer companies are keenly interested in LU 6.2 as a quick way to integrate into the IBM environment without necessarily switching over to full IBM compatibility.

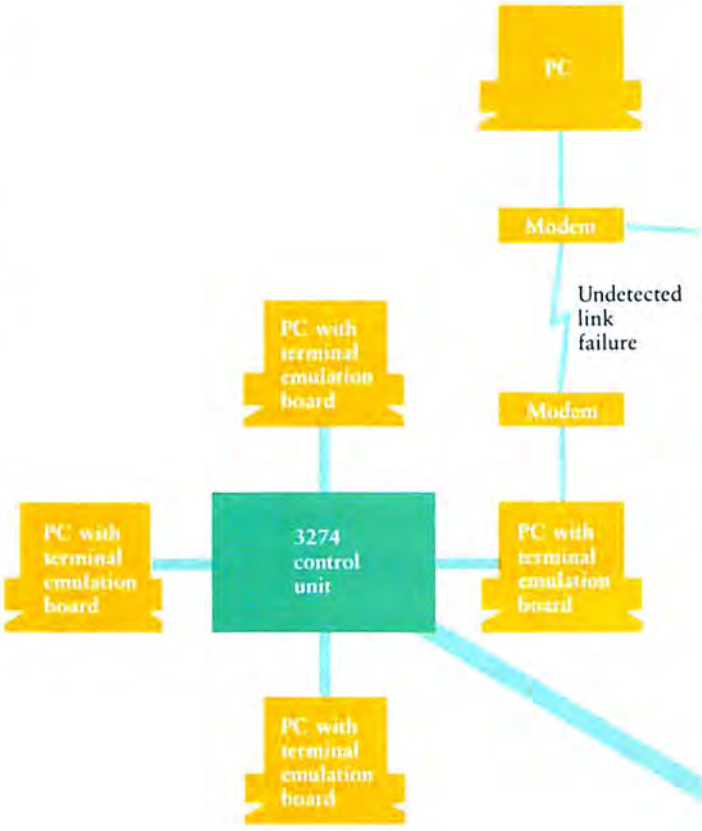
The Token Pioneer

The first product for the PC that will support the LU 6.2 standard is the much-ballyhooed token ring LAN. Token ring users have two choices for network operation software: NETBIOS, which is compatible with existing PC networks, and LU 6.2. Unfortunately, NETBIOS and the PC Network do not support LU 6.2. Consequently, organizations that plan on using the token ring network need to decide whether to be compatible with existing LANs (NETBIOS) or with future integrated systems (LU 6.2). Although the latter course promises communications with IBM mainframes and minicomputers, in the current version LU 6.2 cannot be used as a gateway between the LAN and the host; it can communicate either between PCs or between a PC and a mainframe, not both.

Some analysts, such as Charles Roussel of The Yankee Group, predict IBM may eventually announce a *backbone* network, with token ring networks, mainframes, and departmental computers acting as nodes the way that PCs do on the token ring network. "IBM may make an announcement by the middle of this year," Roussel predicts. A backbone network, he postulates, would probably be a 16-megabit baseband network, although IBM "might introduce a fiber optic or broadband implementation." Either of the latter two technologies, with their multiple-channel capabilities, would allow more data traffic and faster throughput than a single-channel baseband network.

Third-party vendors who have been burned by premature support of other IBM products are a little wary of committing early to LU 6.2.

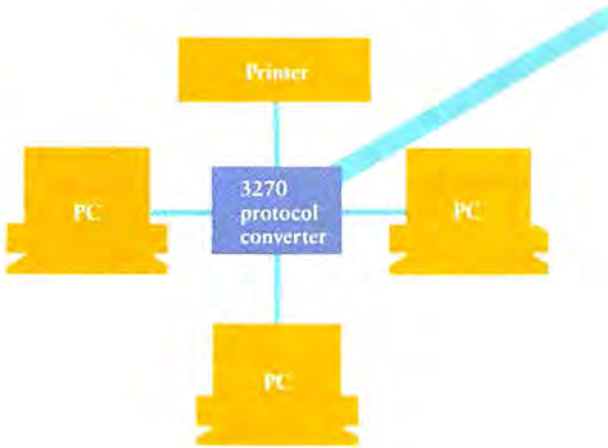
Although stand-alone PCs will also be able to tie into an SNA/LU 6.2 network, IBM is clearly pushing the Token-Ring as its preferred method for PCs to communicate with the rest of the IBM world. It is the introduction of LU 6.2—and the promise that it holds forth—that has made the Token-Ring an overnight sensation.



Opening Up LU 6.2

IBM is depending heavily on third-party vendors to develop products implementing LU 6.2. Roussel says this is deliberate on IBM's part: "IBM can't meet the marketing demands on its own." Also, he adds, IBM discovered with the PC that an open architecture was important in achieving market penetration.

Third-party vendors who have been burned by premature support of other IBM products, such as the faltering PC Network, are no doubt a little wary



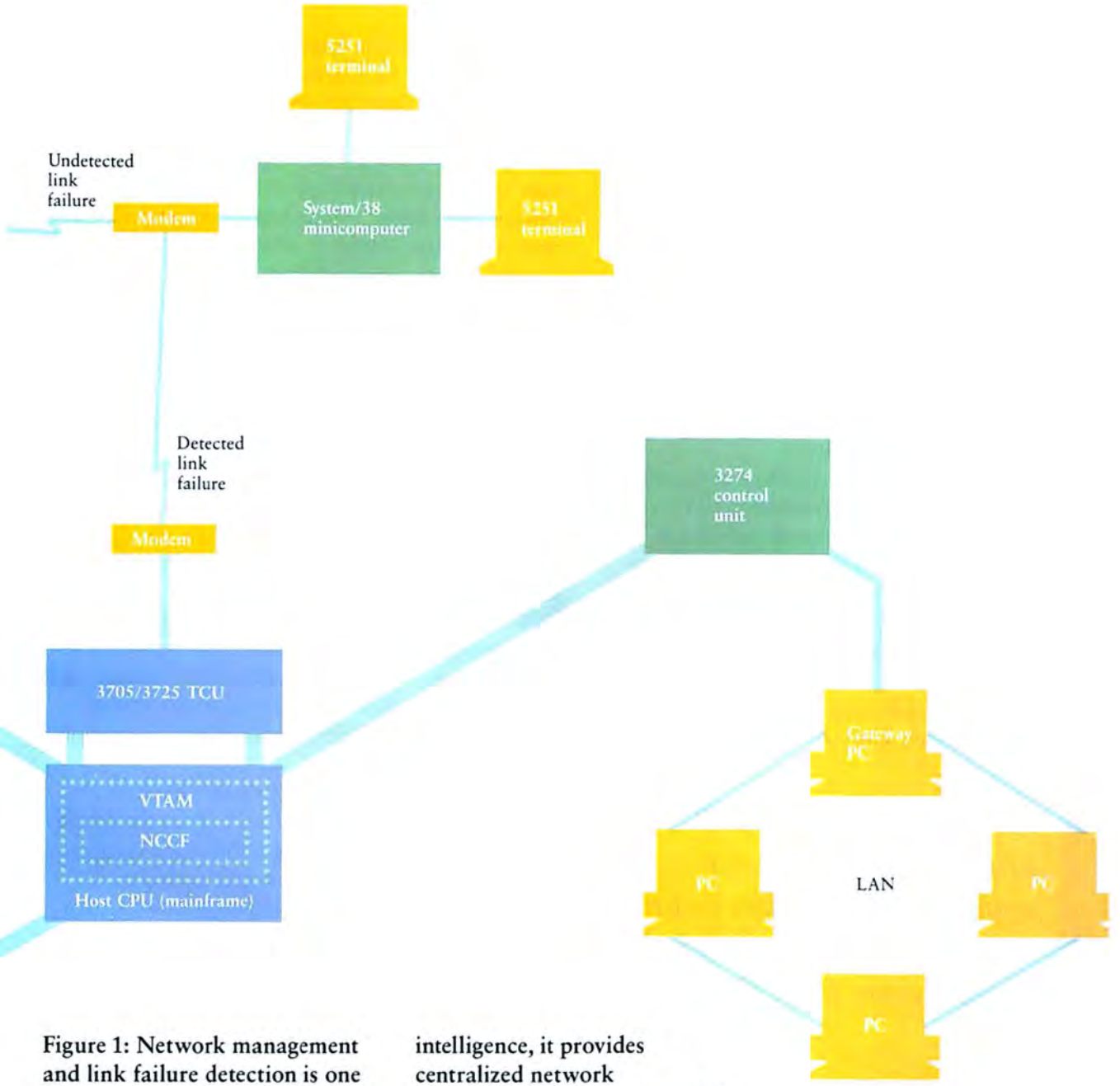


Figure 1: Network management and link failure detection is one of the biggest unsolved problems of a peer-to-peer LU 6.2 network. Under the current master-slave relationship found in IBM SNA networks, all intercommunications between IBM computers pass through the host mainframe. Although this slows down communications and fails to take advantage of smaller computers' native intelligence, it provides centralized network management located in VTAM and NCCF. In a hypothetical peer-to-peer network running under LU 6.2, stand-alone PCs, token ring networks, and minicomputers would be able to communicate directly with one another without necessarily being directly linked to the mainframe. However, if a link failure occurred between two smaller computers, no automatic detection and diagnostics would be possible.

of committing early to LU 6.2. However, LAN software manufacturers and companies that already have network versions of their software, such as Ashton-Tate, are prime candidates for supporting LU 6.2. The first customers to step over the LU 6.2 line will probably be Fortune 1000 firms, such as banks, that are already in the process of building sophisticated PC and mainframe networks.

Roussel suggests that LU 6.2 support might act as a market barometer. "The presence or absence of LU 6.2 will help users identify which products are strategic and which are not," he says.

Problems Before Promise

But many questions remain to be answered before LU 6.2 becomes a common element of PC software. To begin with, IBM hasn't yet fully documented PU 2.1. Since LU 6.2 cannot work without PU 2.1, potential vendors are more or less stymied.

Another problem is the sheer mass of existing master-slave hardware and software. Many of the dumb terminals the PCs emulate are still around. And why not? Unless people need PC functions, replacing the inexpensive dumb terminals is pointless. Even if

Many organizations will probably wait to rewrite applications until they're forced to—at about the time they convert them from COBOL.

an instantaneous mass conversion were possible, it would inconvenience a large part of IBM's installed base. Converting master-slave applications to peer-to-peer requires a complete redesign and rewrite. Many organizations will probably wait to rewrite applications until they're forced to—at about the same time they convert them all from COBOL. Third-party vendors may hasten this process by designing and marketing software bridges to LU 6.2 that will enable applications to use new features without users' being aware of the change.

Meanwhile, a number of decisions need to be made about data management. For example, any organization with more than one PC and more than one copy of *1-2-3* has probably experienced the "multiple spreadsheets" problem. Starting with the same data, users often reach completely different conclusions, some of them flawed. More data can engender even more conclusions, faulty or otherwise.

Moreover, if uploading data from the PC to the mainframe becomes easy enough, some correct information in the mainframe may be overwritten by faulty data from PCs. Transactions will also need to be defined so that one user doesn't rewrite a record just as another user is reading it. Until IBM deals with these issues, application programmers will have to incorporate in their software measures to ensure data integrity.

You Know Where You're Going

Network management is another thorny issue in implementing LU 6.2. For two computers to communicate, they have to know each other's address and how to get there. Whenever computers are added, subtracted, or moved within a network, information changes.

Keeping tabs on computer whereabouts is already a problem in traditional SNA networks, which are set up so that most routing information is contained in a few hosts. A peer-to-peer environment, however, can't be centrally configured. Instead, each node must know the names of the others' LUs, plus the routes needed to reach the nodes. This information grows geometrically. Every time a node is added, it must be configured with information about all the other nodes in the network.

IBM is reportedly developing a technology known as low entry networking (LEN) that might help with these problems. Using LEN, SNA might someday allow network routing tables to be dynamically updated and data to be routed end to end (also known as store-and-forward). With dynamic updating, the entire network wouldn't have to be shut down to add or remove devices, as is currently the case. End-to-end routing would obviate each potential connection's need for a specified route and would let networks route traffic around disabled nodes.

However, in a peer-to-peer network, detecting disabled nodes is no easy matter. Currently, only host

computers can recognize network errors and alert personnel. In VTAM, a mainframe application called the Network Communications Control Facility (NCCF) handles these diagnostic duties. If a node that communicates directly with a mainframe fails, the mainframe's NCCF will discover the problem. But if another node that communicates only with the first node fails, the first node doesn't realize that the second node has failed (see Figure 1). In other words, nodes that communicate indirectly with a mainframe have no access to network diagnostics. Unless IBM adds systemwide network management functions to the PU 2.1, the only solution will be to add NCCF capabilities to minicomputers—an expensive proposition.

A Universal Operating System?

Making predictions about LU 6.2 is difficult because the specifications have yet to be fully defined for the PC, much less implemented. Future enhancements will probably include support for other IBM data communications specifications, such as the so-called context architectures—Document Interchange Architecture (DIA), Document Content Architecture (DCA), Distributed Office Support System (DISOSS), and Professional Office System (PROFS). IBM's first move will probably be to connect DISOSS with LU 6.2 applications to extend DISOSS electronic mail services throughout an office network. Links to other architectures are also being planned.

Ferris envisions LU 6.2 sending text to other systems for word processing. IBM will probably alter PROFS so it supports LU 6.2, he says, "if it hasn't been done already."

"There's an application for LU 6.2 in any context architecture," affirms Roussel. "Without LU 6.2, interchange architectures at the local level will be impossible." He adds that a protocol for graphics is also needed so users can transmit and modify graphic information.

However, IBM may not be in a rush to convert its products to LU 6.2. New products will be delivered as market conditions warrant, and no faster. "Offloading everything to PCs won't be good for IBM," says Roussel, noting that Big Blue makes most of its money from mainframes. One group that doesn't seem to mind about the PC's increasing load on mainframes is IBM's sales force—the overload drives mainframe sales. If the load were decreased with peer-to-peer communications and applications were redistributed to smaller computers, users might be satisfied with small, departmental computers.

Making predictions about LU 6.2 is difficult because the specifications have yet to be fully defined for the PC, much less implemented. IBM's first move will probably be to connect DISOSS.

For this and other reasons, it's not yet time to throw away your terminal emulation board. "Emulation's not dead," says Ferris. "Why should it be? People still have to access mainframes for many useful programs, and they often don't require PCs for access."

LU 6.2 and the token ring network are not perfect; both have a way to go before they can respond to all user requests. But they definitely announce a change in IBM's direction—a jump from 1970 to 1990 that promises to propel the industry toward a universal operating system.

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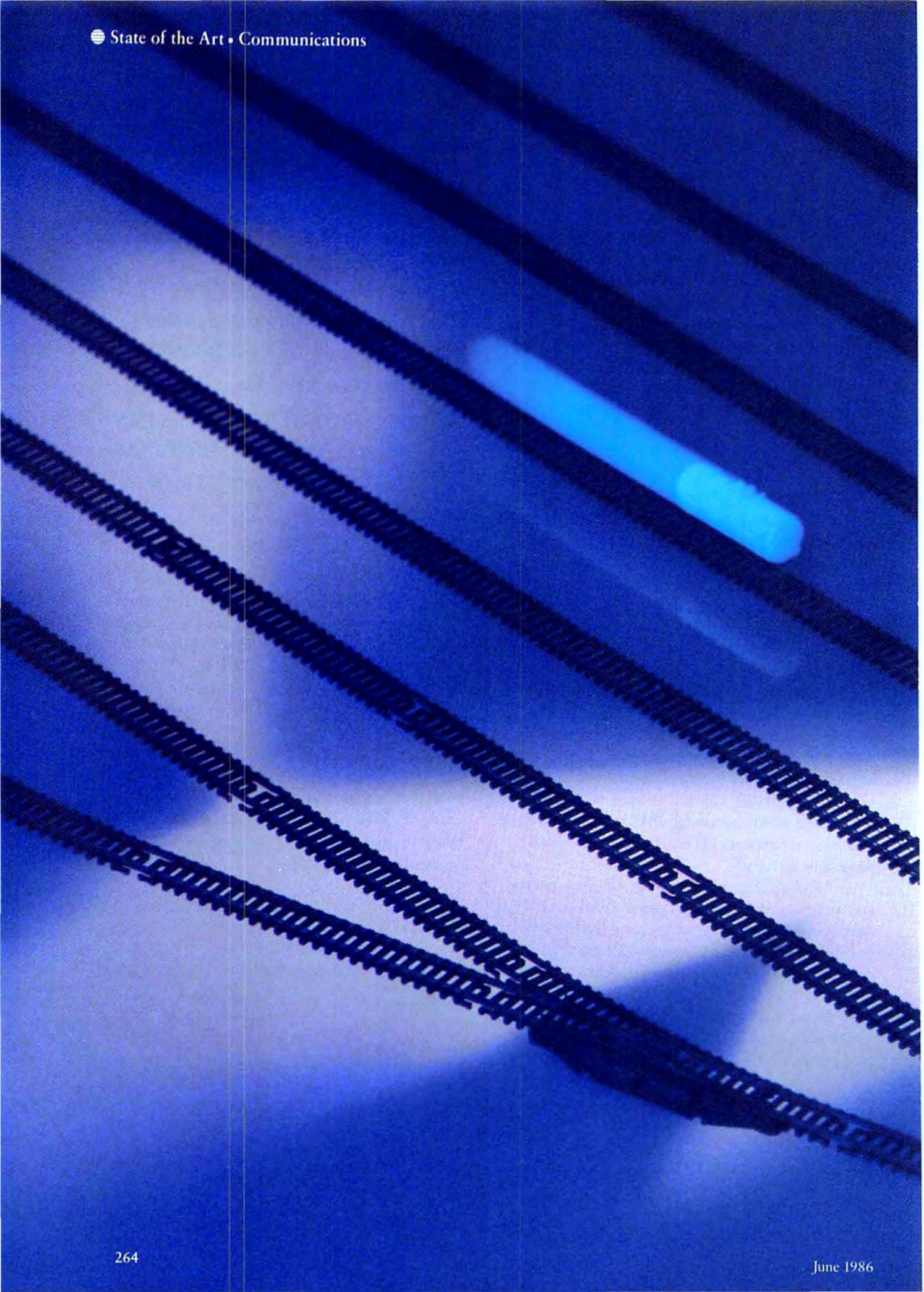
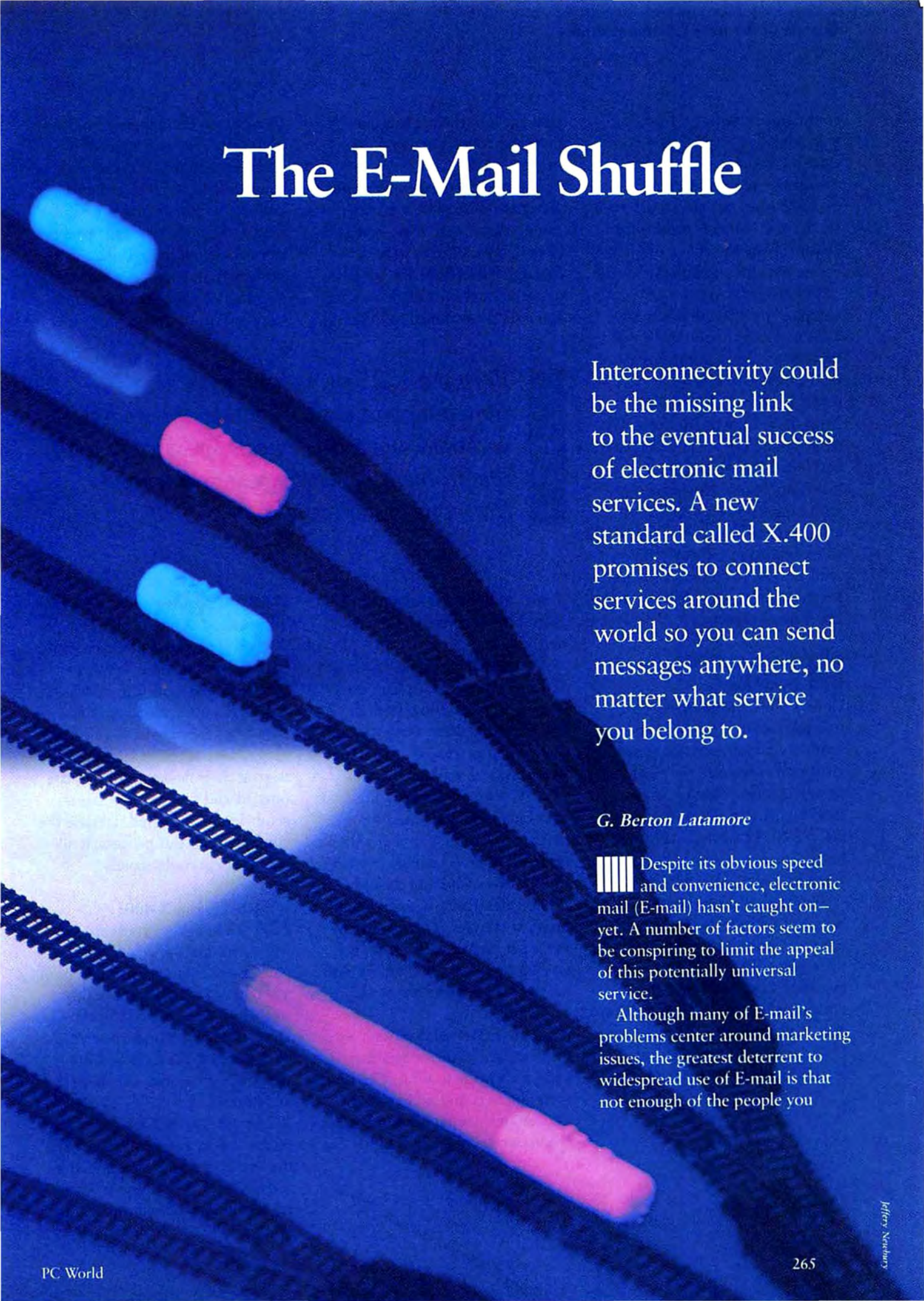


The E-Mail Shuffle



Interconnectivity could be the missing link to the eventual success of electronic mail services. A new standard called X.400 promises to connect services around the world so you can send messages anywhere, no matter what service you belong to.

G. Berton Latamore

Despite its obvious speed and convenience, electronic mail (E-mail) hasn't caught on—yet. A number of factors seem to be conspiring to limit the appeal of this potentially universal service.

Although many of E-mail's problems center around marketing issues, the greatest deterrent to widespread use of E-mail is that not enough of the people you

Jeffery Newbury

communicate with have an electronic mailbox, and if they do, there's a good chance it's not on the service you use. Getting a message from one electronic mail service to another is usually impossible, whether the mailbox is across the globe or across the hall.

The lack of compatibility among competing in-house systems makes most computerized businesses communications islands, unable to reach the electronic mailboxes beyond their front door. Like the in-house systems, public E-mail services have developed proprietary, incompatible technologies. Consequently, with only a few exceptions, the customers of one commercial service cannot use their system to send electronic messages to customers of other commercial or private E-mail systems.

The Role of Packet Switching

Despite the continuing competition for E-mail customers, many vendors of communications services now recognize the need for standard ways of handling electronic messages. The major players in E-mail communications have begun to cooperate and even, in some instances, to consolidate.

Standards already exist for connecting PCs to E-mail services, but not for connecting the services themselves. Guided in large part by established standards, the sophisticated software and hardware of E-mail networks can interpret a PC's data, translating it from asynchronous to synchronous; package it in the appropriate format; and route it across a continent in seconds.

These high-speed transmissions are accomplished by a process called *packet switching,* which allows many messages to be sent through a telephone line simultaneously. Parts of a single message can even be switched to different routes, and the message will be reassembled accurately at its destination.

Packet-switching networks such as Tymnet, Telenet, or CompuServe's network allow several computers to share a long distance line. When you log on to a network on your way to accessing your favorite information utility or data base, you are actually connecting to a minicomputer called a network *node.* The node captures the data you send and divides it into *packets,* each with an equal number of bytes. The number of bytes per packet varies from network to network, but within each network all packets are of identical length.

If you do not send enough bytes to fill a packet, the node automatically adds zeros to fill it. The node then numbers and addresses the outside of each packet and notifies the network controller (which can be a central computer or another network node) that it needs a route to send the string of packets to its destination. Once the route, called a *virtual circuit,* is established, the node sends the packets out over trunk lines to the next node on that route, while also keeping a copy of the data from each packet.

Both the X.25 protocol for packet switching and the OSI model are widely accepted, but neither deals specifically with the problem of sending electronic mail from one system to another.

Each successive node checks the address and contents of every packet. If any errors have crept in because of line noise or other problems, the detecting node will request an accurate copy of the data from the originating node. When the packets reach the node nearest their destination, they are opened and the message is reassembled and delivered. Despite the complexity of this process, it all transpires in milliseconds.

X.25 and X.400: The Packet Protocols

The procedures and formats for packet switching are spelled out in a group of specifications collectively known as the X.25 protocol. Developed by a standard-setting organization, the Comité Consulatif International Téléphonique et Télégraphique (CCITT), the X.25 packet-switching system operates within a larger framework, the open systems interconnection (OSI) model, which divides the telecommunications process into

seven interdependent layers. (To confuse matters thoroughly, the OSI model was developed by another standards group, the International Standardization Organization, or ISO.)

Both the X.25 protocol for packet switching and the OSI model are widely accepted, but neither deals specifically with the problem of sending electronic mail from one system to another, primarily because E-mail is still relatively new. However, in October 1984 the CCITT proposed a set of specifications for exchange of messages via telecommunications. This new standard, known as the X.400 protocol, is still being refined. The X.400 specifications define the software components necessary for exchanging messages as well as the precise structure and coding of various types of E-mail messages. The major definition of X.400 is a universal electronic *envelope* in which messages are placed. Like the packet defined in the X.25 protocol, the X.400 envelope is a series of bits indicating the boundaries of a message.

Because X.400-defined messages will routinely be transmitted on packet-switching networks, most electronic mail will operate under at least two protocols—X.400 and X.25. These standards will not conflict, however, because they apply to different layers in the OSI communications model. X.400 operates primarily at the top level, the applications layer, while X.25 applies to the third level, the network layer.

The Road to X.400

A number of European electronic mail systems, which are generally better established than their American counterparts, have begun to implement the X.400 standard. The German post office, for example, is developing an E-mail system that will utilize the new protocol. In North America, GTE's Telemail service was recently linked to Canada's Envoy 100 E-mail service, using a subset of the X.400 specifications.

Most commercial communications services in the United States and abroad have agreed to support the standard, and 19 American companies—including IBM—have announced that they will release X.400-compatible products in 1986 and 1987. Because X.25 is already designed to handle asynchronous messages from PCs, existing systems will be able to benefit from X.400's ability to transfer messages between E-mail services. However, these future "compatible" products will also take advantage of some of X.400's more exotic features, such as support for local area networks and integrated services digital networks (ISDNs). (See "ISDN: The Network of the Future?" *PCW*, January 1986, for more on ISDN.) Many of these products will include synchronous 9600-bps modems, modem peripherals along the line of Hayes' Transet communications buffer, sophisticated software, and integrated voice/data terminals.

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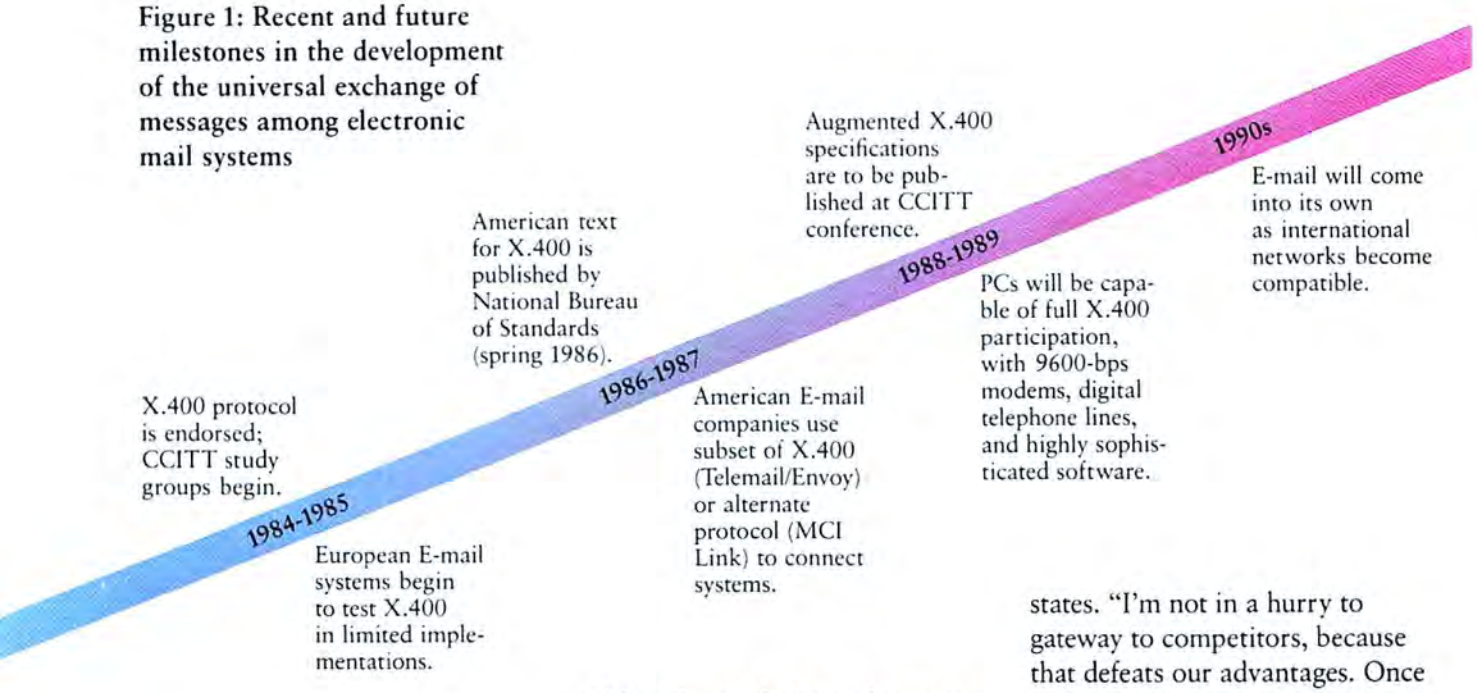
MCI's Interim Link

Until the new standard is fully tested and implemented, electronic mail vendors will have to rely on interim solutions to interconnect their services. Recently, MCI Mail announced that its 200,000 customers can send messages directly to CompuServe subscribers, and vice versa. MCI Mail has also established intersystem connections with businesses that maintain private in-house electronic mail systems, so that messages can be delivered between incompatible mail systems via MCI.

Although MCI intends to support and ultimately implement the X.400 standard, its present interconnections with CompuServe and private companies use a protocol developed by MCI. Called Link, this protocol is "in the spirit of X.400," according to Stuart Davidson, manager of product marketing for MCI Mail. "Link was a carefully planned way of providing functionality to customers in advance of X.400," Davidson explains.

Figure 1: Recent and future milestones in the development of the universal exchange of messages among electronic mail systems



MCI Mail is working with some 80 companies on implementing the Link protocol. Many of these are firms with in-house E-mail systems, for which MCI provides assistance in creating the software needed to interface with Link. The others are software developers. The first announcement of a software product encompassing Link came from mainframe software vendor Soft-Switch, in King of Prussia, Pennsylvania. Soft-Switch's Link product will connect companies using PROFS' internal mail system on IBM computers with MCI Mail. (For more on PROFS, see the sidebar "Profile of PROFS," in "IBM: Practicing What They Preach," *PCW*, May 1986.)

In the world of PC software, Microsoft came close to including Link in its *Access* communications program, but instead chose a similar E-mail front end called Mail. Although you don't need any special Link product to swap messages between MCI Mail and CompuServe, the addition of a Link front end could automate the complex process of sending various messages and copies to mailboxes in several different services.

Marketing Versus Messaging

Despite most services' announced intention to support the X.400 standard, marketing considerations may make some vendors reluctant to implement the protocol. Clark Woodford, vice president of telecommunications services for CompuServe, is not enamored with the idea of complete interlinking, despite his company's connection with MCI Mail. "We work hard to distinguish ourselves from the competition by providing improved services," Woodford states. "I'm not in a hurry to gateway to competitors, because that defeats our advantages. Once everyone is interconnected, electronic mail will become generic, with all our services available through everyone else's systems, and competition will be a pure price battle."

Carver Washburn, vice president of systems development for Western Union's EasyLink service, likewise doubts that X.400 will be adopted soon. "It won't be possible to get everyone in the world to march to the same drumbeat," Washburn observes. "If the customer uses X.400, then we, as the service provider, will use it. If not, we will use what the customer uses. We must deal in the language of the customers—it is a nonstandard world."

The consensus of both marketing and technical experts is that the X.400 standard will be widely accepted, but broad interconnection among E-mail systems will not become reality until the next decade. One of the biggest obstacles in the path of interconnectivity is X.400's lack of a directory protocol. Without a central

directory of all available mailboxes, you would have to know which E-mail service the intended recipient used. Eventually, the E-mail companies will have to sit down together and tackle the complex task of creating such a directory. Figure 1 depicts the major developments toward message-system interconnections from the mid-1980s to the 1990s.

With competition growing in the electronic mail market, many observers expect a shakeout within the next decade; some say it has already begun. Ironically, the best-known services, such as EasyLink and MCI Mail, are the shakiest. They have spent so much on promotion that they are deeply in the red.

Furthermore, some companies are pricing their services under actual operating costs in an effort to build usage. Western Union's financial difficulties of the past two years are a matter of public record: The company has bet its future on EasyLink and is putting all its resources into building the dominant E-mail force in the industry. MCI is running neck and neck with EasyLink in number of subscribers, but industry analyst Eric Arnum of Norwalk, Connecticut's International Resource Development notes that MCI may not be committed to electronic mail and may sell its service if the right offer comes along.

Another major vendor, GTE, recently entered into a joint venture with competitor United Telecommunications. Telemail, GTE's E-mail service, and Telenet, the world's largest packet-switching network, will be combined with United Telecommunications' packet network, Uninet.

Despite most services' announced intention to support the X.400 standard, marketing considerations may make some vendors reluctant to implement the protocol.

To attract customers and differentiate itself from the competition, each commercial E-mail company has added services to its basic system. The hope is that the extra revenues will help offset operating deficits. EasyLink, for instance, offers FYI, a large collection of electronic newsletters and data bases, while MCI Mail offers a connection to the Dow Jones News/Retrieval service.

Despite these efforts, many industry observers expect at least half the electronic mail competitors to disappear in the next decade. When the bloodbath is over, a few strong companies will emerge as computer communications leaders. Surviving E-mail vendors are likely to have their own packet networks, such as Telemail, GEISCO (General Electric), EasyLink, CompuServe, and OnTyme (operated by Tymnet, the second largest packet-switching network). These companies' ability to control network costs and electronic mail prices gives them a major advantage.

Meanwhile, the packet network companies are operating in the black and find themselves in a relatively stable situation. While some shifting is taking place—such as the recent joint venture between Telenet and Uninet—the packet networks are likely to experience a huge growth in demand for their services.

Regardless of who wins the electronic mail sweepstakes, the survivors will end up interconnected. The question is when. Just as it took 50 years for the telephone to become universal, it will take a generation for interconnected electronic mail to become firmly entrenched. ●

G. Berton Latamore is a writer based in South Burlington, Vermont. He is the editor of VideoPrint, *a videotex industry newsletter.*

Battle for the Background

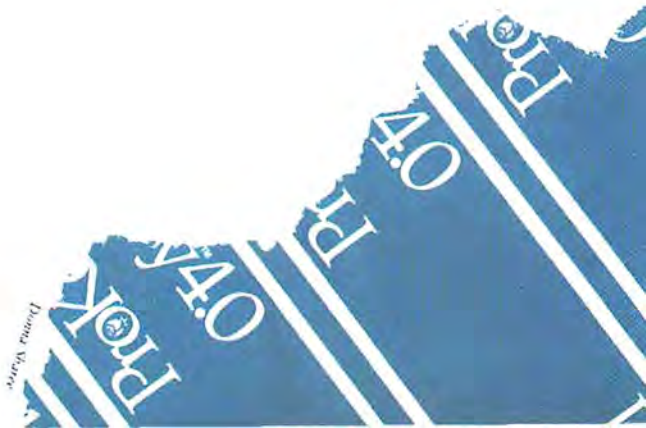
The convenience of memory-resident programs can be offset by technical conflicts. Here's an explanation of how such programs work and some advice for making them work together.

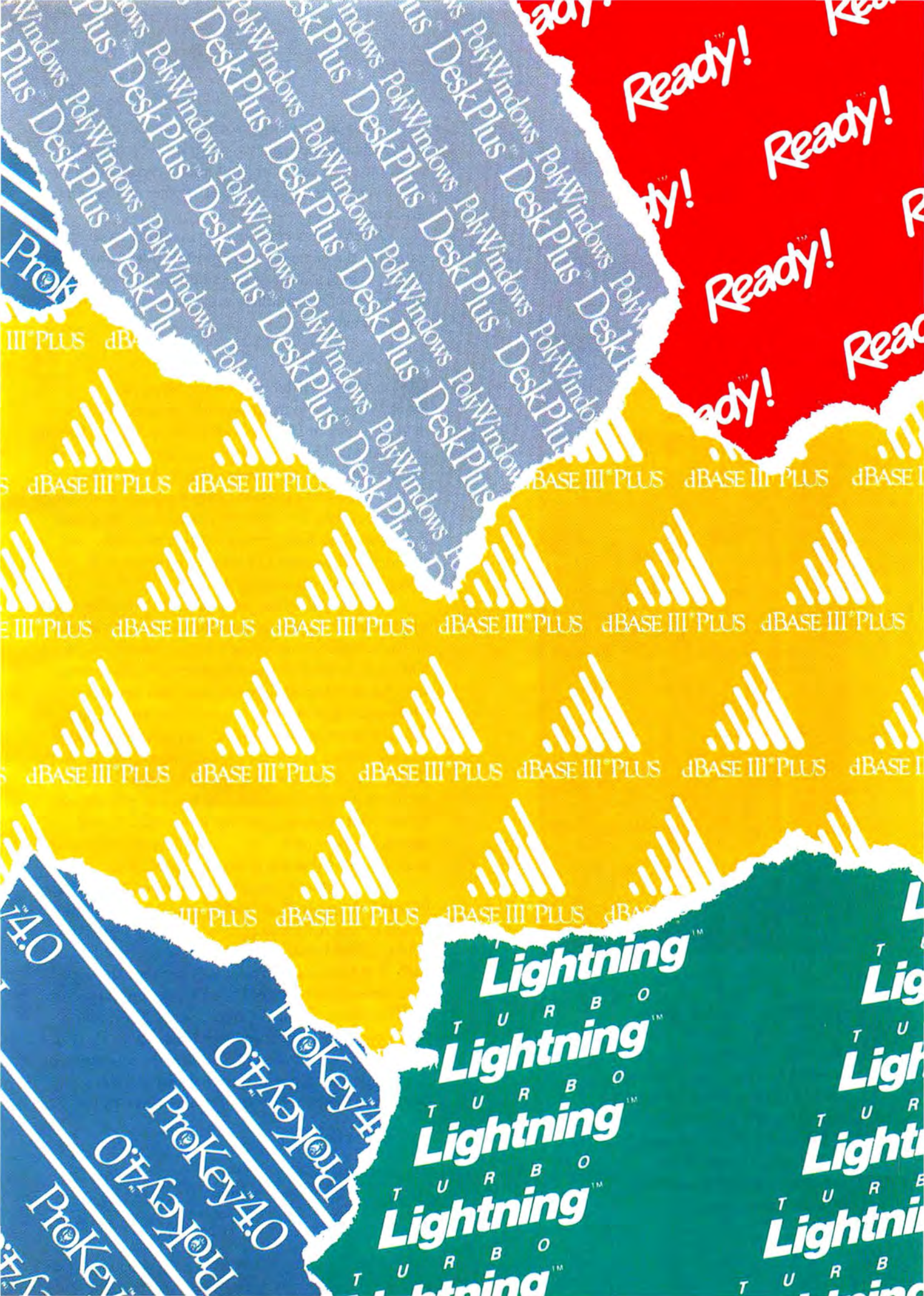
Bruce Owen

You peel the wrapping from the latest version of a pop-up desk organizer and eagerly load it, along with the keyboard macro processor you've been using for years. For once, you've even read the manuals and carefully followed the instructions. But instead of transforming the PC into a multitalented electronic secretary, the new software turns it into a stuttering idiot that repeats every keystroke twice. Daunted, you load the programs in the opposite order. When you call the macro processor menu, the system hangs up. Glumly, you reset the system, wondering why major developers such as Lotus Development and Borland International continue to market programs like *Spotlight,* the desk organizer, and *SuperKey,* the macro processor, that don't work together.

The frustration that such software incompatibility can engender is relatively new. Until recently, you used programs in sequence. You started a word processor and used nothing else until you quit the program. But now pop-up notepads, calculators, macro processors, spelling checkers, and outline processors can all run "in the background." They remain loaded in RAM, along with DOS and the current application program. A simple keystroke combination temporarily halts the application program and brings the background tool to life. Like bickering relatives, they interrupt each other whenever you press their "hot keys." Hot key conflicts are easy to resolve, because most memory-resident programs have some facility for changing the hot key.

When Microsoft developed DOS, the company didn't foresee such shenanigans, and thus didn't provide standards or protocols for memory-resident programs to follow. What's worse, many popular programs, including *WordStar, 1-2-3,* and Microsoft's own *Word,* violate the rules of DOS to maximize their performance. Background programs are forced to employ their own tricks to handle the complex and sometimes antisocial behavior of the many application programs on the market. Unfortunately, but not surprisingly, their coping tactics don't help them work together. It's up to you to waylay—and failing that, to arbitrate—their conflicts.

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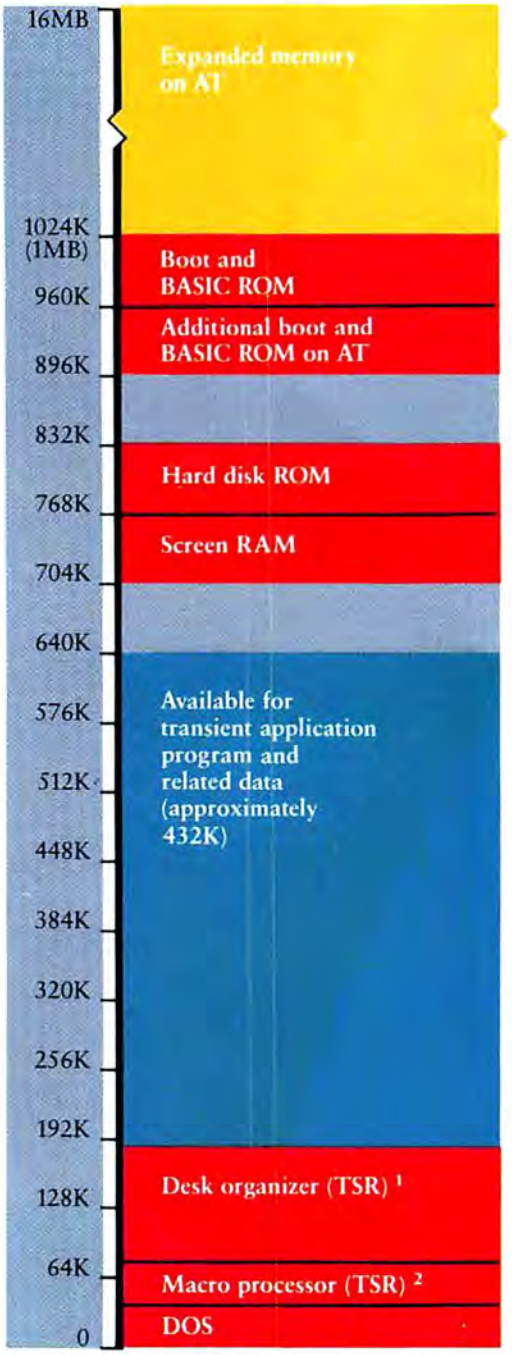


[1] SideKick 96K
[2] SmartKey 32K

Figure 1: A typical system memory map. DOS takes up the first 36K; SmartKey, a keyboard macro processor, inhabits the next 32K; then SideKick eats up 96K. Memory between the end of SideKick's allotment and the 640K limit is available for application programs and the data they generate.

Some less common software products, such as screen blanking programs, program switchers, network interface software, and image-capture or alternative screen printing routines, further confuse the situation.

Microsoft is coordinating an effort to set standards for the behavior of memory-resident programs. At press time, a draft of this standard that would resolve some of the conflicts was circulating for industry comment.

Loading Order and Other Mysteries

When you start or reset the system, the "resident" portion of DOS is loaded into memory, starting at address 0. The amount of space used by DOS varies according to the version you use. As you load memory-resident programs, they stack up above DOS in memory, like the layers of a cake. Both DOS and these so-called TSRs (programs that terminate and stay resident) remain in memory until you reset the system or turn off the power.

Memory-resident programs set themselves up as permanent additions to DOS, always present and active in memory, checking every keystroke you make and ready to flash into action at your sudden instigation. Most of the application programs you use routinely, such as word processors, spreadsheets, and data managers, are considered "transient" programs and are loaded in at the top of the heap (see Figure 1). Unlike the TSRs, however, transients don't occupy a permanent place in memory. When you exit *dBASE*, for example, the memory that it occupied is free again. The next program you run occupies the same area of memory as the transient *dBASE* did.

RAM disks, programs that allocate some of the PC's RAM to simulate a fast floppy disk, complicate the situation. Although permanently ensconced in RAM, a RAM disk program is a special breed of TSR. A RAM disk generally uses not only the small space immediately above DOS that the program code itself occupies, but also a large area of RAM at the top of memory for the simulated disk drive. The gap between the end of the last TSR and the beginning of RAM disk data is the area that ordinary transient programs occupy when you run them (see Figure 2).

Space Savers

The first and simplest cause of incompatibility is insufficient memory, as each TSR usurps memory from the total available for subsequent programs. *ProKey 4.0* and *SideKick*, when loaded into a PC with 256K of RAM, for example, won't leave enough memory to run *Word*. Even with 640K, adding a new TSR could prevent you from loading your largest spreadsheet file. You might be forced to reduce the size of the RAM disk, if you have one, to clear enough space for a transient application program and its data.

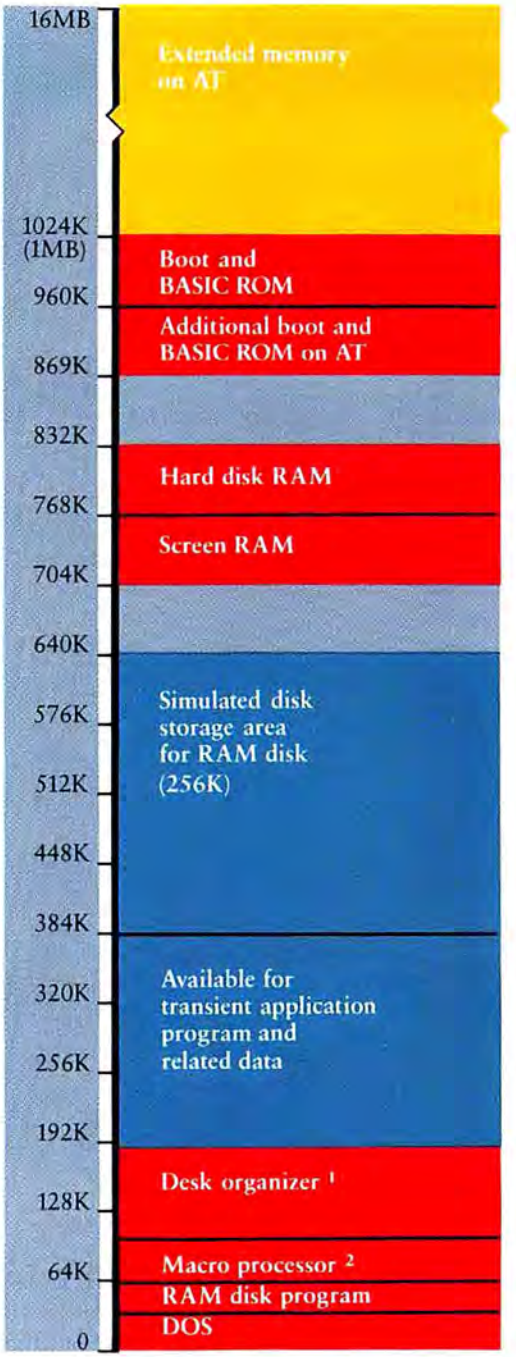
If you're a serious spreadsheet user, you know that even with expanded memory boards, the number of cells in a *1-2-3* worksheet is limited by the amount of conventional memory available, and hence by the space left over after the last TSR is loaded. But if you have plenty of memory and use comparatively small

Unloading memory-resident programs from within applications creates a hole in memory between the last remaining TSR and the transient program.

programs, such as word processors and data base managers without a RAM disk, you can probably load as many TSRs as you like without running out of space.

One somewhat awkward way to circumvent the memory limitation is to opt for small TSRs. (Table 1 lists some popular TSRs and their features, including size.) Choosing *SmartKey 5.0* over *ProKey 4.0* to use with *SideKick*, for instance, enables you to run *Microsoft Word* on a PC that has only 256K of RAM. But you should really base your selection of programs on features and how well they're implemented rather than on size.

Some programs enable you to save space by loading selected features. *SideKick* goes halfway by letting you combine features—notepad, calculator, auto-dialer, and so on—or choose the whole package. *Spotlight* maintains a reasonable size but sacrifices



[1] SideKick 96K
[2] SmartKey 32K

Figure 2: System memory map with a RAM disk. The memory dedicated to simulating a floppy disk drive reduces the amount available for transient programs and data. Because the RAM disk program is usually loaded after DOS, the starting points for the TSRs (macro processor and desk organizer) are moved up.

Table 1: Popular TSR programs compared

Product	Features	Default size in memory: graphics	Default size in memory: text	Partial loading allowed	Windows/ help line movable	Default hot key
Keyworks 2.0	Keyboard macros	65K-105K	65K-105K	N/A	No. Only user-created menus and windows can be moved	<GrayPlus>
ProKey 4.0	Keyboard macros	58K	41K	N/A	Specify when loading	<Alt>-= <Alt>-/
SmartKey 5.0	Keyboard macros	32K	28K	N/A	Limited	<GrayPlus>
SuperKey 1.11a	Keyboard macros Cut and paste File encryption	57K	57K	N/A	Limited	<Alt>-=
Turbo Lightning 1.00A	Interactive spelling checker and thesaurus	62K-234K	66K-238K	N/A	No	<Shift>-<F8>
Ready 1.00	Outline processor	127K	127K	N/A	Uses entire screen	<Ctrl>-<keypad 5>
	With expanded memory board	3K	3K			
PolyWindows DeskPlus 1.2A	Core program	62K	50K	Yes	Yes	<Ctrl>-<Esc>
	Notepad space	3K	3K			
	Calculator	3K	3K			
	Calendar	5K	5K			
	Index cards (help)	18K	18K			
	Keyboard macros	5K	5K			
	Typical memory total	96K	84K			

speed by leaving a portion of each pop-up tool on disk until it is needed. You can conserve the conventional RAM needed for *Ready*, the outline processor, by installing an expanded memory board. *Ready* normally occupies a whopping 127K of conventional RAM but needs only 3K if most of its bulk is shunted to expanded memory. (See "The RAM Revolution," *PCW*, January 1986 for more information about expanded memory.) Other memory-resident program updates will likely follow a similar scheme in dealing with expanded memory.

The simplest solution for accommodating the varied space requirements of TSRs is to install more conventional or expanded memory. But space is just part of the problem.

Beware of Black Holes

Some application programs, such as *WordStar* and *dBASE III*, let you run another program without exiting to DOS. Others, such as *WordPerfect* and *1-2-3* release 2, enable you to jump into DOS without leaving the application program; when you're finished with DOS, typing EXIT lets you resume the application where you left off. Although you might be tempted to use one of these methods to load a memory-resident program after invoking an application, resist the temptation. The probable results of such ad-

Table 1 *(continued)*

Product	Features	Default size in memory: graphics	Default size in memory: text	Partial loading allowed	Windows/ help line movable	Default hot key
Pop-Up DeskSet 1.5	Notepad	58K	58K	Yes	Interactive. Not by permanent setting.	<Alt>-W
	Simple calculator	19K	19K			<Alt>-C
	Financial calculator	34K	34K			<Alt>-X
	Calendar	33K	33K			<Alt>-D
	Dialer	21K	21K			<Alt>-V
	Alarm clock	17K	17K			<Alt>-A
	DOS utilities	22K	22K			<Alt>-U
	Typical memory total	141K	141K			
SideKick 1.56A	Complete: notepad, calculator, calendar, dialer, ASCII table	67K	63K	Only combinations shown	Yes	<Ctrl>-<Alt>
	All but calendar	58K	54K			
	All but notepad	46K	42K			
	Calculator and ASCII table only	28K	24K			
Spotlight 1.1	Core program	76K	76K	No	Interactive. Not by permanent setting.	<Shift>-<Alt>-N
	Notepad					<Shift>-<Alt>-C
	Calculator					<Shift>-<Alt>-A
	Calendar					<Shift>-<Alt>-I
	Index cards					<Shift>-<Alt>-P
	DOS utilities					<Shift>-<Alt>-F
	Dialer					

ventures are a frozen, or "hung," system or an impolite expulsion from the application program to DOS, with the attendant loss of work in progress. Such is the stuff that screams are made of. Unloading memory-resident programs from within applications (to make room for a large spreadsheet, for example) is also fraught with peril; it creates a hole in memory between the last remaining TSR and the transient program.

The problem is that neither DOS nor the reloading mechanisms of most application programs can handle gaps in memory. When you run a program from within *WordStar*, for example, *WordStar* loads that program into memory over the first part of *WordStar;* when the new program is done, *WordStar* ordinarily reloads itself back over the program. However, when the program you call from within *WordStar* is a TSR, after terminating it moves the beginning of available memory up into the space that *WordStar* once occupied (see Figure 3). Because *WordStar*'s reloading mechanism can't handle this unexpected change, you're left with an inert keyboard and a disk drive that is ready to spin until judgment day.

Load and unload TSRs only from the DOS prompt—never from within other programs.

TSRs handle the memory gap in various ways. When you unload *SuperKey* from inside another program, DOS not only returns you to the DOS prompt, it also gets so confused about how much memory is available that you generally can load only the smallest programs until you reset the system. *Ready* is smart enough to check whether anything is above it in memory—either a transient program or a TSR—before

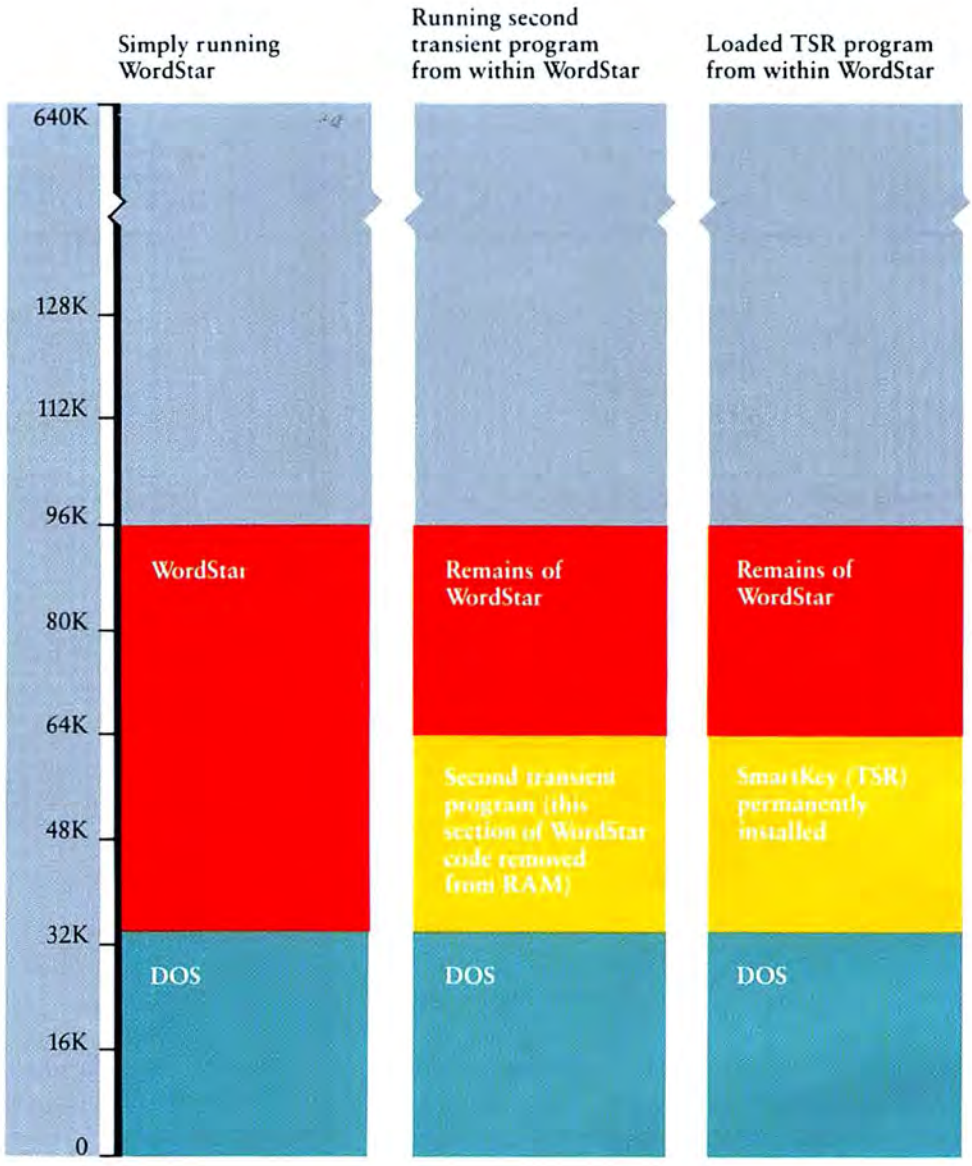


Figure 3: When you run another program from within WordStar, part of WordStar's program code is removed from memory to make room for the second program. When that program is finished running, the WordStar code is restored. If that second program is a TSR, its code is permanently installed in the vacant space. When WordStar tries to restore the rest of its program code, it finds the space occupied. Running a TSR from within WordStar is not recommended.

unloading itself. If not, *Ready* truly unloads and frees up the memory it occupied. If there is a program above it, *Ready* disables itself without releasing the memory space it occupied—and without crashing the system. *ProKey 4.0* also unloads without releasing its memory, but it does so regardless of the circumstances. While this style of unloading saves you from crashing, it is hardly useful when you're trying to free up memory without restarting the system.

The order of unloading memory-resident programs is just as important as the loading order. You can wreak havoc when you unload a TSR that wasn't the last one loaded. For example, if you load *SmartKey* and then *SideKick*, unloading *SmartKey* first (even from the DOS prompt) would fail to recover any memory and would deactivate both programs.

The solutions to these problems are simple: Load and unload TSRs only from the DOS prompt—never from within other programs. And unload programs in the reverse order in which they were loaded.

If you follow these two rules, you can save yourself both grief and data. You might find it helpful to use batch files to load and unload TSRs and transient application programs in the correct order.

Constant Interruptions

When you use a macro processor such as *ProKey* with a transient application program such as *dBASE,* every time *dBASE* wants to read the keyboard status, it generates a keystroke interrupt that *ProKey* senses and passes on to the ROM BIOS. (An interrupt is a special user- or program-instigated control signal that diverts the attention of the computer from its current task to a specific service routine. The ROM BIOS is the PC's Basic Input/Output System, a collection of low-level services, such as video display or keyboard functions.) The BIOS then tells *ProKey* which key you pressed. If that key is one that you have defined as a macro, instead of passing the keystroke to *dBASE* verbatim, *ProKey* passes along the characters stored in the macro definition. In Figure 4, for example, the keystroke combination <Alt>-A is a macro that contains a street address.

If you load a second TSR that uses the keystroke interrupt, the new TSR interposes itself between the transient application program and the last TSR loaded. When a transient program such as *dBASE* generates a keystroke interrupt, that interrupt is handed to the last TSR loaded, which hands it in turn to the previous TSR, and so on, down to the ROM BIOS. The ROM BIOS reads the keystroke and passes it back up the "daisy chain" to the first TSR loaded, then to the second, and so on until it finally gets back to the transient program.

Well-behaved TSRs, such as *PopUp DeskSet,* act like transient applications, generating a keystroke interrupt whenever they want to read the keyboard. By generating the interrupt themselves, these programs start the entire daisy chain from the top, handing the interrupt down past all the other TSRs in the chain, which then "know" that the keyboard is being read and act accordingly.

The majority of TSRs are not so well behaved; they take advantage of the fact that they're already in the daisy chain. Rather than actually generating an interrupt that starts at the top and runs all the way down and back up the chain, they simulate an interrupt by calling directly down the chain to the BIOS or the TSR below them. The programs above them in the chain never know that the keyboard was read.

Such "cheating" in the daisy chain explains why you should always load your keyboard macro processor before other TSRs that use the keyboard interrupt (most do). If you load *ProKey* after *SideKick,* for example, you won't be able to use your macros in the notepad. When *SideKick* wants to read the keyboard, it calls down the interrupt chain. The request travels down the chain to the ROM BIOS; keystrokes are returned up the chain to *SideKick* without ever passing through *ProKey.*

Figure 4 shows the correct loading order, with a request from the transient application program answered by a macro. The macro would work just as well in the *SideKick* notepad.

The loading order also determines how a real-time spelling checker like *Turbo Lightning* interacts with your pop-ups and macro processor. *Turbo Lightning* must be loaded before most pop-up notepads to be able to check the notepad's contents. The same logic explains why *Turbo Lightning,* when loaded after *SmartKey,* checks every word that *SmartKey* plays back, slowing it considerably. Your needs and preferences will determine the most appropriate loading order.

Unload programs in the reverse order in which they were loaded.

Always start with the loading orders specified in the manuals; then try other sequences. You can't hurt anything, and you might prefer a different arrangement. Just test all combinations carefully, and don't expect any sympathy from the manufacturers if a product acts up after you have loaded it in other than the recommended order. You generally load RAM disks and print spoolers first; then keyboard macro processors, spelling checkers, and outline processors; and finally desktop accessories.

Displays: Driven to Distraction

Fancy graphics can give some memory-resident programs fits. Many lack the video device drivers necessary to display their screens over graphics-mode displays. *Word* uses the graphics mode to display italics and boldface; *Symphony* uses it to display graphs; *Reflex, Framework, Enable, Windows,* and all other graphics-oriented packages require it as well. *SuperKey, SideKick,* and others just save the graphic image, switch the screen to text mode, and appear over a blank background or a scrambled mess of multicolored graphics characters that Borland euphemistically calls modern art.

Yet such programs all display properly and restore the graphics screen once they are finished. Others, including *ProKey, SmartKey,* and *Spotlight,* even manage to do it the right way—without hiding the underlying graphics screen.

Always load your keyboard macro processor before other TSRs that use the keyboard interrupt.

Ultimately, it's not graphics-based software, but the many special graphics boards, such as IBM's Enhanced Graphics Adapter and those made by Hercules and Paradise, that trip up TSRs. The problem is twofold. Because each board uses different formats to display graphics, each TSR must include special drivers to display its screen in any given board's graphics modes. Worse yet, a TSR can't always know what a board's text or graphics mode is when it has to pop up. DOS stores a value indicating the mode of a video adapter in an accessible place, and TSRs check that value to determine how to handle a color graphics display. But many third-party display boards have different graphics modes that DOS is incapable of reporting.

The boards themselves lack a direct way to report the mode they are in. Board manufacturers seem to assume that a program will remember how it set the board up. Unfortunately, a memory-resident program must deal with the mode set by the program that it is interrupting. Without knowing the display's initial mode, the memory-resident program can't choose an appropriate driver for its own screens or correctly restore the screen to its original condition once it's done.

Always start with the loading orders specified in the manuals; then try other sequences.

Some TSRs, such as Borland's, try various "tests" to determine the type of board that is present and the mode it is in, but with all the Hercules-compatible boards and other odd displays on the market, success is never guaranteed. Even with standard displays, TSRs cannot always trust what DOS tells them about the current display mode. For example, *1-2-3* version 1A doesn't inform DOS that it has switched to graphics mode when it displays a graph. Popping a TSR's screen up over a *1-2-3* graph will scramble or corrupt the graph when you quit the TSR. Fortunately, you can fix the graph by returning to the spreadsheet and selecting */Graph View* again.

Maintaining the Order

With several memory-resident programs loaded in a single PC, you may have to keep track of exactly where you are when you invoke or quit them. Otherwise, you might find yourself making a mistake. For example, let's say you start up *Ready,* invoke *SuperKey,* and exit *Ready* without closing the *SuperKey* window: The next time you try to invoke *SuperKey,* nothing happens. To restore *SuperKey,* you have to press *Ready*'s hot key to pop up the *Ready* screen with its *SuperKey* overlay, quit *SuperKey* inside *Ready,* and quit *Ready* again before you can pop *SuperKey* up outside *Ready.* Such a remedy is almost worse than the problem. The proper preventive is to back out of memory-resident programs the way you came into them, and never close one TSR while it contains another.

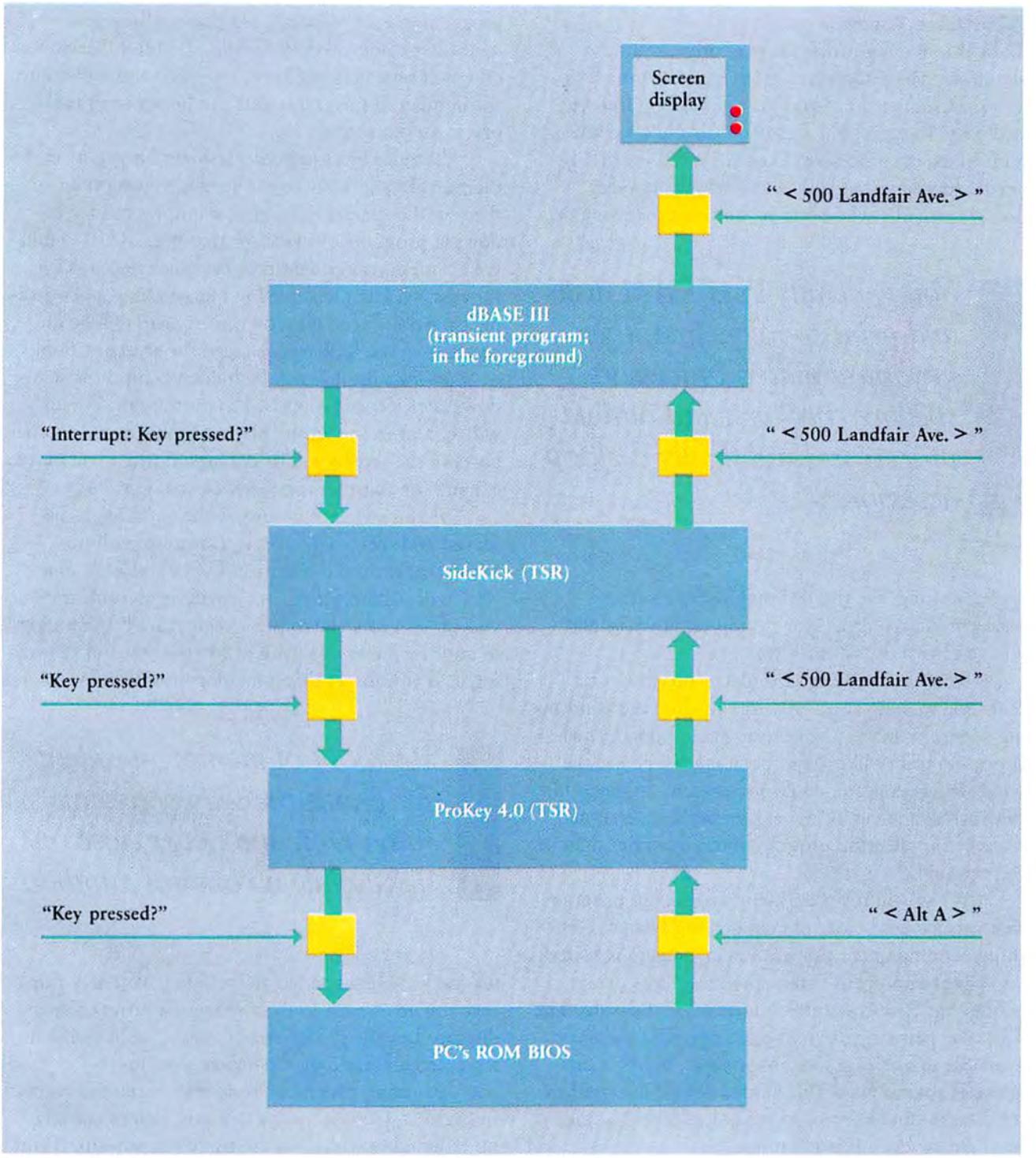


Figure 4: The interrupt daisy chain. dBASE sends an interrupt down the chain to find out if a key has been pressed. On the way back up, ProKey translates the keystroke signal (< Alt > -A) into the previously defined string of characters that comprise the street address.

Doing Windows

Windowing programs may provoke you to abandon TSRs altogether. After all, *Microsoft Windows, Desqview,* and *TopView* all have built-in cut-and-paste features; but *Desqview* also has a good built-in macro processor. Even so, you'll inevitably need a function that your windowing software doesn't provide, whether it be outline processing or spell checking. Or you'll simply prefer the more powerful macro processor or pop-up notepad that you've grown accustomed to.

You generally load RAM disks and print spoolers first; then keyboard macro processors, spelling checkers, and outline processors; and finally desktop accessories.

Don't load a keyboard macro program or a real-time spelling checker before loading the windowing program unless you want to risk a system crash. A pop-up utility like *SideKick,* if loaded before the windowing program, could suffer from display oddities such as the cursor appearing in the interrupted transient application program window rather than in the notepad.

When you invoke a memory-resident program that was loaded before the windowing system, everything running under the windowing system is halted; you have temporarily interrupted the "concurrent processing" feature of the multitasking software. The TSR also permanently reduces the pool of memory available to all programs in windows; unlike a program in a window, a TSR loaded before the windowing system cannot be swapped out of memory and onto a disk when it is not in use.

Because *Windows* usurps all the interrupt routines when it loads, even if you did load a TSR before *Windows,* the TSR would be disabled while *Windows* runs. You can use a batch file to load a macro processor or real-time spelling checker along with the main program in each window, but don't follow this method for pop-up desk utilities. If you do, each window will take up more memory space and will reduce the number of programs that can be active in memory at the same time.

Because most memory-resident programs write their displays directly to the screen, you should run them in the special full-screen windows most windowing programs provide for that purpose. If you invoke a memory-resident program such as *SideKick,* for example, that is loaded in one of *Desqview*'s ordinary partial-screen windows, *Desqview* will be unaware that *SideKick* has changed the screen. Chunks of *SideKick*'s display will be hidden behind the window *SideKick* was supposed to overlap, the cursor will appear in the wrong place on the screen, or other parts of the screen will be corrupted when you move, expand, or contract the *SideKick* window.

If you switch windows while *SideKick* is displayed and then switch back, *Desqview* will not know that it should restore *SideKick*'s display. *SideKick* will still be active, but it will be invisible until you cause it to write to the screen again by changing to another menu or screen or by quitting and reinvoking it. If you forget that a memory-resident program was active when you left the window, you may think that you are typing to the application program being displayed, while the keystrokes are actually being intercepted and used by the unseen pop-up.

Back out of memory-resident programs the way you came into them, and never close one TSR while it contains another.

Running a memory-resident program in its own full-screen window means that you cannot see any other window while you are using the pop-up. If you want to see the program you are interrupting (to cut and paste screen information into the notepad, for example), you may want to load the memory-resident program in the same full-screen window as the application program. You could also load it before starting the windowing program, despite the drawbacks just mentioned. If you load a memory-resident program before loading the windowing system, the mem-

Table 2: Program interactions among TSRs

	Turbo Lightning 1.00A[1]	Ready 1.00	Poly-Windows DeskPlus 1.2A[2]	Pop-Up DeskSet 1.5[3]	SideKick 1.56A	Spotlight 1.1	Microsoft Word 2.0[4]	Desqview[5]
Keyworks 2.0	●	●	●	●	●		●	●
ProKey 4.0	●	●	●	●	●	●	●	●
SmartKey 5.0	●		●	●	●	●	●	●
SuperKey 1.11a	●	●		●	●		●	●
Turbo Lightning 1.00A	—	●	●	●	●		●	●
Ready 1.00	●	—	●	●	●	●	●	●
Microsoft Word 2.0	●	●	●	●	●	●	—	●
Desqview	●	●	●	●	●	●	●	—

[1] *Turbo Lightning* will work only in "full screen-check" mode when invoked from inside *Ready* or *PolyWindows DeskPlus*; concurrent spell checking and the thesaurus are not available. But concurrent spell checking is the only mode that works with *Microsoft Word*–full screen-check and the thesaurus are inoperative.

Although *Turbo Lightning* won't work within *Spotlight*, the combination doesn't cause the system to crash. *ProKey* and *Turbo Lightning* can coexist peacefully, but don't try to invoke *Turbo Lightning* from a macro.

[2] When you use *PolyWindows DeskPlus* with *ProKey*, *SmartKey*, *Turbo Lightning*, *Microsoft Word*, or *Desqview*, you will occasionally have to press an extra key to complete loading an application program or to invoke a memory-resident program.

If you exit the *PolyWindows DeskPlus* calculator too quickly after pressing the equal sign, meaningless numbers may be inserted in a *Microsoft Word* document.

If you load *PolyWindows DeskPlus* before *Ready*, you can use either product within the other. However, you risk a system crash if you exit *Ready* while *PolyWindows DeskPlus* is displayed and then invoke *PolyWindows DeskPlus*. On the other hand, if you load *Ready* first, you'll avoid the system crash but won't be able to use *PolyWindows DeskPlus* within *Ready*.

[3] If you load *Pop-Up DeskSet* before a keyboard macro processor or *Turbo Lightning*, any of these can be used at any time, regardless of what else is currently active. If you use *Pop-Up DeskSet* with *ProKey* or *SuperKey*, you'll want to change the location of the macro program's help line to avoid corrupting Pop-Up Word's column indicator.

[4] If *Microsoft Word* is in graphics mode, *PolyWindows DeskPlus*, *Pop-Up DeskSet*, and *SideKick* will blank or scramble *Word*'s screen to display their data, and *Keyworks* and *SuperKey* will garble one line of *Word*'s graphics screens while you're defining a macro.

[5] *PolyWindows DeskPlus*, *Pop-Up DeskSet*, *Ready*, *SideKick*, *Turbo Lightning*, *SmartKey*, and *SuperKey* must be run in a "writes directly to screen" window. *Spotlight* and *ProKey* can run in an ordinary *Desqview* window, as long as you don't try to switch windows while either program is displayed. However, with those programs in ordinary windows, the cursor is displayed incorrectly.

ory-resident program can appear over any window and transfer data from window to window. If you load it inside a window, it can be used only in that window.

Conflict and Resolution

Some TSRs just don't work together, regardless of the loading order or the options you choose. *SuperKey* was probably the crankiest program tested. You are heading for a quick crash if you use *SuperKey* with *PolyWindows DeskPlus* or *Spotlight 1.1*. Combining *Ready* and *SmartKey 5.0* will crash your computer every time. *Spotlight* and *Keyworks* are also incompatible.

Don't load a keyboard macro program or a real-time spelling checker before loading the windowing program unless you want to risk a system crash. Use a batch file to load a macro processor or real-time spelling checker along with the main program in each window.

Because Borland's family of TSRs were written to work together, you needn't be concerned with conflicts among them. But the manuals recommend that you load *SuperKey* first, then *Turbo Lightning*, and finally *SideKick*. Any other order risks disabling some features. You can use *SideKick* inside *Turbo Lightning* and vice versa. *Turbo Lightning* checks both key definitions and playback with *SuperKey*. You can call *SideKick* from within *SuperKey* as easily as the reverse.

Don't expect a new release of DOS, the next IBM PC, or the heralded Microsoft standard for cooperation among background tasks to solve the nagging problems that plague memory-resident programs. New TSRs will strive to be compatible with all the old, cantankerous programs still in use, thus reinforcing a troublesome status quo. And most software developers still put program performance ahead of tractable behavior and compatibility with background tasks. As new programs are announced, TSRs are rewritten to accommodate them. There is some give and take, of course. *XyWrite*, for example, is being changed to eliminate its nonstandard keyboard handling so it will work with TSRs other than the exceptionally tricky *SideKick*. Many of the TSR companies are in close contact to determine and fix compatibility problems.

The Microsoft proposal, if generally accepted by the industry, will be a single step forward. It will take the responsibility of choosing the best loading order off your hands and will simplify the unloading issue. But the software industry is built on evolution and refinements—not breakthroughs. The proposed compatibility standard is no exception. It will outlaw particularly intractable programming techniques, but it will primarily make it easier for TSRs to detect each other's presence in order to know when to use particular fixes for known interactions with other TSRs.

If a multitasking version of DOS or windowing/multitasking software such as *Microsoft Windows*, *TopView*, and *Desqview* ever become very popular, you might see a new breed of small software tools similar to the pop-up calculators, datebooks, and auto-dialers, but without the complicated and trouble-prone memory-resident mechanisms. You would simply run each tool in a separate window and use the multitasking package to switch to the tools as you need them. TSRs offer at least one advantage over a multitasking system: Multitasking systems divide the computer's time among all the jobs and slow each one. A TSR does not slow the system until you activate the TSR; it then halts the computer's other tasks altogether, which is preferable to a continual slowdown.

TSRs are often small and inexpensive; they have to sell in quantity to make a profit. As long as multitasking is limited to a small segment of "power users," the emphasis will remain on the stand-alone TSRs that can be used with or without windowing software.

Test programs before you buy them. Test them with the other software you use, including device drivers for your special video board, RAM disk, and print spooler. Try various loading orders and popping

up one program inside another. Try defining macros inside a memory-resident desk utility or spelling checker and invoking the TSRs from within your word processing and telecommunications programs. Try anything else you are likely to do with the programs.

If you already have RAM-resident software, take the time to make sure that the versions you have are reasonably current. Ask the manufacturer if the changes since your version are likely to affect compatibility with the other software you use. An update is generally a good investment for many reasons, only one of which is compatibility.

Take heart. Many TSR combinations work well or have minor inconsistencies (see Table 2). If you consider compatibility an achievement rather than an assumption, you're less likely to be a victim of the battle for the background.

Bruce Owen, an archaeology student at UCLA, has written documentation for Tall Tree Systems and DataVision.

1-2-3
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
800/343-5414, 617/253-9150
List price: $495
Requirements: 192K, two disk drives
Copy protected

dBASE III
Ashton-Tate
20101 Hamilton Ave.
Torrance, CA 90502-1319
213/329-8000
List price: $695
Requirements: 256K, two disk drives, DOS 2.00 or later version
Copy protected

Desqview
Quarterdeck Offices Systems
150 Pico Blvd.
Santa Monica, CA 90405
213/392-9851
List price: $99.95
Requirements: 128K, one disk drive, DOS 2.00 or later version
Not copy protected

Enable
The Software Group
Northway 10 Executive Park
Ballston Lake, NY 12019
800/932-0233, 800/338-4646 New York
List price: $695
Requirements: 256K, two disk drives, DOS 2.00 or later version
Not copy protected

Framework
Ashton-Tate
List price: $695
Requirements: 256K, two disk drives, DOS 2.00 or later version
Copy protected

Jetdrive
Tall Tree Systems
1120 San Antonio Rd.
Palo Alto, CA 94303
415/964-1980
List price: $60

Keyworks 2.0
Alpha Software
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800/451-1018, 617/229-2924
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Microsoft Windows
Microsoft Corp.
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Bellevue, WA 98073-9717
206/882-8080

(continues)

List price: $99.95
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Microsoft Word 2.0
Microsoft Corp.
List price: $395
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PolyWindows DeskPlus
Polytron Corp.
P.O. Box 787
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PopUp DeskSet
Popular Programs, Inc.
135 Lake St. #180
Kirkland, WA 98033
206/822-7065
List price: $69.95
Requirements: 128K, one disk drive, DOS 1.10 or later version, Hayes-compatible modem for auto-dial
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ProKey 4.0
RoseSoft
P.O. Box 45880
Seattle, WA 98145
206/282-0454
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Ready
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2432 Charleston Rd.
Mountain View, CA 94043
415/964-6300
List price: $99.95
Requirements: 128K, one disk drive, DOS 2.00 or later version
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SideKick
Borland Int'l
4113 Scotts Valley Dr.
Scotts Valley, CA 95066
408/438-8400
List price: copy protected $54.95, not copy protected $84.95
Requirements: 128K, one disk drive, Hayes-compatible modem for auto-dial

SmartKey 5.0
Software Research Technologies
3757 Wilshire Blvd. #211
Los Angeles, CA 90010
213/384-4120
List price: $49.95
Requirements: 64K, one disk drive, DOS 2.10 or later version
Not copy protected

Spotlight 1.1
Lotus Development Corp.
List price: $150
Requirements: 128K, one disk drive, Hayes-compatible modem for auto-dial
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SuperKey 1.11a
Borland Int'l
List price: $69.95
Requirements: 128K, one disk drive, DOS 1.10 or later version
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SuperPak 5.02 (includes SuperDrive, SuperSpool)
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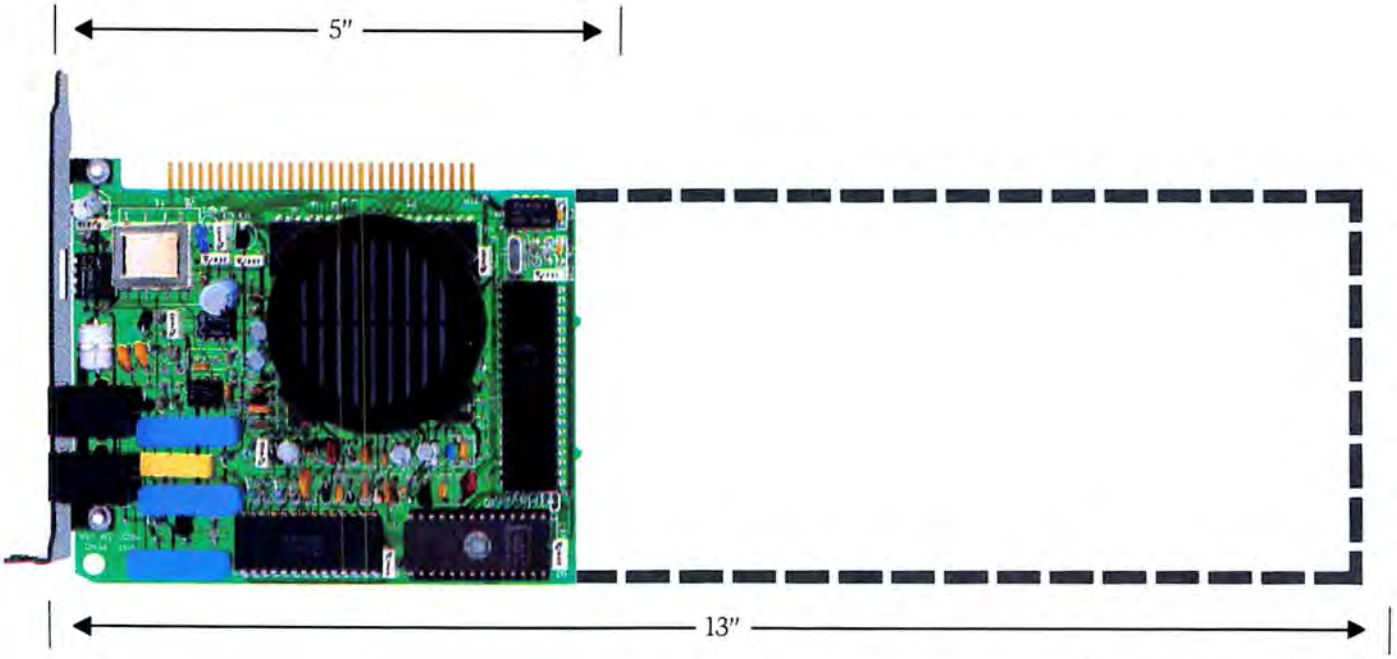

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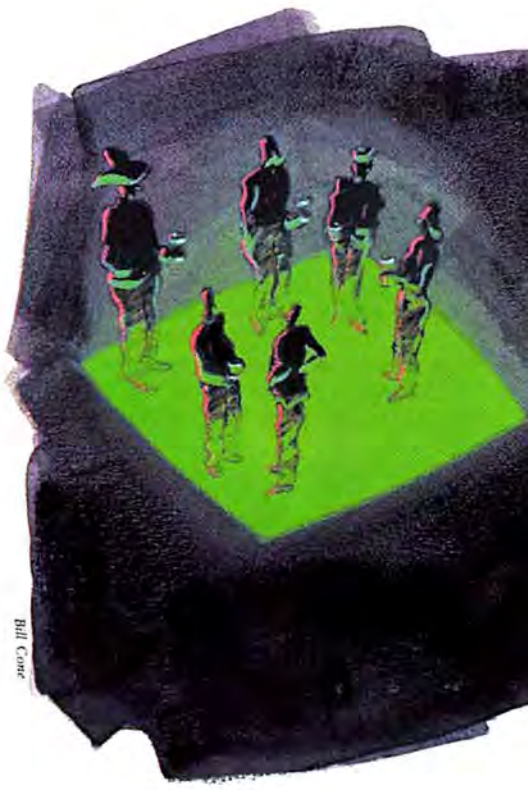
Information and insights on the PC communications marketplace

This month:
On-line party time at People/Link, Microcom and DCA battle it out beyond 18,000 bps, Hayes' synchronous gambit, and Microstuf's legal war against clones

Edited by Eric Brown

On Line

People/Link: The Ultimate CB


Bill Cone

I was full of the kinds of stories one brings back from vacation. I had carried on all-night conversations with dozens of colorful characters with exotic names. I had been invited to parties in far-flung locales. I had even picked up some of the lingua franca (*OIC* stands for *Oh, I see,* and *Morf* for *Are you male or female?*). In short, I had laughed a lot and forgotten about the time.

I hadn't been on vacation though. I'd spent the past few hours exploring People/Link, American Home Network's online entertainment network, and it was nearly as much fun as pulling out the suitcase and heading to the local aerodrome.

The brainchild of Chicago video-arcade moguls Jules and Merrill Millman, People/Link might be better called PartyNet, and so it was at one time. The network caters to PC users who want more from their modems than the latest financial news or the satisfaction of a completed patent search.

Among People/Link's offerings are regular "happy hours" with reduced connect rates, and an assortment of bulletin boards and special interest clubs focusing on topics like science fiction, sports trivia, home video, health, and political debate. But the network's main attraction is its *partylines.* Here computer users chat with others around the country in a computerized version of citizens band (CB) radio. You can adopt a fantasy *handle* (name) and start keying in text, as you watch the conversation scroll down the screen like the script of a play.

The system supports 100 partylines, and up to 30 users can participate in public discourse on each. They can join the street-market hullabaloo of the public channels, make confidential asides, or engage in private one-to-one conversations.

Computer CB services like this are nothing new; they're available on other networks, most notably CompuServe. So what makes People/Link so special? For one, the bargain-basement rates. At $3.95 an hour for 300-bits-per-second (bps) access on evenings and weekends (including Tymnet or Telenet charges), People/Link might well be called the People

(continues)

Diary of an

I traded my 16K machine and all those disks for Lotus® 1-2-3 and 256K. And immediately got the urge to merge. I started by merging regional statements in Maine. But before I could get to Iowa, I ran out of gas.

At 512K, I discovered what the coordinates IV169 looked like. I was so far out there it felt like I was walking on the moon. It didn't take long to find out 512K was nothing more than a walk around the block.

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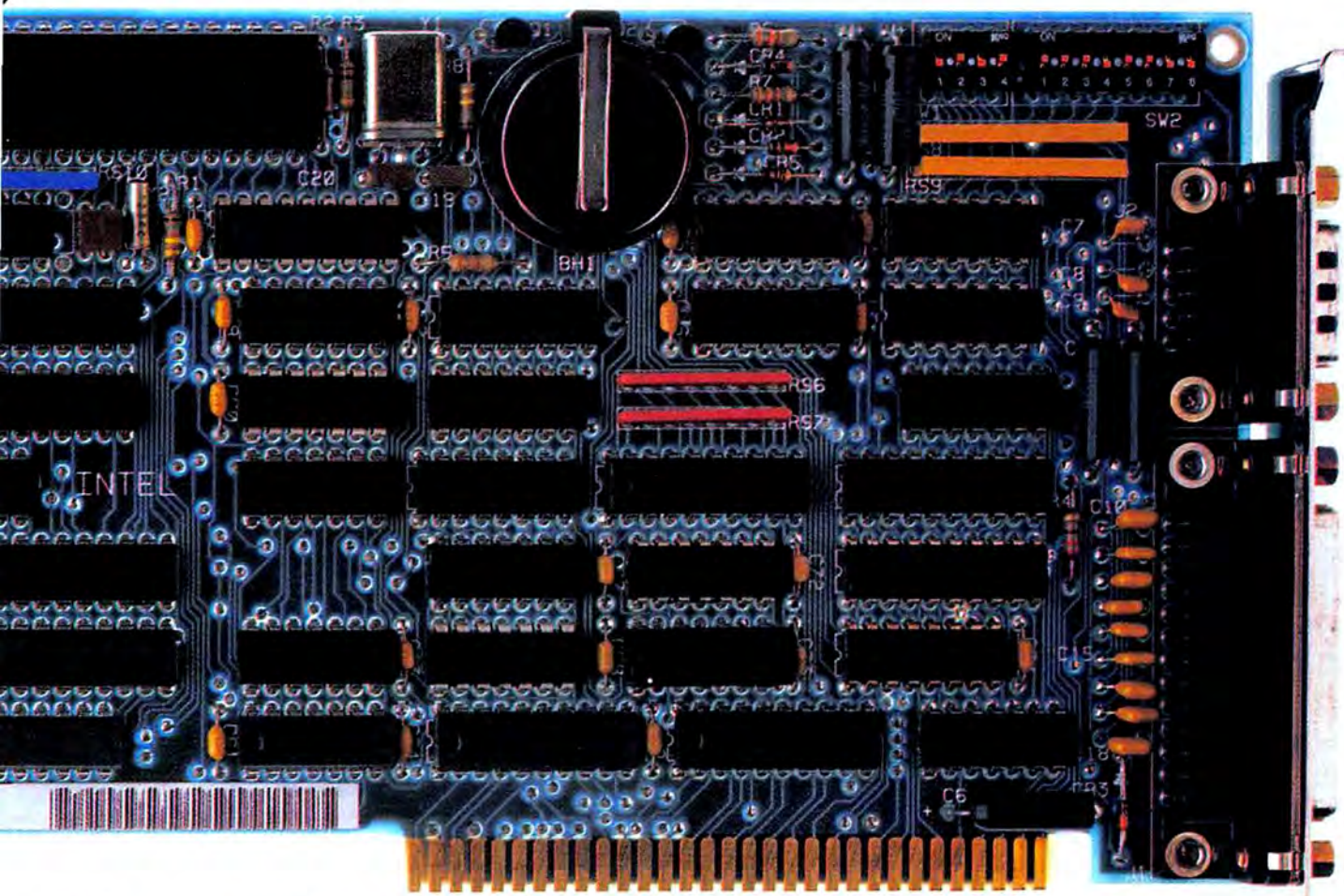

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Express of on-line services. The system is designed so that users don't waste connect time scrolling through extraneous menus and bulletins. They can log on and go straight to the partylines.

According to George Spink, spokesperson for the network, "The appeal of People/Link is very specific compared to The Source or CompuServe." It's designed, he says, for people whose main interest is communicating and meeting others rather than accessing monolithic data banks.

My time on the network certainly confirmed that assessment. After only a few hours I had befriended an army sergeant in Augusta, Georgia, who repaired remote satellite receptors; a Texas rancher; the publisher of a nautical antiques magazine; and a female "Captain Crunch." Once, I logged on at 4 a.m. and discovered dozens of CBers on both coasts who'd been going at it all night. Another time, I dropped by shortly after dawn and found users popping in just to say hello to the crowd before heading off to work.

Fascinating, I thought. Equally fascinating was the devotion expressed by so many of the customers. Several professed to racking up monthly People/Link charges in the 4-digit range—this in spite of the low rates. More than a few were former CompuServe users who, for one reason or another—and not necessarily CompuServe's lofty prices—bore well-entrenched enmity toward that network's CB channels. Some felt that CompuServe's popularity had attracted a few bad apples, causing the service to degenerate into a venue for pornographic solicitations and leading to censorship. People/Link, users claim, is self-policing, and the conversation is more stimulating.

People/Link is little more than a year old, boasting a mere 5000

(continues)

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subscribers and only one local direct-access node. But in that short span of time, the network has come a long way, polishing its software and better aligning itself with its audience. When the Millman brothers first launched the network in late 1984, they intended it as a low-cost entertainment net for teenage computer users. Before long, however, they realized People/Link was attracting an almost entirely adult crowd. Also, People/Link's appeal as a social spot meant that while the network's use was heaviest in the evening hours, it was a virtual wasteland during the day.

To populate its lines during the 9-to-5 hours, People/Link recently embarked on a campaign to sell itself to the corporate crowd. The idea is to woo businesses by offering cut-rate use of the network for private teleconferencing and the lowest-priced electronic mail service you can find—you're charged only for connect time. At this writing, American Home Network has had only three takers for its teleconferencing service. People/Link's electronic mail has shown more promise and may well be the element that brings the pinstriped persona to a network whose strong suit has been superficial late-night chatter.

Besides being cheap, the E-mail service is one of the easiest imaginable electronic mail systems—completely menu-driven, with an advanced mode that can be switched on or off at almost any prompt. Plus, it's equipped with a feature few E-mail systems can boast: the ability to receive binary and data files of up to 192K via XMODEM.

For example, users can transmit *1-2-3* spreadsheets through People/Link without first converting them to .DIF files. Other files similarly embedded with program codes or nonstandard high-bit characters can also be uploaded, mailed, and received. The mail system is not without flaws. It occasionally loses large chunks of letters and sometimes alternates between single- and double-spacing during

(continues)

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XMODEM transfers. However, if the Millman brothers manage to smooth these rough edges, the XMODEM feature could be the right ticket for attracting the business crowd. Meanwhile, People/Link continues to gain a reputation as *the* place to be for the late-night on-line crowd. *–Judy Getts*

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Start Bit

Modems Move Past 18,000 bps

Last summer, when a joint venture of Telebit and Digital Communications Associates (DCA) unveiled a 10,000-bps asynchronous modem called the IRMA Fastlink (or Trailblazer, if you buy from Telebit), the personal computer world responded with accolades. Communications vendors hustled to modify their software for this new miracle modem (see *Password: Communicate, PCW,* November 1985 for a look at the Fastlink's unique technology).

But it wasn't long before the Fastlink/Trailblazer's speed record was broken. Earlier this year, Microcom announced its AX9624C modem, which reportedly runs at 19,200 bps under ideal conditions. Technically, the AX9624C doesn't transmit data at that remarkable rate but depends on built-in data compression algorithms to achieve a virtual throughput of 19,200 bps.

(continues)

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Throughput is also boosted by means of Microcom's adaptive packet assembly technology, which adjusts the size of packets depending on the amount and direction of data being sent at any given time. The modem also incorporates an advanced version (Class 6) of Microcom's MNP error-checking protocol to ensure data integrity.

Not to be counted out, the DCA/Telebit joint venture recently introduced an improved version of its Fastlink/Trailblazer modem that reportedly transmits at 18,000 bps. DCA/Telebit has also added a remote access capability so you can change Fastlink parameters from afar and has tossed in compatibility with two-wire leased lines. In addition, like Microcom's AX9624C modem, the Fastlink is now compatible with the international standards V.22 (for 1200-bps modems) and V.22bis (for 2400-bps modems). Despite these improvements, the modem's price remains the same; an upgrade kit is available for $99.

"When we first came out with the product, we knew we could do better," says Jose Porto, general manager of DCA/Telebit Data Systems. Porto estimates that although 18,000-bps transmissions can be achieved in ideal test conditions, 14,000 bps is the average speed when communicating via clean local loop lines, with 10,000 bps about par for cross-country telecommunications. Considering that previous cross-country speed averaged about 7000 bps, the Fastlink has accelerated considerably. Meanwhile, Microcom reports it has achieved 15,000 bps during cross-country transmissions with the AX9624C.

According to Porto, 23,000 bps is the theoretical limit for the current Fastlink technology, and the company will keep trying to edge up to that speed. However, claims Porto, one customer has already achieved a virtual throughput of 27,000 bps using data compression software in league with the enhanced Fastlink. That should be fast enough for just about anyone's data communications needs; but then again, PC users are greedy for speed. Anybody care to try for 30,000?

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AX9624C
Microcom
1400A Providence Highway
Norwood, MA 02062
617/762-9310
List price: $1799
Requirements: serial port

Hayes Synchronous Gambit

Recently, two quiet, synchronous bombshells were dropped in the asynchronous world of PCs: First, synchronous capabilities were added to the 2400-bps modem offerings of Cermetek, Novation, Racal-Vadic, and Hayes (see "Safe at Any Speed?" *PCW*, May 1986 for a review of some of these modems). Second, Hayes proposed a synchronous interface standard for personal computers called the Hayes Synchronous Interface, or HSI. Suddenly, synchronous communications support is popping up in an area where it was previously noted only for its absence. As Marvin Gaye crooned, what's going on?

Synchronous communications, the vehicle of choice in the mainframe world, is known for having better data efficiency and higher overall speed than its asynchronous sibling. Asynchronous modems surround each byte of data with start and stop *guard bits*, whereas synchronous modems send data in a continuous series of characters, called blocks. Special bit patterns *frame* each block of data, rather than each byte, yielding lower overhead, increased efficiency, and higher speeds.

Despite these advantages, asynchronous communications has maintained its dominance in the PC marketplace thanks to the wide adoption of standards. While the asynchronous world benefits from both hardware interface standards (IBM's asynchronous adapter board) and software standards (Hayes' ad hoc AT command set), no such standards exist in the PC synchronous environment. If vendors design a product for a popular standard, they can be fairly confident of compatibility with products from other vendors that have adopted the standard.

(continues)

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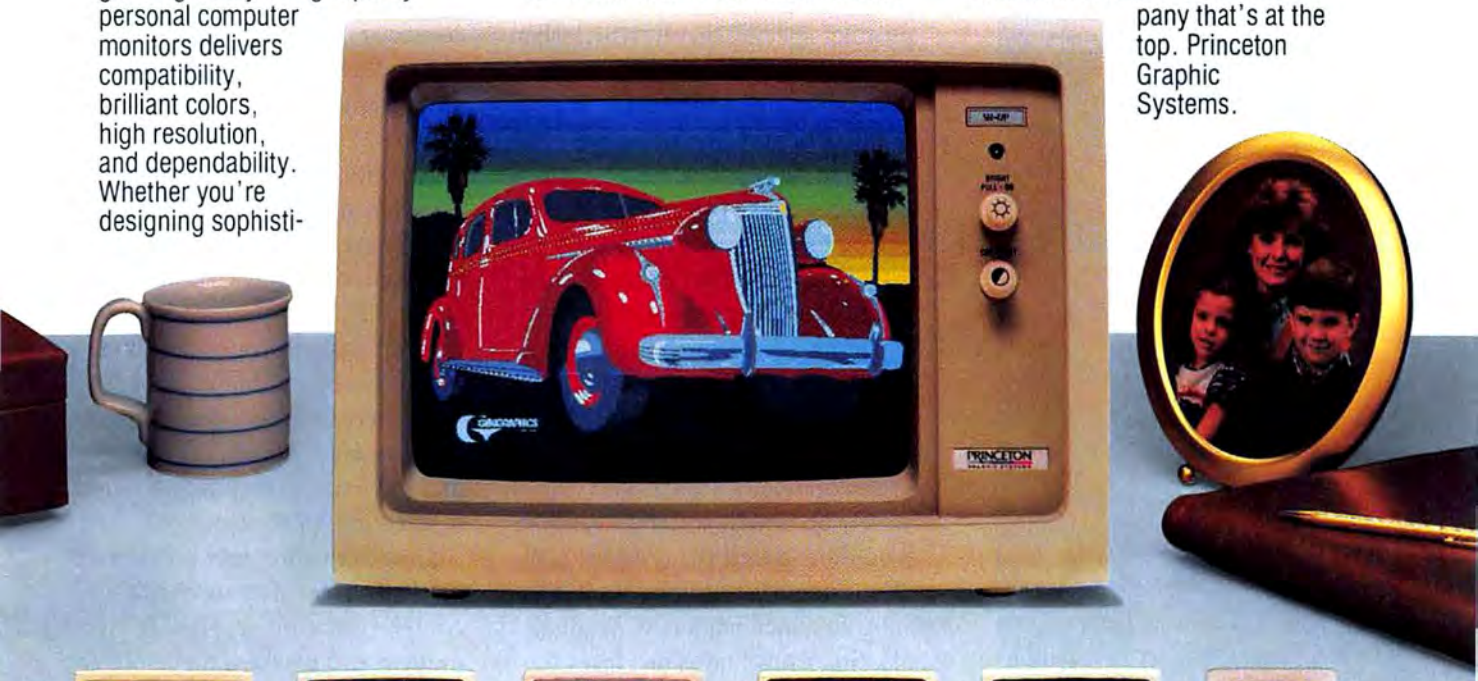

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Hayes' HSI standard is intended to fill the gap of synchronous standards, paving the way for the increased use of synchronous modems for micro-to-mainframe communications. HSI is a public domain interface specification that describes exactly how software applications should address Hayes' synchronous communications products. Taking software instructions from a communications program, HSI sends them on to a product-specific driver, which then passes them on to the hardware device, usually a modem.

In particular, the standard seems to have solved some of the problems caused by using synchronous modems over dial-up lines as opposed to the traditional leased-line environment of synchronous communications. HSI defines three different methods for dialing asynchronously and switching to synchronous mode.

Theoretically, if HSI were widely accepted, software vendors would be spared the arduous task of continually rewriting their software to match each new product offering from Hayes or Hayes-compatible manufacturers. Instead, they could simply attach to the software a specific communications driver supplied to them by Hayes.

The benefits of HSI would be that products would become compatible faster, leading to a wider choice for the end user. Hayes benefits from increased market visibility in an area only beginning to be explored by PC modem manufacturers.

Under the HSI licensing structure, Hayes will license the Hayes Synchronous Driver, or HSD, for $100 per year. The fee provides the licensee with HSD, currently designed to work with the Hayes 2400B internal modem; source code on disk; technical support by phone; documentation; and any driver updates released during that year. When Hayes releases a new product—say a 4800-bps or 9600-bps synchronous modem—the company sends the attendant driver out to its list of licensees and, presto—instant software support.

Benefits to all notwithstanding, is such a standard really necessary now? And if so, will the industry embrace the Hayes standard, a different one, or will vendors continue to design proprietary interfaces? Thanks to Hayes' HSI announcement, the synchronous controversy has been rekindled and industry leaders are no closer to agreeing on the issue.

Greg Ferguson, vice president of marketing for Microcom, the company that makes the ERA 2 modem and markets the MNP error-checking protocol, voices the apprehension of all standards promoters: "After all our MNP wars and scars, we'll probably take a wait-and-see attitude on this one. HSI has an uphill fight, because many popular products, such as DCA's IRMA, already provide synchronous interfacing. It's not likely that HSI will affect the success of those applications."

Bob Zack, vice president of corporate planning for Digital Communications Associates (DCA),

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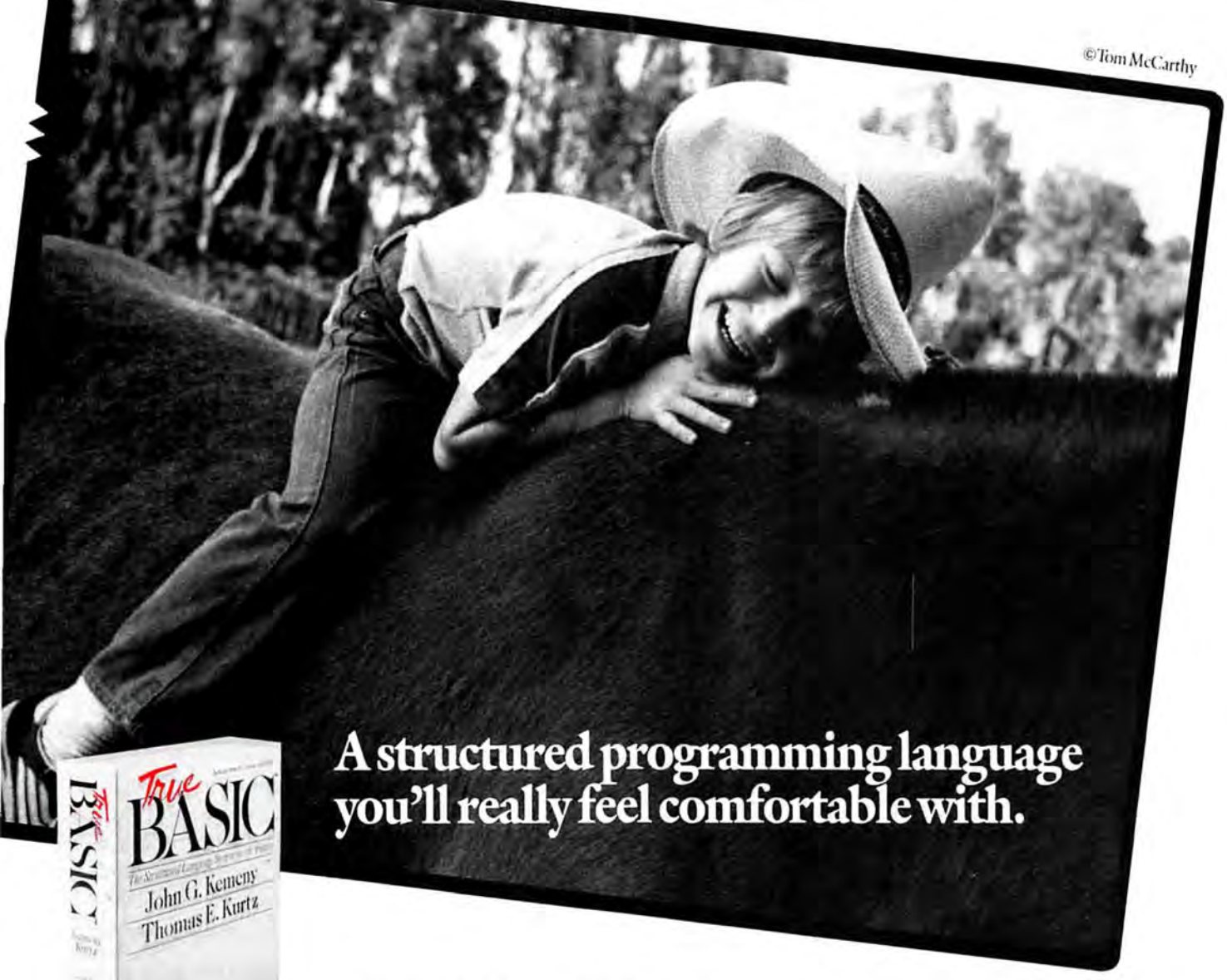

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agrees that no urgent need currently exists for HSI. "IBM already has de facto standards in place for emulation devices," says Zack, "and for our market, they seem sufficient for now." As the vendor of two leading products positioned in the micro-to-mainframe market (the popular IRMA terminal emulation board and the Fastlink 9600-bps modem), DCA has pitted itself directly against Hayes. By surprising the industry with an acceptable asynchronous solution to 9600 bps, DCA and its Fastlink may have stolen some of the thunder from Hayes' master plan for synchronous high-speed modems.

Jack Armstrong of Cullinet Software also questions the necessity for synchronous modems, noting that "most of the synchronous applications these days are hardwired directly to the mainframe." However, Armstrong points out, "If you want to go pure 3270 with a remote PC, you must have a synchronous modem."

Despite the fact that the number of remote terminals that access mainframes via synchronous modems comprises a small percentage of micro-to-mainframe communications, the overall size of that market makes synchronous modems an attractive new market niche for the 2400-bps modem vendors.

Ken Krechmer, president of Action Consulting and designer of the Popcom modem, points out that some remote locations that previously accessed mainframes over secure but expensive point-to-point leased lines may be the prime customers for the new synchronous modems. Because costs of such leased lines are skyrocketing, "low-usage locations will drop back from the leased line route and go to a dial-up synchronous access. Users such as the small travel agency or the industrial supplier that transmits purchase orders to factories will find this an attractive alternative." Krechmer also suggested that companies that use time-sharing or batch applications could be potential markets.

The incompatibility of communications software is another obstacle to switching to the synchronous approach. "Today's asynchronous software will need to be modified before it operates smoothly in synchronous mode," contends Krechmer. Yet he noted that HSI could ease the updating process.

Although the precise market for 2400-bps synchronous products remains undefined, Hayes appears committed to taking the risk. As Hayes' vice president of sales, Gary Betty, explains, "Our position has always been to provide products that create new markets and additional opportunities for communications ... and to be there with the product as the trends develop."

Whether the HSI standard will float is uncertain, but because of Hayes' market clout and an increase in remote micro-to-mainframe links, synchronous communications will no doubt become a greater force in the PC marketplace. *–Art Wilcox*

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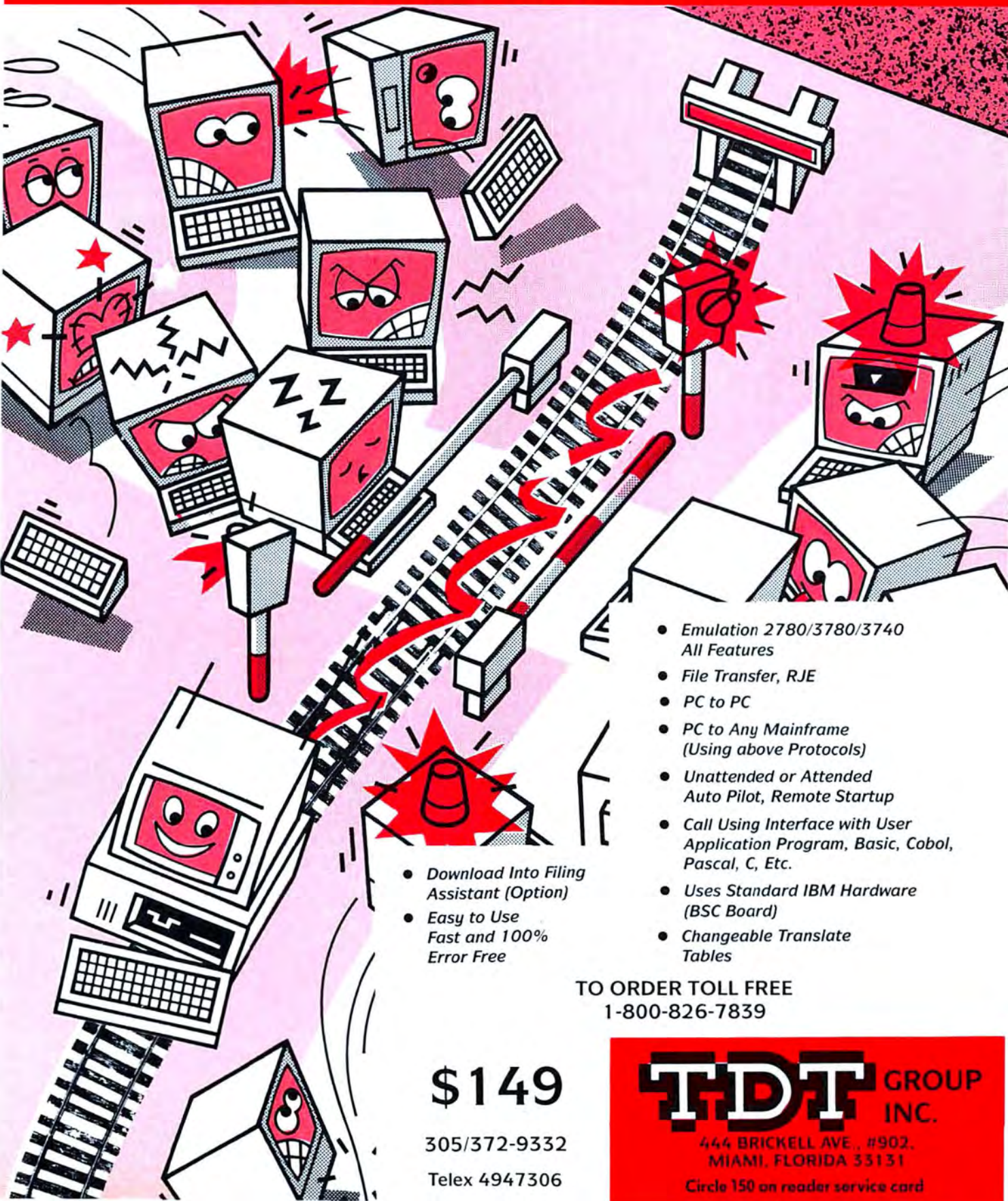

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While you may well question the suitability of the David-and-Goliath metaphor (after all, it's debatable which developer is further removed from the days of garage-shop R&D), indications are that the wrangle may develop into the software battle royal of the season. Not since Apple slapped down Digital Research last year over the look and feel of *GEM*'s user interface has there been such a legal fuss in the land of PCs (see *PC World View*, *PCW*, February 1986).

SoftKlone has been peddling a $49.95 look-alike of Microstuf's $195 best-selling communications program, *Crosstalk XVI*. The SoftKlone product, *Mirror*, is ad-

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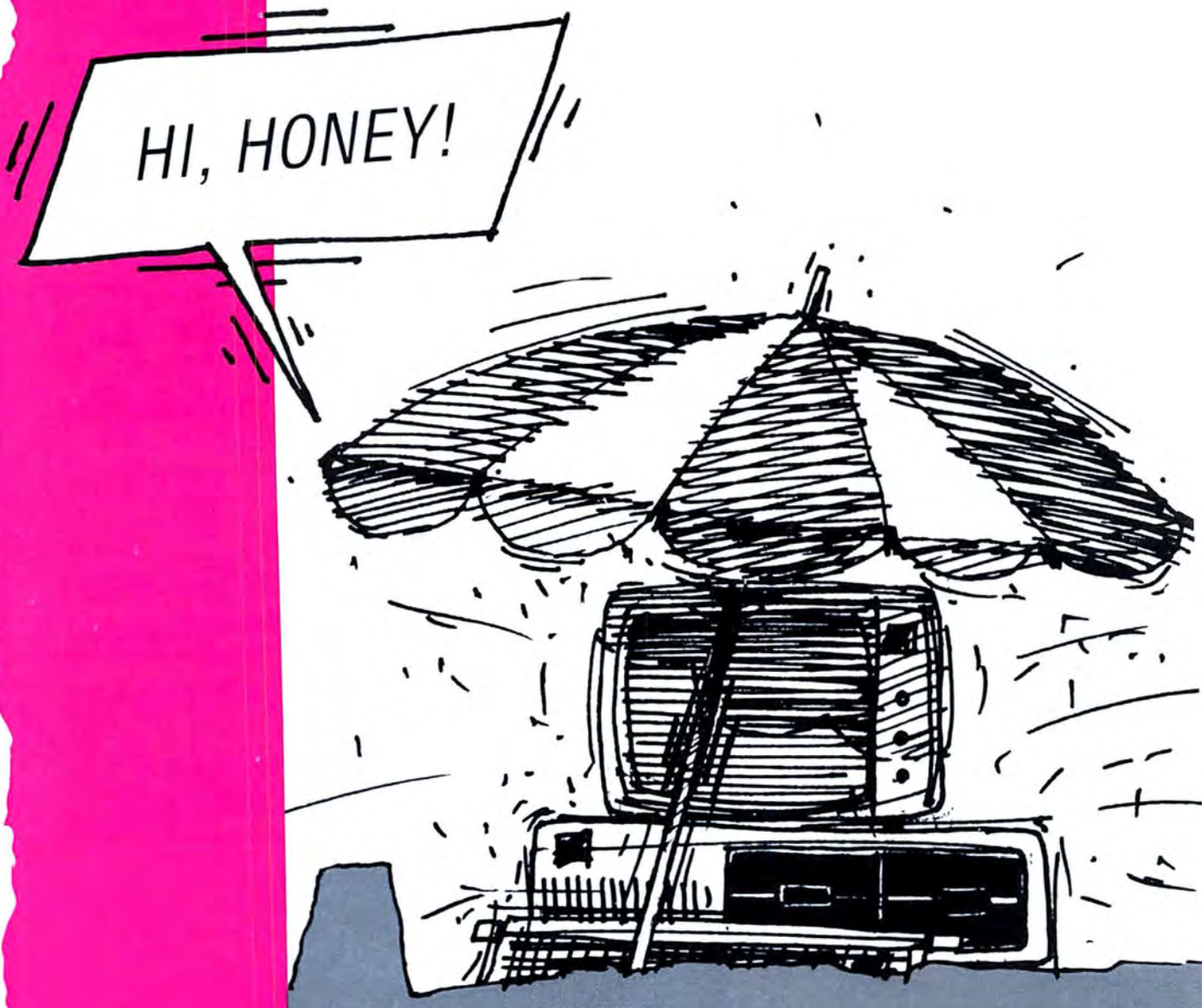

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Microstuf responded last January with a multipronged suit charging SoftKlone with copyright infringement on two of *Crosstalk*'s screen displays and the screens' underlying source code, in addition to unfair and deceptive use of the company's registered trademarks and *Crosstalk* logo in advertising for *Mirror*. According to Microstuf attorney Stan Birch, whose law firm handled the copyright litigation for Coleco Industries' Cabbage Patch Kids, Microstuf is seeking $1 million in punitive damages—an amount four times SoftKlone's gross profits from *Mirror* sales—attorney fees and court costs, and a permanent injunction barring the sale and distribution of *Mirror*. Birch says that if the suit is successful, Microstuf will follow up with similar suits against SoftKlone's parent company, Foretec, plus individual suits against all of Foretec's officers and some of its employees.

"You call this nasty?" says Pete Tanzy, corporate counsel for SoftKlone. "They began, not by contacting us, but by serving us with papers."

Stunned but still moving, SoftKlone charged the U.S. Copyright Office with fraud for having granted Microstuf copyrights on the two disputed *Crosstalk* screens, namely the status screens displaying a list of commands in a window at the bottom (see

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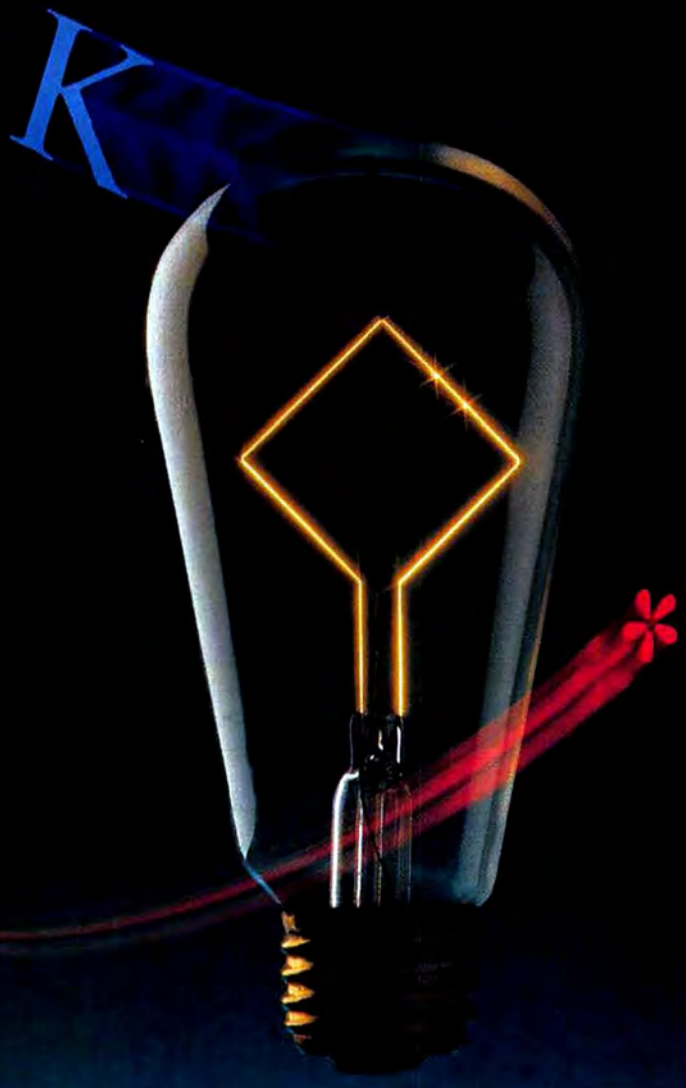

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Circle 265 on reader service card

Screen 1: Can you copyright a screen? One of two Crosstalk status display screens showing help commands.

Screens 1 and 2). SoftKlone maintains such screens occupy the legal hemisphere of business forms and thus cannot legally be granted a copyright.

"There's a big question mark right now on whether you can copyright screen formats," says Michael Scott, executive director of the Center for Computer/Law in Manhattan Beach, California. He explains that the ability to copyright any graphic work hinges upon the degree to which it can be considered a creative rather than a utilitarian expression. For example, the layout of bank checks cannot be copyrighted, but the artwork embellishing them can.

A correlate to this is the inability to copyright anything that can be expressed in only a limited number of ways. Directions on how to heat a microwave dinner or tear off and mail in the stub on a water bill are two examples. Plain vanilla program menus are another. Protecting such things with copyrights, says Scott, "would permit the copyright holder to monopolize the underlying idea."

Carey Heckman, a computer law specialist with the law firm Ware & Freidenrich in Palo Alto, California, says, "I'm not at all comfortable with the idea of the law providing that degree of protection. Consider the spreadsheet metaphor. If we'd had a doctrine like this at the time of *VisiCalc*, we'd all still be using Apple IIs."

In response, Microstuf's Birch says that the *Crosstalk* screens

(continues)

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Case in point. The formidable 24-pin Brother 2024L. It sets a new pace by marrying the speed and graphic capabilities of a dot matrix printer to letter quality printing that, at 96 cps, is two to three times faster than any daisy wheel. At 160 cps, drafts are faster still.

But that's not the half of it. The 2024L comes with four typefaces and the ability to add virtually any other fonts available. It handles a host of versatile print functions. And it profits from a buffer memory plus built-in tractor and optional cut-sheet feeders. With either parallel or serial interfaces, it works with almost every system made. And it helps keep the office blessedly quiet.

Of course, maybe you don't need a printer like the 2024L. But even on a shoe-string budget, you net many of its best features.

The compact Brother M-1509 sizzles with bi-directional printing at a racy 180 cps for drafts...45cps for near letter quality. It credits both serial and parallel interfaces to its features. And, along with most of the 2024L's print functions, it's equipped with a one-inch paper cut function to save paper and a buffer memory to save time.

And if your budget's even less than a shoe-string, the new Brother M-1109 is for you. Its standard features include both a friction-feed platen and a built-in tractor feed. Like the M-1509, it has dual interfaces and a spectrum of print options. All of which adds up to big system advantages at a small system price.

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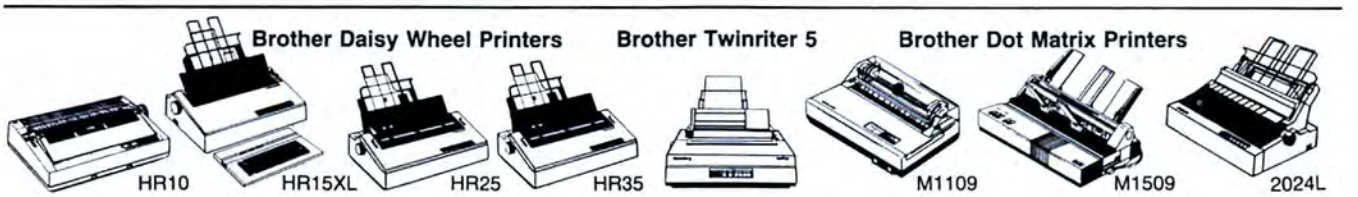

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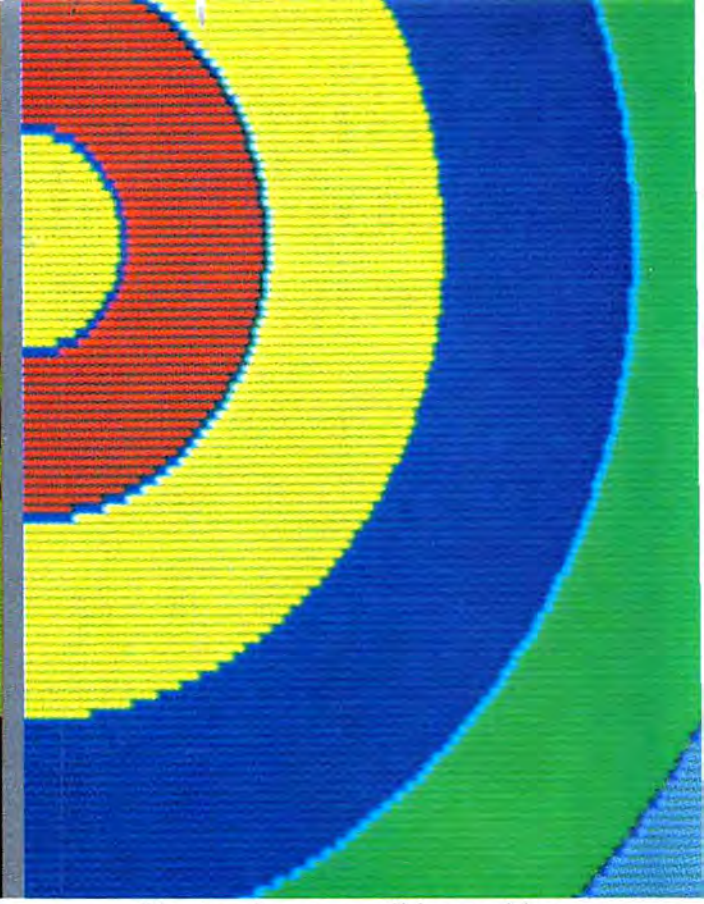

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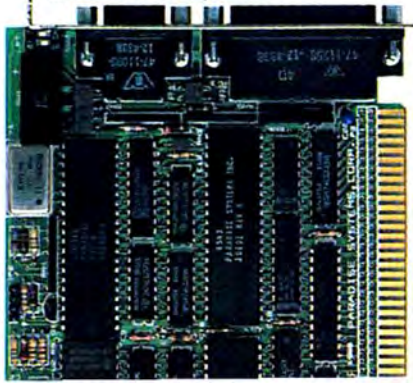

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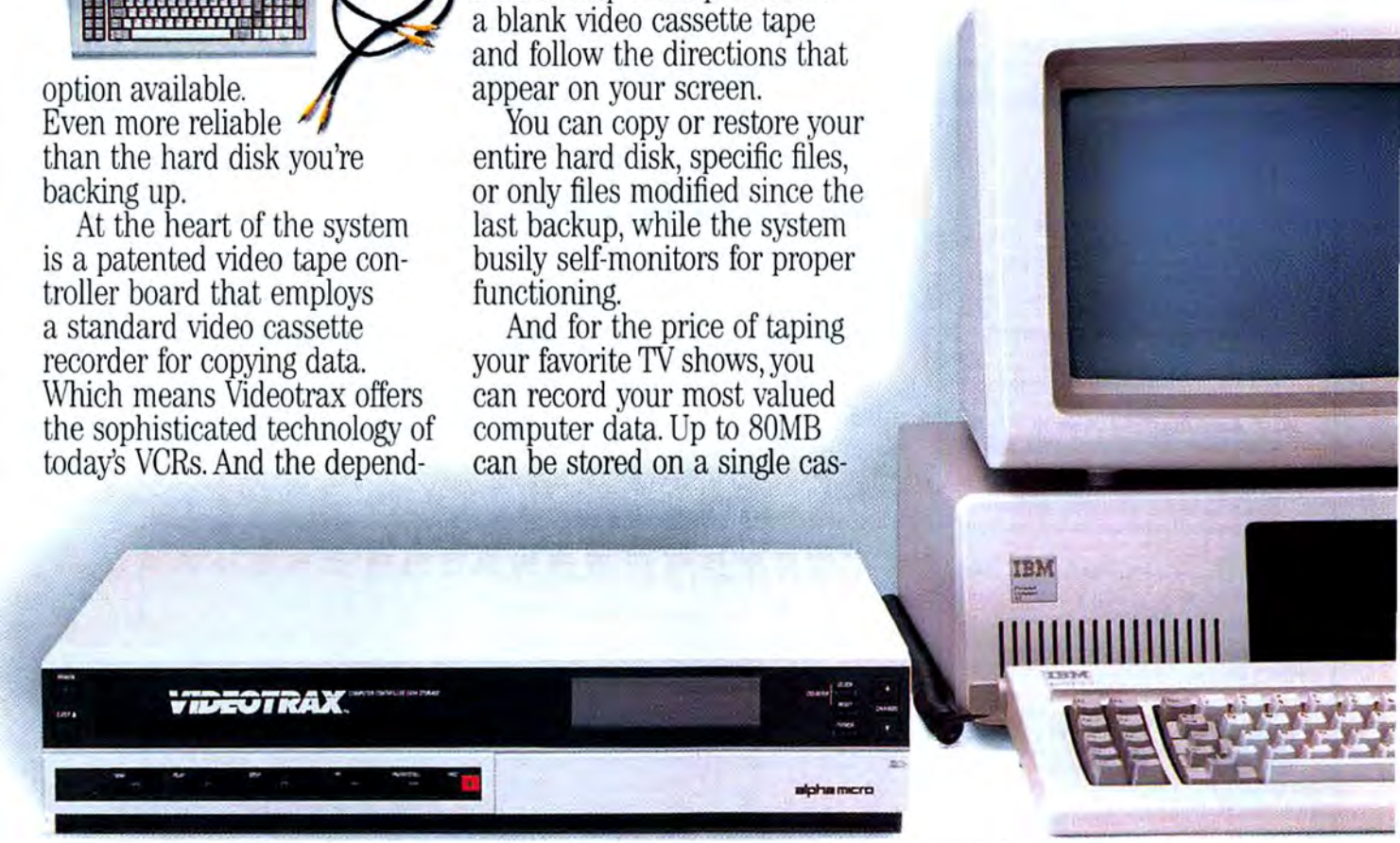

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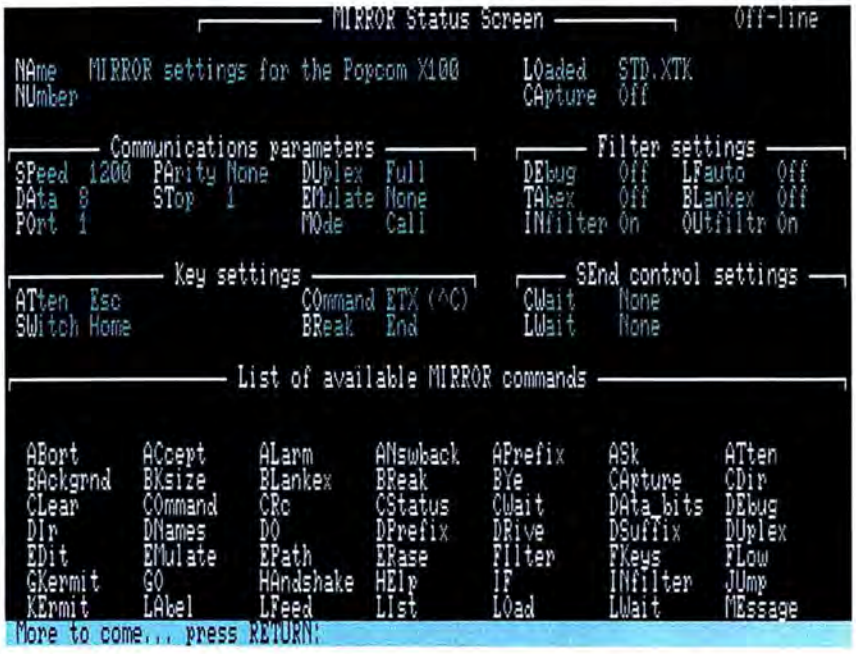

Screen 2: Mirror's imitative status display screen, which is the key to Microstuf's suit

have been designed with "painstaking care" by a human factors engineer. "Every component of the screen—the linear patterns, the arrangement of commands in groups of five and seven—has been arranged specifically to allow the user to feel comfortable with the program." He adds, "There are at least 15 communications programs out there, and their screens are all different. The function of the program does not dictate what screen display must be set up."

One thing all the lawyers queried agree on is that if SoftKlone had used some restraint in its design and promotion of *Mirror*, toning down its ads in which the *Crosstalk* logo was emblazoned across the top, taking fewer swipes at Microstuf in its documentation, and, on the whole being less blatant about the product's imitative aspect, Microstuf might not have unleashed such winds of legal fury.

But then, as Tanzy of SoftKlone says, "This is definitely a David-and-Goliath situation." *–Judy Getts*

Judy Getts is a freelance science writer. Art Wilcox is a Contributing Editor for PC World.

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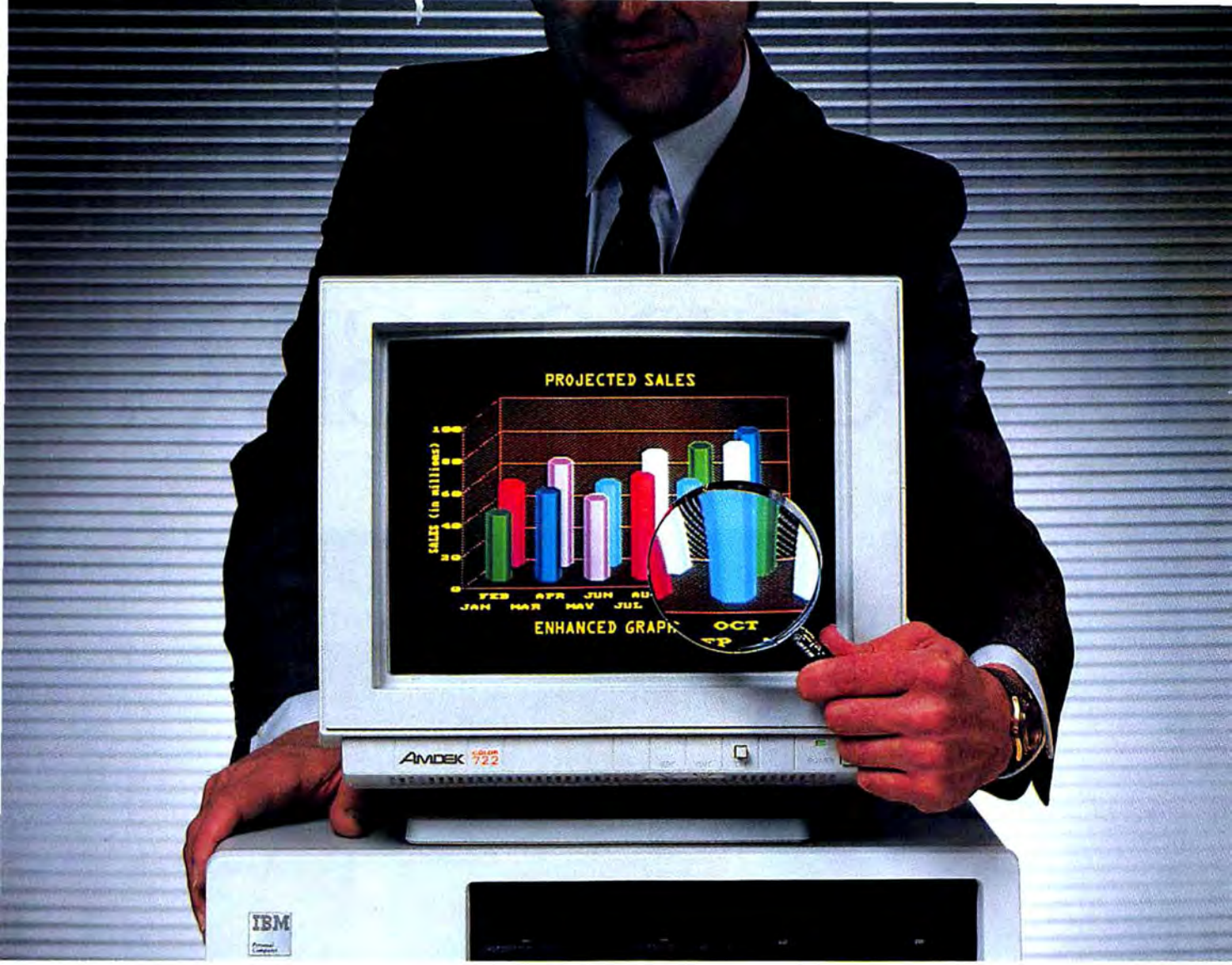

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When every bit counts, it's Super Star®!

Nearly a million Super Star® diskettes a month are being sold to some of the largest and most recognizable names in the nation. They love 'em, because they save money...and they are dependable.

So now is the time for you to re-discover Super Star® diskettes.

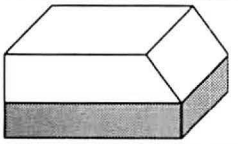
And we say "re-discover" for a reason.

You've already used Super Star!

Super Star® diskettes, as noted, are made by some of America's leading diskette manufacturers...and the odds are that you've already used them more than once as the copy-protected masters on some of the best known software programs around.

So, when you want the best...and the least expensive best...order Super Star®!

SUPER STAR SPECIAL!
Your choice of storage at $ 4.95!



Buy 50 Super Star® diskettes and get a storage case for only $ 4.95 (shipping included)!

These are durable plastic cases with dividers and are very nice units.

The 5.25" unit holds 50 diskettes and the 3.50" unit holds 40 diskettes.

5.25" Storage Case(P/N3100)..$ 4.95 ea.
3.50" Storage Case (P/N 3102).$ 4.95 ea.

What the world needs now is a complete line of high quality, inexpensive diskettes with a LIFETIME WARRANTY!

And DISK WORLD! has them!

Super Star 5.25" Diskettes

5.25" SSDD	(P/N 3800)	.55 ea.
5.25" DSDD	(P/N 3801)	.64 ea.
5.25" SSDD-96TPI	(P/N 3802)	.80 ea.
5.25" DSDD-96TPI	(P/N 3803)	.84 ea.
5.25" DSDD-HD	(P/N 3804)	$ 1.72 ea.

ORDER IN MULTIPLES OF 50 ONLY!

All Super Star 5.25" Diskettes are poly-bagged in lots of 25 with sleeves, write-protect tabs and user ID labels.

QUANTITY DISCOUNTS: 350-500 diskettes, deduct 3%. 500-700 diskettes, deduct 6%. 750-1,000 diskettes, deduct 9%. 1,000+ diskettes, deduct 12%.

Super Star 3.50" Diskettes

3.50" SSDD	(P/N 3805)	$ 1.52 ea.
3.50" DSDD	(P/N 3806)	$ 1.86 ea.

ORDER IN MULTIPLES OF 50 ONLY!

Super Star 3.50" diskettes are packaged in boxes of 50 with user ID labels.

QUANTITY DISCOUNTS: 350-500 diskettes, deduct 1.5%. 500-700 diskettes, deduct 3%. 750-1,000 diskettes, deduct 4.5%. 1,000+ diskettes, deduct 6%.

The Super Star LIFETIME WARRANTY!

Super Star Diskettes are unconditionally warranted against defects in original material so long as owned by the original purchaser. Returns are simple: just send the defective diskettes with proof of purchase, postage-paid by you, with a short explanation of the problem and we'll send you replacements.(Incidentally, coffee stained diskettes or diskettes with staples driven through them or otherwise damaged don't qualify as defective.)

HOURS:
8AM-6PM Central Time
Monday - Friday

WE WILL MEET OR BEAT ANY NATIONALLY ADVERTISED PRICE ON THE SAME PRODUCTS AND QUANTITIES SUBJECT TO THE SAME TERMS AND CONDITIONS.

HOW TO ORDER:

ORDERS ONLY:
1-800-621-6827
(In Illinois: 1-312-256-7140)

INQUIRIES:
1-312-256-7140

FOR FASTEST SERVICE, USE NO -COST MCI MAIL. Our address is DISKORDER. It's a FREE ,MCI MAIL letter. No charge to you. (Situation permitting, we'll ship these orders in 24 hours or less.)

SHIPPING: 5.25" & 3.50" DISKETTES-Add $ 3.00 per each 100 or fewer diskettes. **OTHER ITEMS:** Add shipping charges as shown in addition to other shipping charges. **PAYMENT:** VISA, MASTERCARD and Prepaid orders accepted. **COD ORDERS:** Add $ 5.00 special handling charge. **APO, FPO, AK, HI & PR ORDERS:** Include shipping charges as shown and additional 5% of total order amount to cover PAL and insurance. We ship only to United States addresses, except as shown above. **TAXES:** Illinois residents add 7% sales tax.

MINIMUM ORDER: $ 35.00

DISK WORLD!, Inc.

629 Green Bay Road
Wilmette, Illinois 60091

Circle 780 on reader service card

The Greatest buy on BASF Qualimetric Diskettes!

.79 Ea. Qty. 50 5.25"SSDD — **.90** Ea. Qty. 50 5.25"DSDD

Packaged in boxes of 10 with Tyvec sleeves, user ID labels and write-protect tabs.

LIFTEIME WARRANTY!

	Qty. 20-40:	Qty. 50+:
5.25"SSDD(P/N3406)	.81	.79
5.25"DSDD(P/N3407)	.92	.90
5.25"SSDD-96TPI(P/N3404)	.92	.90
5.25"DSDD-96TPI(P/N3405)	1.03	1.01
5.25"DSDD-HD(P/N3403)	2.07	2.04
3.50"SSDD-135TPI(P/N3402)	1.85	1.82
3.50"DSDD-135TPI(P/N3412)	2.41	2.37

FOR ORDERS ONLY: 1-800-621-6827 (In Illinois: 1-312-256-7140)
INFORMATION & INQUIRIES: 1-312-256-7140

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DISK WORLD!

KODAK DISKETTES:
Discover the future today!

.92 Ea. Qty. 100 5.25"SSDD — **1.13** Ea. Qty. 100 5.25"DSDD

LIFETIME WARRANTY!	Qty. 20-40:	Qty. 50:
5.25"SSDD(P/N4200)	1.03	1.00
5.25"DSDD(P/N4201)	1.23	1.21
5.25"SSDD-96TPI	N/A	N/A
5.25"DSDD-96TPI	N/A	N/A
5.25"DSDD-HD(P/N4202)	2.35	2.31
3.50"SSDD-135TPI(P/N4206)	1.87	1.84
3.50"DSDD-135TPI(P/N4207)	2.46	2.42

BULK 5.25" DISKETTES!
(Packaged in boxes of 100 with Tyvec sleeves, user ID labels and write-protect tabs.)

5.25"SSDD(P/N4203)	.92
5.25DSDD(P/N4204)	1.13

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INFORMATION & INQUIRIES: 1-312-256-7140

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DISK WORLD!, Inc.
629 Green Bay Rd. • Wilmette, Illinois 60091

DISK WORLD!

3M Diskettes at the lowest prices ever!

.78 EA. <- 5.25"SSDD(P/N1000) Qty.50+
5.25"DSDD(P/N1004)-> **1.10** EA. Qty.50+

LIFETIME WARRANTY!
Packed in boxes of 10 with User ID labels and write-protect labels.

	Qty. 20-40:	Qty. 50+:
5.25"SSDD(P/N1000)	.81	.78
5.25"DSDD(P/N1004)	1.13	1.10
5.25"SSDD-96TPI(P/N1008)	1.58	1.53
5.25"DSDD-96TPI(P/N1011)	1.98	1.93
5.25"DSDD-HD(P/N1040)	2.30	2.24
3.50"SSDD-135TPI(P/N1039)	1.58	1.53
3.50"DSDD-135TPI(P/N1046)	2.23	2.17
8.00"SSSD w/WP(P/N1020)	1.54	1.52
8.00"SSDD w/WP(P/N1025)	1.89	1.86
8.00"DSDD w/WP(P/N1030)	2.12	2.06

DATA CARTRIDGES:
(Sold 10 to a carton only.)
(Add $ 5.00 shipping charges for cartridges.)

DC100(P/N1041)	12.62	12.40
DC300XLP(P/N1042)	19.38	19.04
DC600A(P/N1043)	21.45	20.89

DISK WORLD!

BASF Qualimetric Diskettes in Bulk.

.72 Ea. Qty.150 5.25"SSDD — **.83** Ea. Qty.150 5.25"DSDD

Save a lot of money by buying **BASF QUALIMETRIC** diskettes in bulk. Packed in cartons of 150 diskettes with Tyvec sleeves, User ID labels and write-protect tabs. **LIFETIME WARRANTY!**

	Qty. 150+:
5.25"SSDD(P/N3408)	.72
5.25"DSDD(P/N3409)	.83
5.25"SSDD-96TPI	N/A
5.25"DSDD-96TPI	N/A
5.25"DSDD-HD(P/N3410)	N/A
3.50"SSDD-135TPI(P/N3411)	1.51**
3.50"DSDD-135TPI(P/N3413)	2.05**

* Available in 250 piece cartons only.
**Available in 200 piece cartons only.

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DISK WORLD!

DISK WORLD! Ordering & Shipping Instructions

FOR FASTEST SERVICE, USE NO -COST MCI MAIL. Our address is DISKORDER. It's a FREE ,MCI MAIL letter. No charge to you. (Situation permitting, we'll ship these orders in 24 hours or less.)

SHIPPING: 5.25" & 3.50" DISKETTES-Add $ 3.00 per each 100 or fewer diskettes. **OTHER ITEMS:** Add shipping charges as shown in addition to other shipping charges. **PAYMENT:** VISA, MASTERCARD and Prepaid orders accepted. **COD ORDERS:** Add $ 5.00 special handling charge. **APO, FPO, AK, HI & PR ORDERS:** Include shipping charges as shown and additional 5% of total order amount to cover PAL and insurance. We ship only to United States addresses, except as shown above. **TAXES:** Illinois residents add 7% sales tax.

MINIMUM ORDER: $ 35.00

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DISK WORLD!

Printer Ribbons at extraordinary prices!

Brand new ribbons, manufactured to Original Equipment Manufacturer's specifications, in housings. (Not re-inked or spools only.)

LIFETIME WARRANTY!

EPSON MX-70/80(P/N2500)
$ 2.70 ea. + .25 Shpng.

EPSON MX-100(P/N2501)
$ 4.08 ea. + .25 Shpng.

Okidata Micro83(P/N2505)
$ 1.37 ea. + .25 Shpng.

Okidata Micro84(P/N2502)
$ 2.98 ea. + .25 Shpng.

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DISK WORLD!

3M Bulk Diskettes
Incredible Value!

.54 ea. DSDD
Multiples of 50 only!

These are genuine 3M diskettes as supplied to software duplicator accounts. LIFETIME WARRANTY. Tyvec sleeves included! Limited supplies, so act now!(P/N10041)

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DISK WORLD!

ATHANA DISKETTES
The great unknown!

.60 Ea. Qty. 50 5.25"SSDD — **.69** Ea. Qty. 50 5.25"DSDD

LIFETIME WARRANTY!	Qty.	Qty. 50+:
5.25"SSDD(P/N3700)	.60	
5.25"DSDD(P/N3701)	.69	
5.25"SSDD-96TPI(P/N3702)	.88	
5.25"DSDD-96TPI(P/N3703)	.92	
5.25"DSDD-HD(P/N3704)		1.79
3.50"SSDD-135TPI(P/N3705)	2.00	
3.50"DSDD-135TPI(P/N3706)	2.73	

You've used these diskettes hundreds of times as copy-protected originals on some of the most popular software packages. They're packed in polybags of 25 with Polymer-impregnated sleeves userID labels and reinforced hubs,write-protect tabs.

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DISK WORLD!

Diskette Storage Cases

AMARAY MEDIA-MATE 50:
A revolution in disk storage.
Every once in a while someone takes the simple and makes it elegant. This unit holds 50 5.25" diskettes, has grooves for stacking, inside nipples to keep diskettes from slipping and several other features. We like it. (P/N3013)
$ 9.69 ea. + $ 2.00 Shpng.

DISK MINDER II:
Low-priced, but effective storage for 75 5.25" diskettes. Smoked plastic top, beige bottom with inside dividers. (P/N2800)
$ 6.49 ea. + $ 2.00 Shpng.

DISK MINDER 36:
As above, but holds 36 3.50" diskettes. (P/N2950)
$ 6.49 ea. + $ 2.00 Shpng.

DISK CADDIES:
The original flip-up holder for 10 5.25" diskettes. Beige (P/N2200) or Grey (P/N2201)
$ 1.65 ea. + .20 Shpng.

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FREE SEMINAR SERIES

Wednesday, July 9, 11:00-11:50, Room A
PC EXPO Keynote Address
Wednesday, July 9, 12:00-12:50, Room A
Compatibility Issues in Enhancement Products
Wednesday, July 9, 12:00-12:50, Room C
Personal Computer Training in Corporate America
Wednesday, July 9, 12:00-12:50, Room D
The Information Center—A Case History
Wednesday, July 9, 12:00-12:50, Room E
Avoiding Computer Nightmares
Wednesday, July 9, 1:00-2:50, Room A
Site Licensing Panel
Wednesday, July 9, 1:00-1:50, Room C
Multi-Processor Micro-Systems Challenge Minicomputers
Wednesday, July 9, 1:00-2:50, Room D
The Direct-Sales Dilemma
Wednesday, July 9, 1:00-1:50, Room E
Purchasing Decisions Using LAN Standards and Benchmarks
Wednesday, July 9, 1:30-3:30, Room B
A Technical Presentation by IBM, for Independent Hardware and Software Developers, Concerning IBM PC Products and Enhancements
Wednesday, July 9, 2:00-2:50, Room C
Microcomputer Service and Repair
Wednesday, July 9, 2:00-2:50, Room E
Managing Personal Computing: What's Hot, What's Not
Wednesday, July 9, 3:00-4:30, Room A
Graphics: What's Now, What's Next
Wednesday, July 9, 3:00-4:30, Room C
Voice Recognition: Less Talk and More Action
Wednesday, July 9, 3:00-4:30, Room D
Choosing a Local Area Network: A Multi-Faceted Decision
Wednesday, July 9, 3:00-4:30, Room E
Issues and Alternatives of Micro-to-Mainframe Connections
Thursday, July 10, 10:00-12:30, Room B
A Technical Presentation by IBM (see Wed. July 9, 1:30)
Thursday, July 10, 11:00-12:50, Room A
Portable Computers: Solutions Finally Finding Application
Thursday, July 10, 11:00-11:50, Room C
The Role of Management in Securing Computer Systems
Thursday, July 10, 11:00-12:50, Room D
Migration Patch and Time Bombs
Thursday, July 10, 11:00-12:50, Room E
The Write Stuff: A Word processing Panel Discussion
Thursday, July 10, 12:00-12:50, Room C
Customized Microcomputer-Based Information Systems
Thursday, July 10, 1:00-2:50, Room A
Information Management for Corporate Decision Makers
Thursday, July 10, 1:00-1:50, Room C
The System/36 and Networked PCs: A Hands-On Comparison
Thursday, July 10, 1:00-2:50, Room D
Electronic Printing: A Demystifying Look at The Options
Thursday, July 10, 1:00-1:50, Room E
Forces of Change in the Microcomputer Industry
Thursday, July 10, 1:30-3:30, Room B
A Technical Presentation by IBM (see Wed. July 9, 1:30)
Thursday, July 10, 2:00-2:50, Room C
Automation of the System Development Process on the PC
Thursday, July 10, 2:00-2:50, Room E
Software Buying Plans of Corporate PC Users
Thursday, July 10, 3:00-4:30, Room A
Multi-User Systems and LANs: How They Fit Into a Company's Plans
Thursday, July 10, 3:00-4:30, Room C
Micro-to-Mainframe Communications: The Industry Catches Up
Thursday, July 10, 3:00-4:30, Room D
On-Line Meetings: A Telecommunications Application With a Competitive Edge
Thursday, July 10, 3:00-4:30, Room E
Project Management Using Microcomputers
Friday, July 10, 10:30-12:30, Room B
A Technical Presentation by IBM (see Wed. July 9, 1:30)
Friday, July 11, 11:00-11:50, Room A
Graphics In Word Processing and Database Applications
Friday, July 11, 11:00-12:50, Room C
Presentation on the State of the Industry
Friday, July 11, 11:00-11:50, Room D
Corporate Training: An Integrated Approach
Friday, July 11, 11:00-11:50, Room E
Office Automation from the Bottom Up
Friday, July 11, 12:00-12:50, Room A
Computer Contracts—Upgrades, Support, and Service
Friday, July 11, 12:00-12:50, Room D
PCs and Expert Systems: Costs/Benefits
Friday, July 11, 12:00-12:50, Room E
Handling Dissimilar Data Using a Chart of Accounts
Friday, July 11, 1:00-2:20, Room A
What Makes an Information Center Tick?
Friday, July 11, 1:00-1:50, Room C
Computer Security: Is Your System Safe and Sound?
Friday, July 11, 1:00-2:20, Room D
LANs: Assessing User Needs
Friday, July 11, 1:00-2:20, Room E
Micro-to-Minicomputer Communications: An Overview
Friday, July 11, 2:30-4:00, Room A
Beyond Keyboard Entry: Options in Data Input
Friday, July 11, 2:30-4:00, Room C
CAD/CAM, Candidly
Friday, July 11, 2:30-4:00, Room D
Memory Storage: Past Dreams/Future Visions
Friday, July 11, 2:30-4:00, Room E
The Revolution in PC Publishing

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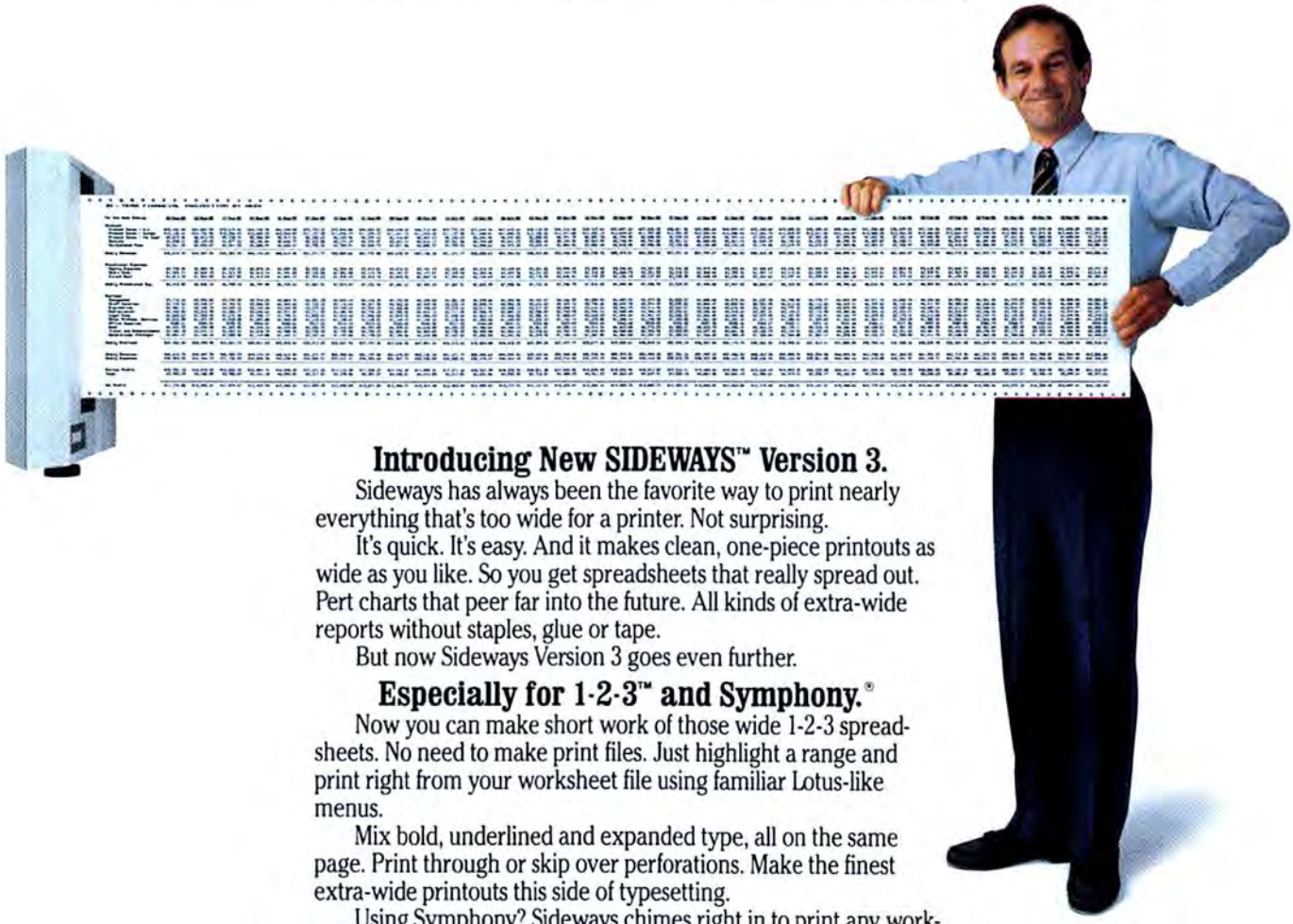

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Circle 92 on reader service card

The Help Screen

PC World offers answers and advice at every level

This month: Windows draws a blank, parking COMMAND.COM in your RAM disk, tips for hard disk backups, automatically activating a Compaq portable's external monitor, and more

Karl Koessel

Of Screen Blankers and Windows

Q. Lately, I've been using Micrografx's Windows Draw *with* Microsoft Windows *on an AT equipped with a VEGA board, Video 7's version of IBM's Enhanced Graphics Adapter (EGA). The VEGA includes a utility program that blanks the screen after 10 minutes without keyboard input—or video output—of text. In a normal text environment I can simply press any key to reactivate the screen; I usually press <Shift> because it recalls the screen unchanged.*

When I use Draw *under* Windows, *however, I rarely touch the keyboard, primarily because* Draw *is a mouse-driven program. Accordingly, the screen routinely blanks 10 minutes into the program. Unfortunately, pressing the <Shift> key, or even a character key, does not reactivate the screen when* Windows *is running. The only apparent way around this problem is to disable the screen blanker before running* Windows. *Can you suggest an alternative?*

Barbara Curran
Kalamazoo, Michigan

A. Use the <NumLock>, <CapsLock>, or <ScrollLock> key. Each is treated as keyboard input. *Microsoft Windows* intercepts the other keys and fails to pass them to the screen-blanking program.

RAM Disks Take Command

Q. I recently upgraded my dual floppy PC to 640K of memory, then installed a RAM disk to store my word processing program. After using the RAM disk for a while, I thought it might be an ideal place to put COMMAND.COM; I reasoned that, when necessary, DOS could reload that file quickly rather than prompt me with 'Insert COMMAND.COM disk in drive A: and strike any key when ready' or 'Invalid COMMAND.COM in drive A:'. Hunting for a way to tell DOS that COMMAND.COM resides on drive C:—my RAM disk—I sought help on a bulletin board service. One BBS user suggested that I issue the command COMMAND C:\ after copying COMMAND.COM to drive C:.

That approach has worked well but I'd like to understand why. I have yet to find even a scrap of documentation on this feature.

Paul Tebbits
Huntsville, Alabama

A. COMMAND.COM is the DOS command processor. It is loaded automatically from the default drive—usually drive A:—when you start the computer. The command COMMAND C:\ causes DOS to load a new copy of COMMAND.COM from the root directory of drive C:. This secondary command processor runs under the first. DOS maintains an environment table that stores the drive, directory, and name of each command processor it loads. When it needs to reload a particular command processor, it checks the related environment table to locate the appropriate command processor file.

While this technique does reload COMMAND.COM from drive C:, it wastes memory. You don't need to load a secondary command processor. You only

(continues)

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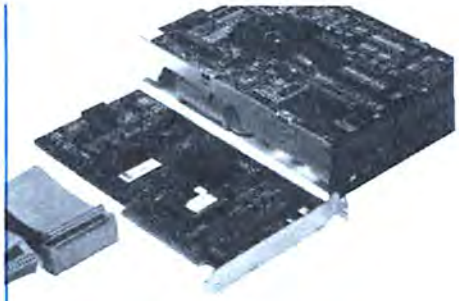

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need DOS to use the copy of COMMAND.COM that resides on drive C:. If you're using DOS 3.00 or a later version, load it as you did before you tried your bulletin board solution. Next, copy COMMAND.COM to drive C:. Follow that by typing **SET COMSPEC=C:\COMMAND.COM <Enter>** to change the environment table. (You can view the contents of the environment table by typing **SET <Enter>**.) DOS will now use the copy of COMMAND.COM in drive C: whenever it needs to reload the command processor.

In earlier versions of DOS the SET command does not work properly. "Command Redirection" (*.*, *PCW*, July 1985) offers a utility called CMDFIX.COM that you can use instead of the SET command to change the COMSPEC entry in the environment table. More information on COMMAND.COM and its use may be found in chapter 7 of the DOS 3.10 manual under COMMAND and in the article "The Fully Powered PC," *PCW*, July 1985.

Backing Up Selected Directories

Q. Several months after buying a hard disk drive for my PC, I wisely decided to back up my files. I did so using the DOS command BACKUP.COM, and assumed that I could back up several small directories into newly created directories on a floppy disk. For example, I created a UTILITY directory on a formatted floppy disk in drive A:, logged onto the UTILITY directory of drive C:, and issued the command BACKUP C:\UTILITY.* A:\UTILITY to initiate the process.*

This variation and others consistently elicited an 'Invalid parameter' error message. It seems that BACKUP should be able to back up a directory to a directory. Why can't it? Is it impossible to accomplish this? Or does BACKUP break the DOS syntax rules?

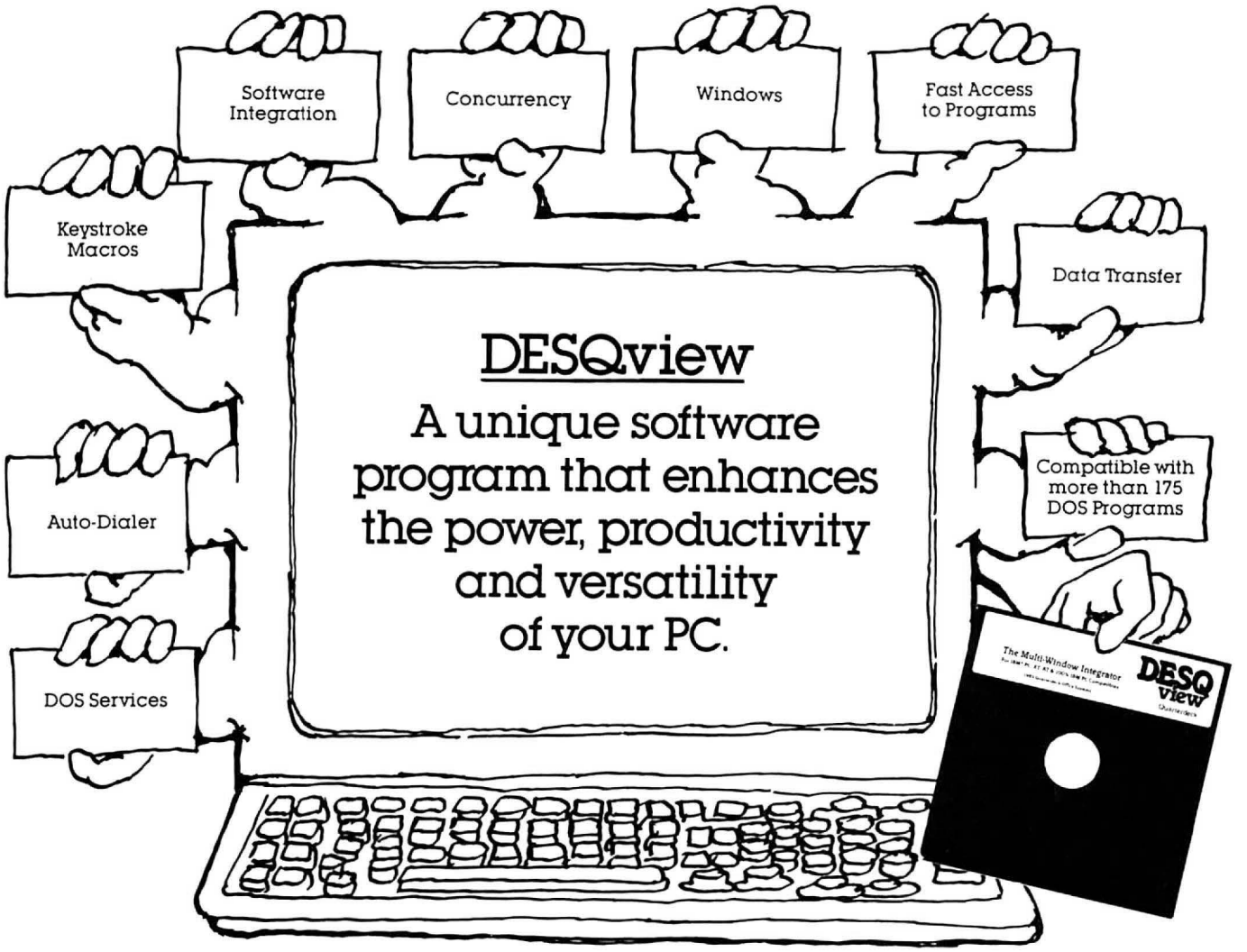
R. J. Lunt
Huntington Beach, California

A. To each file that BACKUP saves, it adds a header that contains the full path to the directory from which the file is being copied. Should it become necessary to replace a hard disk file with its backup, or to recreate your entire directory structure on a newly formatted hard disk, RESTORE will read each backup file's header to determine the directory into which the file should be copied. If the directory does not exist, BACKUP will create it.

There's no need to worry about maintaining your hard disk's directory structure on the backup floppies—BACKUP and RESTORE do it for you. Just type **BACKUP C:*.* A: /S <Enter>** to back up your files. C:*.* tells BACKUP to save all the files in the root directory of drive C:; the A: indicates the target drive; and the /S indicates that all files in the subdirectories under the specified directory, C:\, are to be backed up.

Although BACKUP does not violate DOS syntax, it has, like

(continues)



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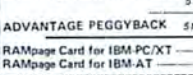

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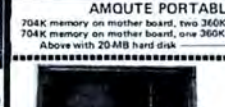

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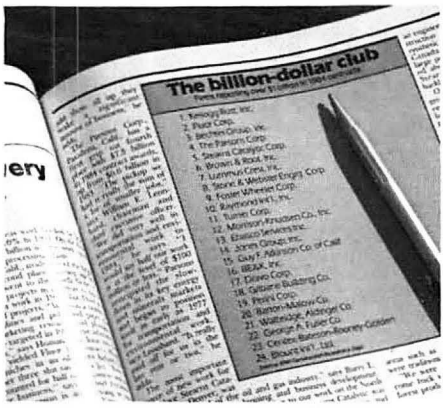

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any DOS command, its own syntactical restrictions. BACKUP's first parameter lets you choose a specific directory and/or file (or group of files, using the global file name characters ? and *) from the drive to be backed up; the command's second parameter simply notes the drive destined to contain the backup files. Because BACKUP keeps track of the directory of each backup file, backing up files into a particular directory on the target disk is unnecessary.

Monitoring the Compaq Portable

Q. *I use my Compaq Portable 286 chiefly for property management; while working in my office, I attach an external RGB monitor to the unit. I'd like to configure my AUTOEXEC.BAT file to ask whether the external monitor should be in use. For a yes (or Y) answer, I want the batch file to activate the color monitor, just as though I'd pressed <Ctrl>-<Alt>-<. Can this be done, or must the keyboard be used to call the external color monitor?*

Don Keller
Los Angeles, California

A. The MODE command of Compaq DOS features an optional parameter to enable or disable an external monitor attached to a Compaq machine. To activate the external monitor for 80 columns and color, the AUTOEXEC.BAT file should execute the command MODE CO80,E. The command MODE 80,I will disable the external monitor and return the unit's own monitor to its usual high-resolution, 80-column text display.

(continues)

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QUERY.COM (*.*, *PCW*, April 1986) permits you to modify your AUTOEXEC.BAT file to ask whether an external monitor should be activated. Then the batch file conditional IF ERRORLEVEL can determine whether to execute the command MODE CO80,E. Insert the following two lines into your batch file.

```
QUERY Activate external monitor? @NY
IF ERRORLEVEL 2 MODE CO80,E
```

Be sure that both the N and the Y at the end of the QUERY command are uppercase and that the N occurs before the Y. Also, note that QUERY.COM and the Compaq DOS MODE.COM commands are external—both files must be available (either in the current directory, or in a directory specified by the latest PATH command) when called by the batch file.

Incidentally, the volume of the key click, which is usually increased with repeated presses of <Ctrl>-<Alt>-<GrayPlus> and decreased by repeatedly pressing <Ctrl>-<Alt>-<GrayMinus>, can also be set with the Compaq DOS MODE command. The syntax is MODE CLICK = *n*, where *n* is a number from 0 to 127. The key click is off for *n* = 0 and becomes louder as *n* is increased.

Overlays From a Hard Disk

Q. *I faithfully keyed in the files shown in "The Single-Button Menu" [PCW, Vol. 2, No. 11] to implement the menu system described in that article. It displays a menu of my PC applications, any of which I can then select and run by pressing one key. When I read "Serving Up DOS" [PCW, February 1986], I was reminded that although my menu system works, one application uses overlay files. It requires that I place that program's disk in drive A:, even though the overlay files reside on*

(continues)

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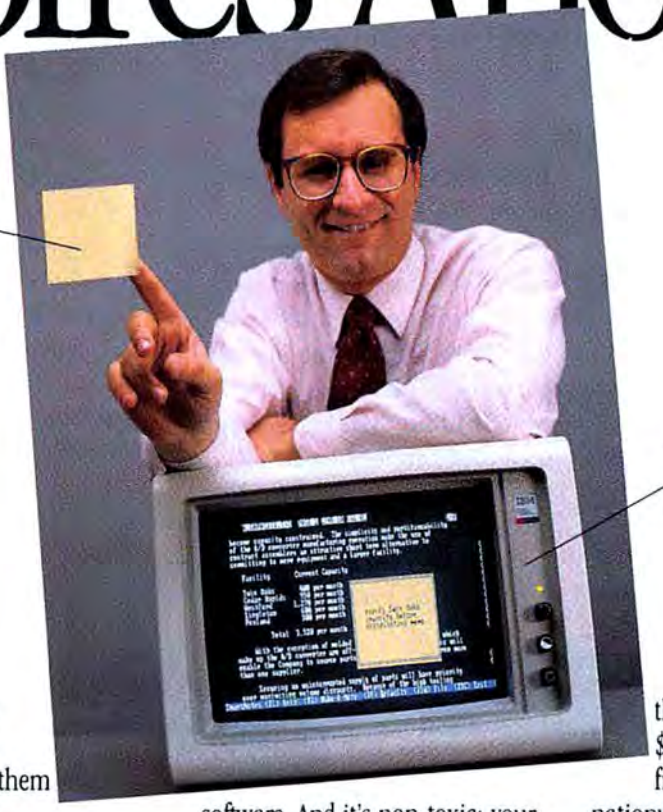

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Circle 446 on reader service card

my hard disk, drive C:. How can I can require that application to access its overlays from drive C:?

Nathan Pelner
Los Angeles, California

A. You can instruct DOS to look to drive C: when an application requests an overlay file from drive A:. You should note, however, that you must temporarily relinquish use of drive A: while running that application.

Scan your menu system's batch file for the command that calls the application. Insert the command **ASSIGN A=C** before the application call and the command **ASSIGN** after the application call. Be certain that the DOS command ASSIGN resides in the same directory as the application, or in a directory listed in the last PATH command, and your menu system will be ready for action.

RUN BASIC Programs From DOS

Jim Palmer, a reader from Clarksville, Tennessee, offers a better solution to Duane Hansel's problem ("DOS to BASIC Application—Directly," *The Help Screen*, *PCW*, March 1986). Mr. Hansel sought a means of simplifying BASIC program operation so the inexperienced PC user could run a BASIC program without having to learn how to load the BASIC interpreter and then load and run a particular BASIC program. Mr. Palmer suggests that the published solution (which entailed creating a separate batch file for each BASIC program) is "a hassle," as well as a waste of disk space.

His suggestion requires just a single batch file, called RUN.BAT. Users need only know to place the program disk in drive B:, insert the disk containing BASIC and RUN.BAT in drive A:, and type A:RUN *progname*, where *progname* is the name of the desired BASIC program in drive B:. If

(continues)

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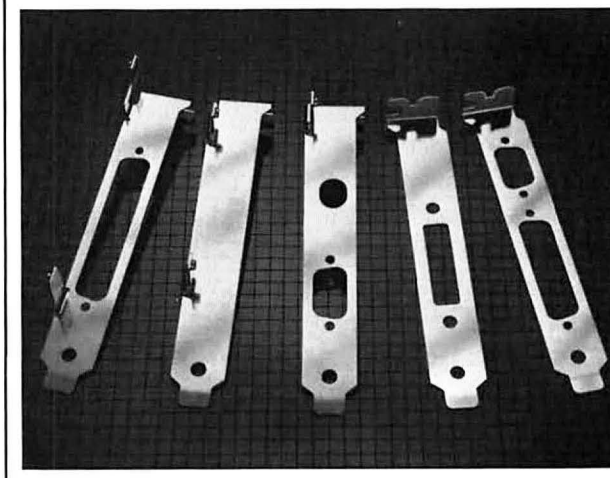

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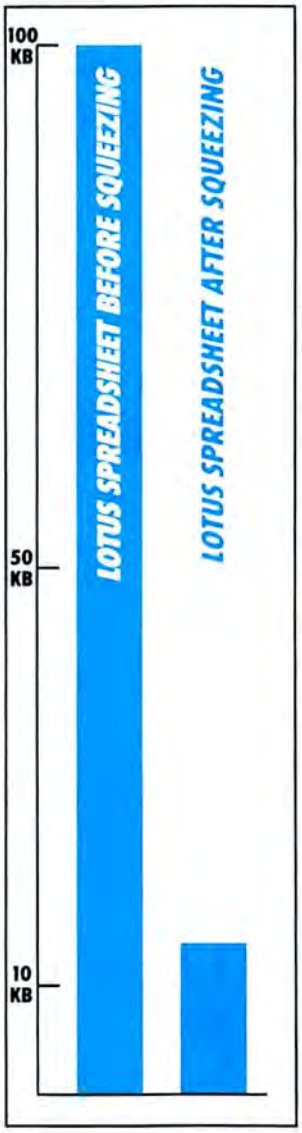

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```
COPY CON RUN.BAT
ECHO OFF
CLS
A:
IF x==%1x GOTO NONAME
BASIC B:%1
GOTO END
:NONAME
ECHO BASIC programs in drive B: are
DIR B:*.BAS/W/P
:END
```

Then press function key < F6 > and < Enter > to save the batch file on the disk in the default drive.

Lightning Enlightenment

Ray Hawley, operations manager at H & M Telecommunications, offers advice to readers concerned about high voltage entering their computer systems via telephone lines and modems (see "Phone Line Lightning Arrestors," *The Help Screen, PCW,* January 1986). Mr. Hawley's company sells an induction neutralizing transformer that does not have a delay limitation or a voltage threshold that must be exceeded before the device will operate. This device uses the induction property of changing voltage to counter voltage spikes like those produced by lightning. For more information, contact the company at P.O. Box 10, Kenansville, FL 32739, or call 305/436-1360.

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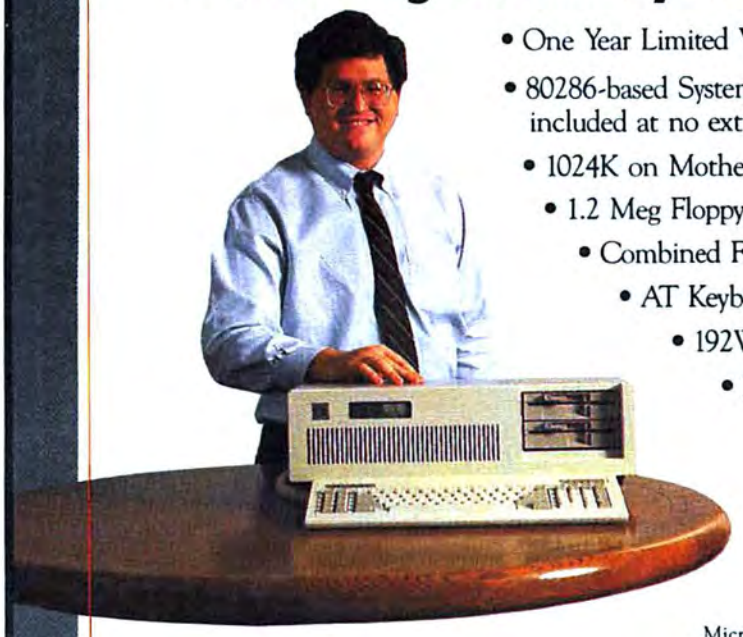

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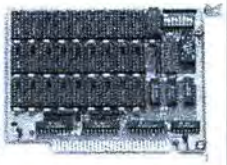

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Macro tips for 1-2-3 users, batch file menus, faster printouts, unlocking a BASIC program, a WordPerfect utility program, and more

Edited by Steven Cook

Macro Minder

Although *1-2-3* normally lets you define only 27 macros per worksheet, I have devised a technique that allows a virtually unlimited number.

First, create your macros and use the /Range Name Create command to give each one a descriptive name. Do not use names that start with the backslash character (\).

Next, type the macro command **/XG{NAME}{?}~** into an unused cell and name it \A with the /Range Name Create command.

Now whenever you press <Alt>-A, a menu of range names will appear on screen. Merely move the cursor to highlight the name of the macro you wish to execute and press <Enter>. Since the macros have descriptive names, it's much easier to remember their function.

This also leaves the remaining backslash-*letter* macro names available for specific tasks.

Jim Direnzi
Cincinnati, Ohio

More on Menus

Here is another technique, like those described in "Two More on 1-2-3" [*.*, *PCW*, October 1985] and "1-2-3 Macro Menus" [*.*, *PCW*, February 1986], to avoid trouble caused by users pressing <Esc> while a *1-2-3* /XM menu is being displayed.

As the *1-2-3* manual states, macro execution continues at the cell below the /XM command when <Esc> is pressed. With this information in hand, I define the effect of the <Esc> key by placing appropriate macro instructions in the cell below the /XM command. Those instructions may be additional macro steps, a /XQ command to terminate macro execution, or, most commonly, a /XG command to continue macro execution at some other cell, typically holding another macro menu.

Using /XG to branch to another macro menu has the same effect as placing several /XM statements in a row, but the resulting macro is less confusing and lets you build menus that branch back several levels in a single step.

This method eliminates any ambiguity about the results of pressing <Esc>. For the same reason, I make it a habit to put a /XQ command wherever I intend a macro to end.

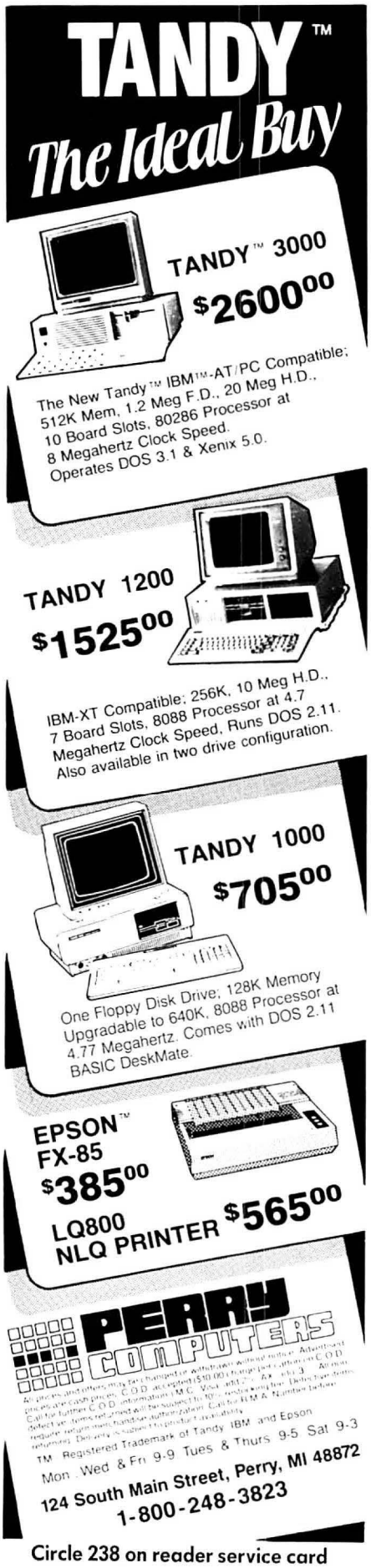
Richard Routh
Spokane, Washington

Printer Enhancement

When I learned that IBM was enhancing its Graphics Printer, I decided that it was time to enhance mine as well. The upgrade is inexpensive, and now my IBM Graphics Printer skips along at almost twice its normal 80-characters-per-second speed with no loss in print quality. Since the Epson MX-80 printer is identical to the unmodified IBM, you should be able to enhance it by following the same steps. [This item assumes that you have the skill to solder without damaging heat-sensitive electronic components.]

The secret to double-time printing? Replacing the two 6MHz timing crystals on the printer's main circuit board with 10MHz crystals. I ordered mine from Radio Shack for $4.95 each. They come in standard metal casings with two wire leads. The crystals

(continues)



Circle 238 on reader service card

look identical to the ones already installed, so it's easy to locate the parts to be replaced.

Unplug the printer from the wall and from the computer. Lift the cover until it's upright and pull it straight up to take it off. Remove any paper present. Turn the printer upside down and unscrew the four screws located in the wells at each corner. Then turn the entire printer right side up, taking care not to lose the screws as they fall out of the wells. Reach inside near the right front and grasp the group of multicolor wires. Pull them gently to the left to disconnect their connector from the control panel circuitry underneath the printer's buttons. Pull off the paper-feed knob and, lifting the left side of the shell, gently flip the shell to the right, over the knob shaft, to remove it.

Remove the two mounting screws and the multiwire connector from the small circuit board located in the right rear next to the printer's parallel port. Lifting straight up, unplug the small board from the main board and set it aside. Next, unplug the two power connectors at the right rear and the ground connector at the right of the parallel port from the main board. Slip off any plastic spacers covering the plastic shafts that protrude through the circuit board and remove the screws that hold the board in place; one is near the center of the board, and the others are in a small metal plate on the right that connects the board to the bottom of the printer. The main board will still have several wires connected to it but, holding the three plastic clips (two at the rear, one at the left) away from the edges of the board, you can remove it with care and work on it next to the printer.

With the main board out, locate the old crystals, one at the front left and the other on the left (they're stamped either "6000" or "6MHz"), and use a soldering iron to remove them and attach the replacements. If you don't want to solder on the main board, you can cut the old crystals off and solder the new crystals onto the old leads.

Mike Schaefer
Missoula, Montana

Editor's note: This upgrade works because the circuits used in newer printers can operate at speeds in excess of the original design specifications. Older printers, however, may not be able to handle the increased speed, so hang on to the old crystals until you are certain. Crystals are easily damaged by heat—be careful when soldering. Use needle-nose pliers to grip the lead between the case and the soldering iron, or better still, install sockets for the crystals—this makes replacing them easier if your printer can't handle the faster crystals.

Tandy Trouble

In using my Tandy 1000 computer and an Epson LX-80 printer, I discovered that in some situations the printer will double-space, even if the appropriate printer switch is set to prevent automatic linefeeds.

The computer is supplied with a utility program called LF.COM that partially resolves the problem.

(continues)

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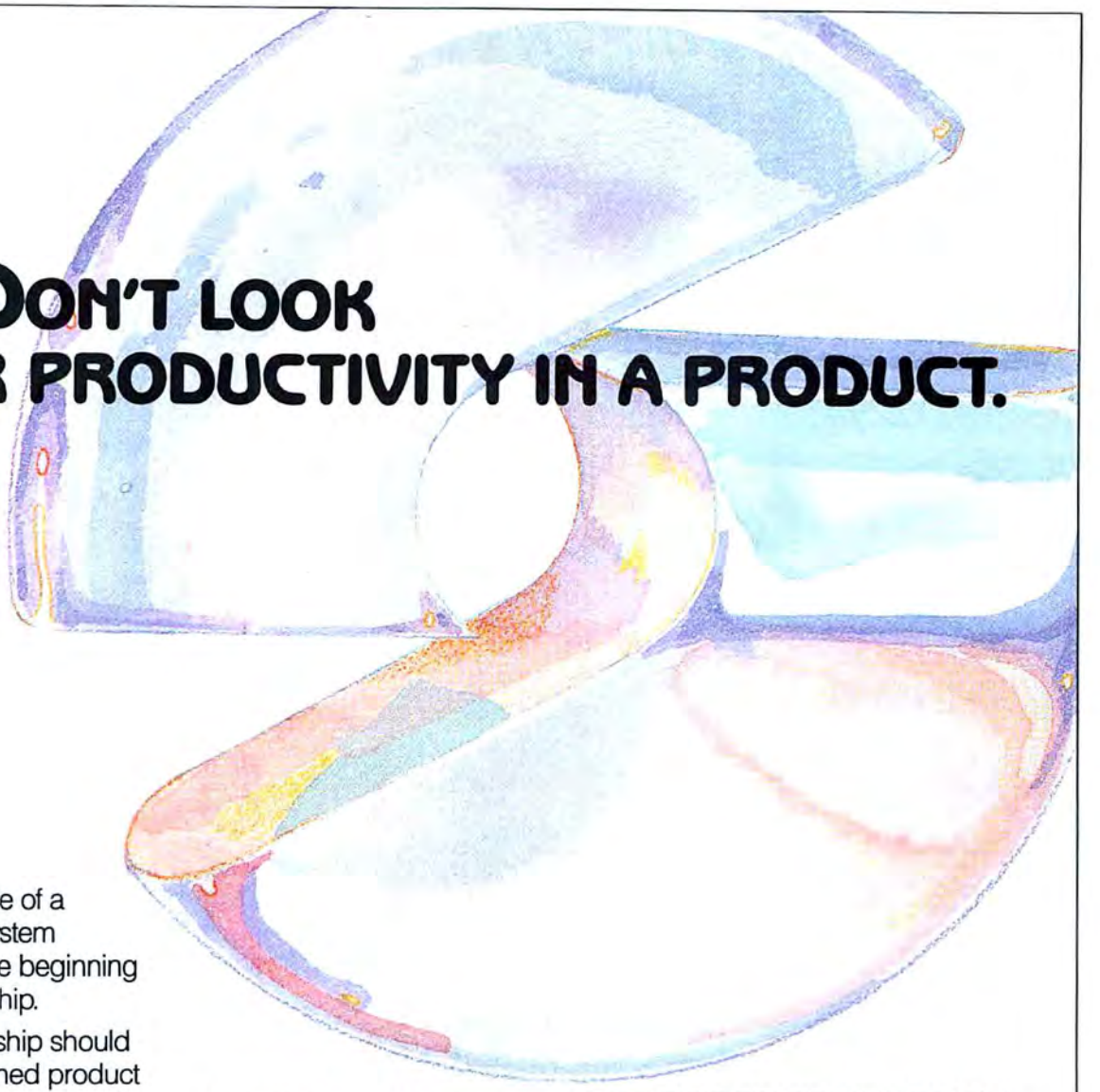

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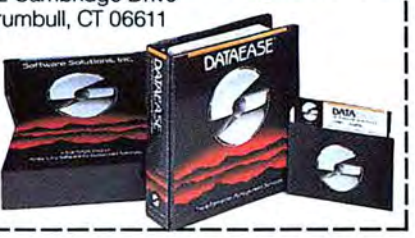

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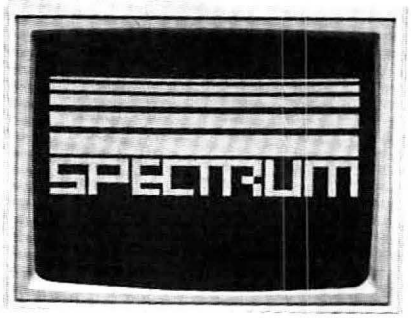

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After you run the program, the printer will print single-spaced text. However, specifying bold or underlined text with a word processor such as *IBM Writing Assistant* sends a carriage return to the printer, followed by the boldface characters or character underlines. LF.COM is useless in this situation because it merely strips out linefeed characters sent to the printer (even in graphics mode, which causes still more trouble). Since the printer advances the platen one line when it receives the carriage return, boldface characters and underlining end up on a separate line.

The problem is caused by the grounding of pin number 14 of the printer's interface, which overrides the setting of the internal Auto-LF switch. When this pin is grounded, the printer advances one line upon receipt of a carriage return character. Simply putting a piece of tape over pin 14 or disconnecting it completely eliminates the problem as well as the need to use LF.COM.

Doug Burger
Athens, Georgia

Editor's note: This fix can be used to override the Auto-LF setting on many other printers.

BASIC Unprotect

I have written many BASIC programs and, after saving them in both protected and unprotected formats (as the manual advises), lost the unprotected versions. After this happened for the nth time I decided to look into unprotecting protected files.

```
-e 100 ff 1a  < Enter >
-n unprot.bas  < Enter >
-r cx  < Enter >
CX 0000
:2  < Enter >
-w  < Enter >
Writing 0002 bytes
-q  < Enter >
```

UNPROTECTION: Use these commands with DEBUG.COM to remove the protection status from BASIC programs.

The solution I devised is a 2-byte BASIC "program" called UNPROT.BAS. Because of its brevity, loading UNPROT.BAS resets the flag that indicates a program's protection status without overwriting the program already in memory. UNPROT.BAS also works with programs that have been accidentally erased by the NEW command.

Follow these steps to create UNPROT.BAS. First, insert a disk containing a copy of DEBUG.COM from the DOS Supplementary Programs disk and type **DEBUG < Enter >**. When DEBUG's hyphen prompt appears, type the text shown bold in UNPROTECTION. To use UNPROT.BAS, load the protected program first, then load UNPROT.BAS, and presto! Your masterpiece is ready to be listed, edited, and saved.

Matthew Lucas
Address unavailable

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Graphics to Go

My AT&T PC 6300 has a special high-resolution screen mode of 640 by 400 pixels, twice the number possible with the IBM Color/Graphics Adapter. Unfortunately, the normal <Shift>-<PrtSc> feature cannot print these high-resolution screens, which limits their usefulness.

Recently I discovered a utility program called *Grafplus* from Jewell Technologies. Once loaded into memory, this program intercepts the print screen command and sends the 6300's 400-line screen image to any of a variety of printers (including the HP LaserJet). It can print horizontally or vertically in different sizes as well as in color, if your printer supports it.

James Stubchaer
Santa Barbara, California

Editor's note: Many programs offer graphics-printing capability for a variety of printers, but unlike IBM's GRAPHICS.COM, few are memory resident. Nevertheless, if you have a special graphics adapter and would like to print graphics screens, the products and companies listed here all support a wide array of devices. Contact the manufacturers directly for specific information.

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Media Cybernetics, Inc.
7050 Carroll Ave.
Takoma Park, MD 20912
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Grafplus
Jewell Technologies
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Seattle, WA 98116
206/937-1081
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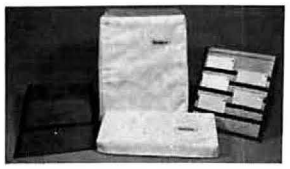

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As much as I like *WordPerfect*, its encoding of "soft returns" renders the DOS command TYPE useless for displaying a *WordPerfect* text file. Consequently, cleaning old files off the disk means running the word processor whenever I need to look at a file to determine whether it should be deleted. This motivated me to create the program WPTYPE.COM, which displays the contents of a *WordPerfect* file in readable format and shows control codes as asterisks.

Stephen Berg
Kailua, Hawaii

Editor's note: To create WPTYPE.COM, load BASIC, type in the X-MAKER.BAS program followed by the lines shown in WPTYPE.DAT, then type **RUN** and press **< Enter >**. *To use*

(continues)

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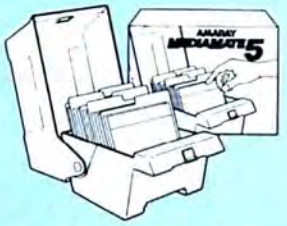

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```
10 DEFINT A-Z:CLS:KEY OFF:DEF FNHEX(X$)=VAL("&h"+X$)
20 LOCATE 3,1:PRINT "X-Maker":READ F$
30 LOCATE 5,1,1:PRINT "Now testing for data errors...please wait";
40 SUM=0:READ LN:IF LN<0 THEN 80
50 READ H$:IF VAL(H$)<0 THEN 70
60 SUM=(SUM+FNHEX(H$))*2:SUM=(SUM\256)+(SUM MOD 256):GOTO 50
70 READ CKSUM$:IF SUM=FNHEX(CKSUM$) THEN 40 ELSE GOTO 170
80 RESTORE:CLS:LOCATE 3,1:PRINT "X-Maker":READ F$
90 LOCATE 5,1,1:PRINT "Press any key except ESC to create ";F$;": ";
100 A$=INPUT$(1):PRINT:IF A$=CHR$(27) THEN END
110 LOCATE 6,1:PRINT "Working...";
120 OPEN F$ AS #1 LEN=1:FIELD #1,1 AS BX$
130 READ LN:IF LN<0 THEN 160
140 READ H$:IF VAL(H$)<0 THEN READ CKSUM$:GOTO 130
150 LSET BX$=CHR$(FNHEX(H$)):PUT #1:GOTO 140
160 CLOSE:PRINT:PRINT F$;" has now been created.":END
170 PRINT:PRINT "Error in DATA line";STR$(LN);" :"
180 PRINT "Check your work.":BEEP:END
```

X-MAKER.BAS: Star-Dot-Star's program-creating program

```
1000 DATA "a:wptype.com"
1010 DATA 1,BE,80,00,B8,00,00,8A,1C,46,C6,00,00,46,89,F2,B8,-1,70
1020 DATA 2,00,5D,CD,21,72,42,89,C3,B9,01,00,BA,6E,01,B4,3F,-1,EE
1030 DATA 3,CD,21,3D,00,00,74,2F,8A,16,6E,01,80,FA,0D,74,07,-1,B8
1040 DATA 4,80,FA,0A,74,02,EB,08,B4,02,B2,0A,CD,21,B2,0D,80,-1,8C
1050 DATA 5,FA,7F,72,02,B2,2A,80,FA,08,77,02,B2,2A,B4,02,CD,-1,92
1060 DATA 6,21,80,FA,1A,75,C5,CD,20,B4,09,BA,61,01,CD,21,CD,-1,13
1070 DATA 7,20,46,69,6C,65,20,65,72,72,6F,72,0D,0A,24,-1,C9,-1
```

WPTYPE.DAT: Add these lines to X-MAKER.BAS to create WPTYPE.COM.

```
echo off
cls
c:
cd \frontend
type %0.txt
pause >choice.bat
choice
```

FEMENU.BAT: Front-end menu program using the PAUSE command to accept user input

WPTYPE.COM, simply enter **WPTYPE** filename *at the DOS prompt, where* filename *is the name of the* WordPerfect *text file you wish to examine. Take care to insert only one space between WPTYPE and the file name.*

Cause to Pause

I was very impressed with Hal Nieburg's article "Serving Up DOS" [*PCW*, February 1986]. To reduce the keystrokes required to select menu items, I put a PAUSE command in the FEMENU.BAT file, redirect its output to a batch file (such as CHOICE.BAT in my example), and then execute that batch file. My version of the FEMENU.BAT file is shown here.

This technique works because the character you type in response to the PAUSE command is stored in the specified file. (For more information, review "Redirection of Standard Input and Output Devices" in the DOS manual.) Executing that file will then cause the selected batch file to run.

(continues)

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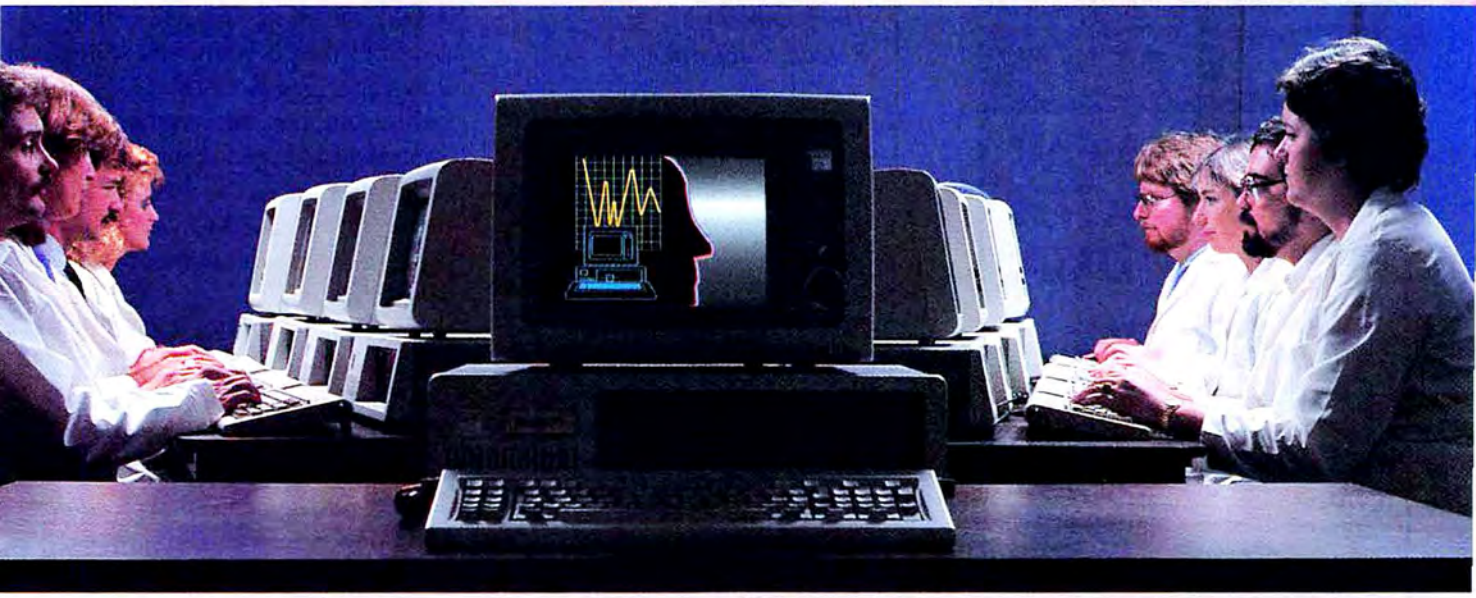

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```
echo off
cls
echo +                          +
echo    A - Database
echo    B - Spreadsheet
echo    C - Word Processing
echo +                          +
echo Press the letter of your selection
pause >choice.bat
echo %0>>choice.bat
choice
```

MENULOOP.BAT:
Demonstration of uses and effects of PAUSE command redirection

Of course, since the PAUSE command works when you press a single key, you should remove the line from the menu file that instructs the user to press the <Enter> key.

Terry Lahman
Reseda, California

Editor's note: The PAUSE command's 'Strike a key when ready . . .' prompt is not affected by redirection; it continues to appear on screen, while the character entered goes to the disk file. As MENULOOP.BAT illustrates, the ECHO command is used with I/O redirection to append the name of the menu program after the user's keystroke; that file is then executed. This causes the menu program to execute again if the named batch file does not exist. The example also reveals an obscure bug in DOS 2.10 that causes MENULOOP.BAT to terminate if the user presses <Enter>.

Batch File Input Comment

DOS does not have a batch file facility to accept input from the keyboard. If you write batch files frequently, you may have been frustrated because they can't prompt the user to supply text that can be used as parameters for another operation.

One solution is KEYLINE.COM, which accepts a line of input from the keyboard and stores it in a specified file. With I/O redirection, that file can supply the equivalent of typed input for another program; if the specified file name ends with .BAT, .COM, or .EXE, it can be run without modification.

To create KEYLINE.COM, load BASIC, type in X-MAKER.BAS followed by the lines shown in KEYLINE.DAT, then type **RUN** and press **< Enter >**. To use KEYLINE.COM, type **KEYLINE** *filename* and press **< Enter >**. (Be sure to type only one space between the command KEYLINE and the name of the file that is to store the user's input.) *Filename* may include a DOS path, but be careful: Although KEYLINE.COM will create the specified file when it does not exist, the program will

(continues)

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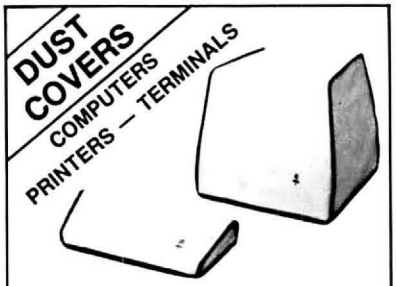

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```
1000 DATA "a:keyline.com"
1010 DATA 1,BE,80,00,31,DB,8A,1C,46,C6,00,00,46,89,F2,B9,20,-1,1B
1020 DATA 2,00,B4,3C,CD,21,72,32,89,C1,BE,4F,01,C6,04,80,89,-1,5B
1030 DATA 3,F2,B8,0A,0C,CD,21,46,31,DB,8A,1C,80,C3,02,C7,00,-1,58
1040 DATA 4,0A,1A,FE,C3,87,CB,46,89,F2,B4,40,CD,21,72,0A,B4,-1,A0
1050 DATA 5,3E,CD,21,72,04,B0,00,EB,02,B0,01,B4,4C,CD,21,-1,21,-1
```

KEYLINE.DAT: Add these lines to X-MAKER.BAS to create KEYLINE.COM.

```
echo off
cls
echo Enter the command you wish to perform:
keyline cmd.bat
echo pause >> cmd.bat
echo %0 >> cmd.bat
cmd
```

MENU.BAT: Demonstration of KEYLINE.COM program

erase the current contents of an existing specified file before it accepts and stores the user's response.

If for any reason the file cannot be created, KEYLINE.COM will set the batch ERRORLEVEL to 1 and exit, so you may wish to test for that value immediately after executing KEYLINE.COM. The batch file MENU.BAT demonstrates one way to use KEYLINE.COM.

CHMOD Comment

A few readers have been having problems with CHMOD.COM from "CHMOD Revisited," in February's column. Many *.* items are simple utilities that lack sophisticated error checking and command line parsing. Take care to insert only one space between the command CHMOD and the file name.

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- Align

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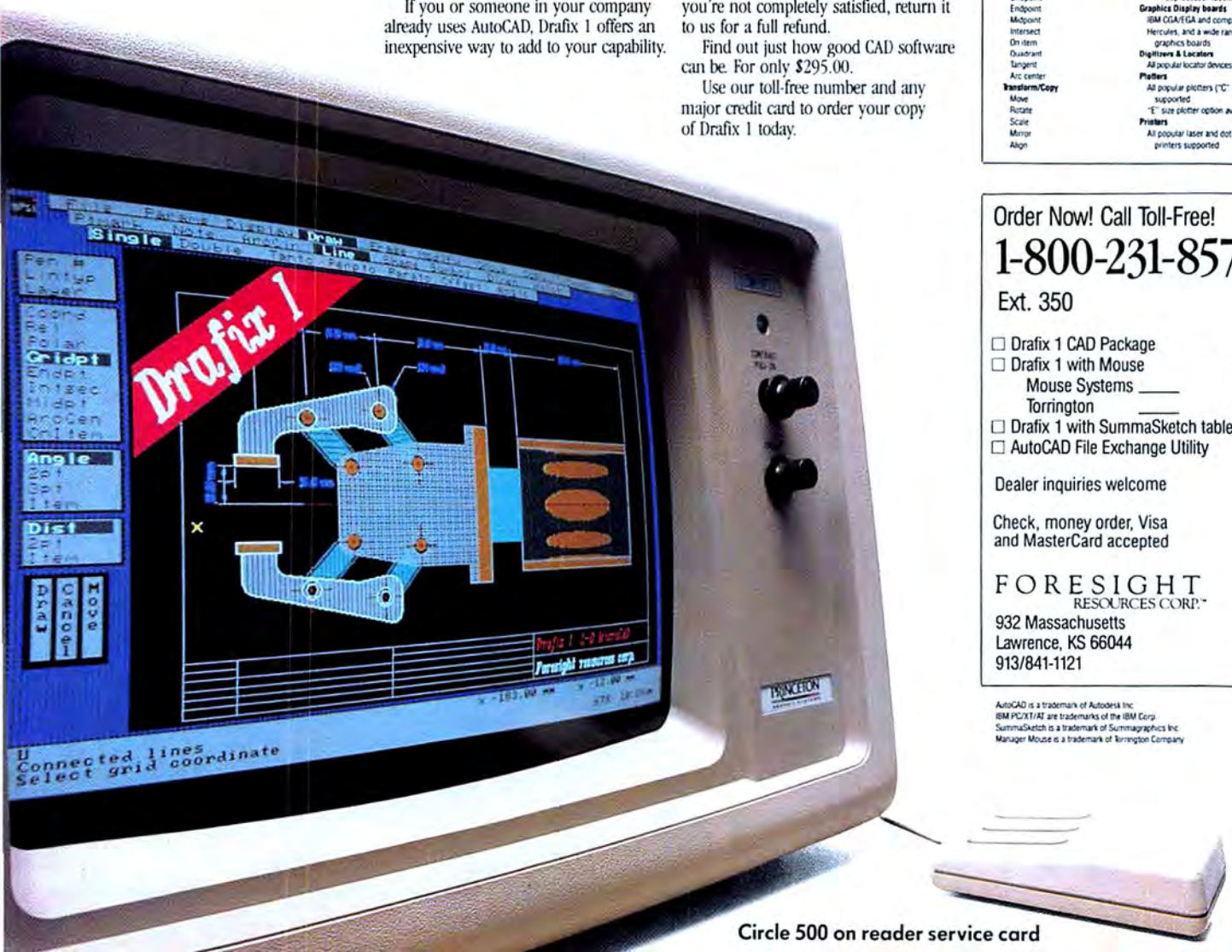

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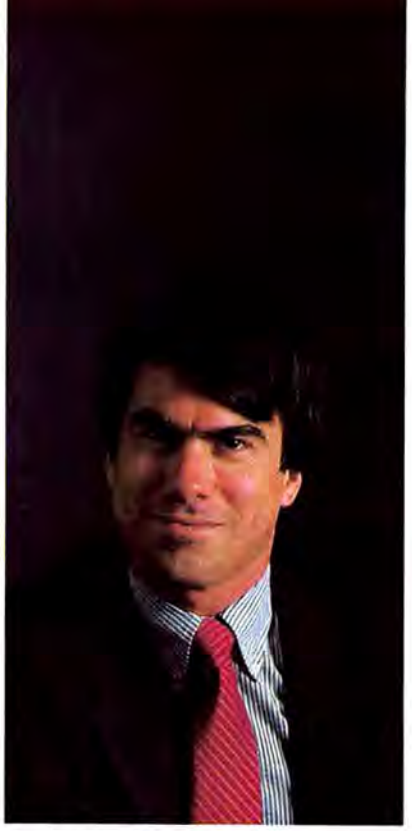

Kevin Strehlo

The PC Prescription

An orthopedic surgeon has added a new tool to his medical bag: a customized expert system to back up his own expertise on some of the toughest decisions a surgeon faces—when, and how, to operate.

I arrived at Dr. William Mouradian's Los Angeles office a mere 3 hours late, but it didn't seem to matter. He had plenty of patients to see, there being a seemingly endless number of people whose previous back surgery has proved a failure. Tending to such cases is his specialty. If he didn't have patients, he could always while away his time inventing a new orthopedic device or writing a learned treatise on bad backs—two of his many subspecialties. Or, if these activities bored him, there was always the expert system he'd been crafting on his PC—the reason for my visit. "The computer's keeping me from getting bored," he'd told me on the phone. "It's a lot of work, but I like being this busy."

Mouradian's receptionist showed me to a chair in the doctor's outer office. The room was occupied by three computers: an old IBM 5141, which, she explained, was used for billing, an XT used primarily for correspondence with insurance companies and patients, and an IBM Portable PC (with an external monitor on a swivel arm) that Mouradian had described over the phone as a mobile, two-person minicomputer. It sat between the desks of the office manager and the nurse.

Mouradian had fired up the Portable PC with a 286 turbo board and a 2MB AboveBoard. His nurse whipped through the 22 *Framework* data base files needed to manage the day's office routine and Mouradian's upcoming surgeries. She was telling me that the doctor took the machine with him on trips, when Mouradian walked in.

"None of the cables on the back is screwed in," he said by way of introduction, "so I can just grab it." He excused himself to see another patient, saying we'd have time to talk at the end of the day. The receptionist said that despite the apparently full log of appointments, today was actually a bit slow. "On a busy day, we have a patient every 15 minutes." "How much time does he have for his computers?" I asked. "Oh, maybe 4 hours a day," she said.

(continues)

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Circle 850 on reader service card

I sat for a few minutes, wondering why I never seemed to find the time to start that novel I'd been longing to write.

It was 8 p.m. before we settled into the leather chairs in front of a Compaq Deskpro 286 in Mouradian's inner office and finally took a look at his expert system.

Mouradian, like any other computer enthusiast, gave me a quick tour of his subdirectories and then explained how he'd gotten involved in building an expert system. "Decision making in back surgery is so complex, and there are so many variables," he said. "You can read all the research articles you want, but if you can't process the information properly, you can't use it."

Mouradian often works on patients who have been operated on more than once without success. Of the 200,000 back operations performed annually in the United States, about 40 percent are failures, he said. Those patients usually end up with psychological problems that make the chance for recovery from another operation very dicey. "Failed back surgery can destroy people," said Mouradian, adding that his success rate has increased steadily and is now near 90 percent.

Mouradian feels that the decisions about whether to operate on a patient with chronic back pain and what procedure to perform are arguably the most difficult in medicine. Should it be a simple fusion—a procedure in which bone grafts permanently join two or more vertebrae—or perhaps a cleaning out of the area around the nerve endings along the spine? "Sometimes it's a dealer's call," he said. Indeed, he became interested in using a computer to help make those decisions when he realized he wasn't sure of his methods in calling the close ones.

"I was examining a psychologist who had a back problem, and he asked how I would decide whether he needed a back operation," Mouradian recalled. The question fascinated them both. "We started having dinner about once a week, just to talk about how you make decisions like that. I commented about an interesting looking woman on an elevator one night, and we spent hours analyzing the process I went through to make my judgment. There turned out to be hundreds of factors involved, millions of bits of information, but I made the judgment in just a split second. How?"

Mouradian realized he ran largely on "intuitive expertise" in his life, and in his practice. "I can get a very good assessment of how sick someone is before I even examine them by watching the way they move in the examining room, watching how much trouble they have taking their shoes off, how they put the gown on." But how could he explain the process to someone else?

(continues)

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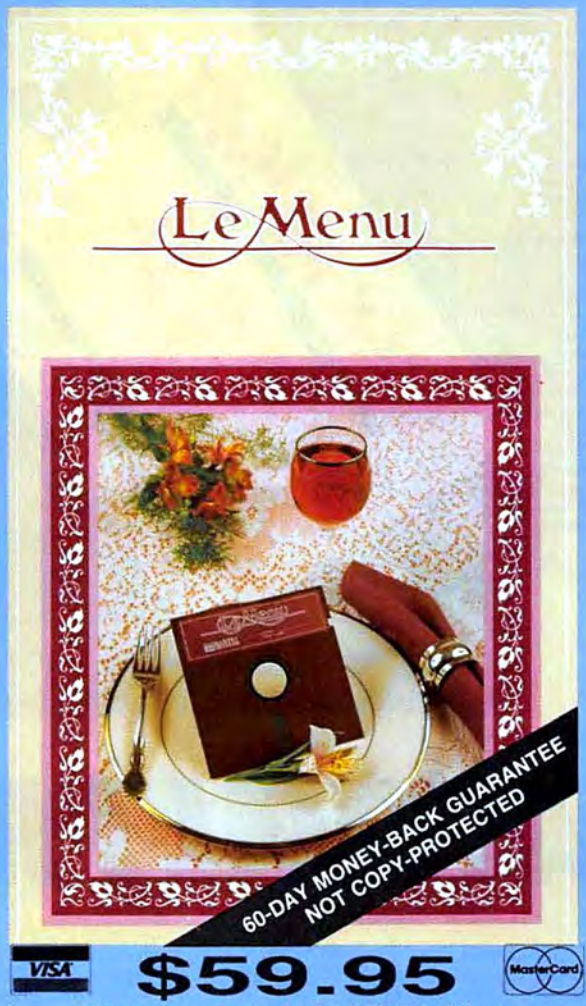

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[redacted]

The problem of imparting such knowledge to others goaded him on. He remembered facing the same puzzle during his medical residency. "I studied with a famous back surgeon in New York 15 years ago," Mouradian said. "Dr. Fielding would go through a group of patients saying, 'He needs a fusion . . . she doesn't need a fusion . . . he doesn't . . . she does.' I still can remember asking him, 'Bill, how do you know?' 'Well, they have mechanical pain,' he'd say. 'What's mechanical pain?' 'How the hell should I know?' But he did know—he just hadn't formalized it."

Mouradian's goal in building an expert system, then, "wasn't to make the machine smart; it was to clarify how I arrived at the decisions I made."

Mouradian has put a lot of time into his expert system—"hundreds and hundreds and hundreds of hours"—not all of it enjoyable. He recalled problems caused by extraneous characters embedded in what was supposed to be a pure ASCII file. Those hidden characters gave the program he was using, *Expert Edge* from Human Edge Software, real grief. "I spent a couple of weekends, all day both Saturday and Sunday, losing compile jobs right and left. I was ready to tear my hair out."

Mouradian still hasn't solved his problems completely, and he's thinking of switching to a new expert system shell, *Personal Consultant* from Texas Instruments. He

(continues)

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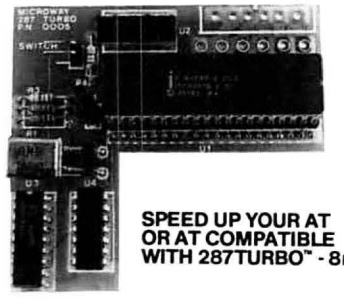

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has basically given up the task of getting *Expert Edge*'s help screens to work. Help screens will be crucial if other doctors are to use Mouradian's system because they tell the program operator how to quantify processes that normally are carried on intuitively.

"This is the part that answers the question, What's mechanical pain?" Mouradian remarked as he guided me, question by question, through the system. The few working help screens dealt with such things as how the degree of back movement restriction could be plotted on a scale from one to ten. Other questions were straightforward, or seemed to be. "Is it true that you are relieved by lying in bed face down?" one posed. Mouradian explained that any patient who answered yes to that one wasn't being completely truthful. A serious back problem would make the face-down position intolerable.

Mouradian keyed in responses from an actual patient. Even working as fast as he could, he took more than 30 minutes. "You should see it on a vanilla PC—there's a long lag between questions. It really makes you appreciate a 286 machine."

I was beginning to understand. Mouradian had thought about thinking, and he used the fastest tools he could find to help the process along. But the drive for speed wasn't at the expense of rigor. He had designed the system so it asked every question he posed to patients. In the beginning, he said, "The system was behaving erratically in that it seemed to get an idea about something and follow that idea at the expense of all others. That bothered me." So Mouradian wrote in what he calls a "stupid rule" to trick the program, making it impossible for the computer to miss a particular line of questioning. "I'll cut corners when I'm making my decision, but the machine shouldn't," he explained. That way, the program's evaluation is thorough. "It does what I would do on my best day, when I'm the most methodical, when I have all the time I need to think about a problem."

Mouradian said all the fine-tuning of his program has paid off—it agrees with him nearly every time. Indeed, after he renders his own independent judgment on a case, he has his nurse run the program, and then he runs the program.

"When all three don't agree, I figure we have a problem." That happens rarely, although a few times he has had to turn to the program for guidance when he's been undecided on a course of action.

It seemed Mouradian had succeeded in transferring his knowledge of back surgery to a program. I asked if other specialists wouldn't be keen on using it, given Mouradian's high success rate. He said he was hopeful—but also somewhat pessimistic.

(continues)

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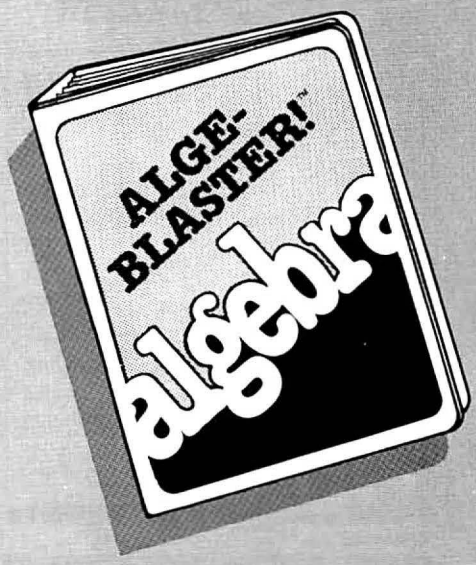

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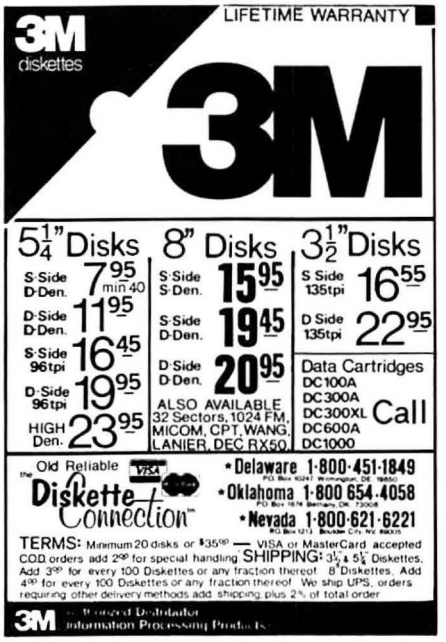

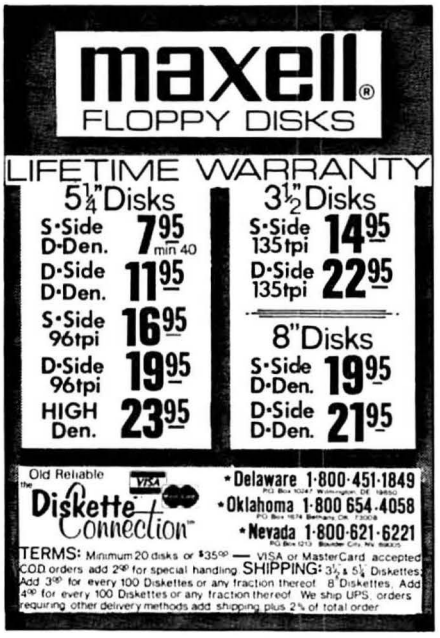

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Kevin Strehlo

"It's a time-consuming process. To get reasonable answers you need a very good psychological evaluation [of the patient], for one thing—two lengthy personality tests, one of 560 questions and the other about 150 questions, the results of which get fed into the program. And some back specialists don't think a psychiatric evaluation has any relevance at all.

"So maybe no one would use it," he said. "But even if the machine blew up tomorrow and destroyed all my work—sure, I'd be disappointed. But I wouldn't be that disappointed. I've learned so much about how I think." That factor, he suggested—the greater awareness and refinement of his own thinking process—may be the greatest benefit of the expert system.

Later, as we sat over a very late dinner of tostadas at a restaurant near the Santa Monica freeway, he elaborated on his quest for speed and ever-greater expertise. "You know, the 286 is fast, and I put in a lot of hours at it, but the important thing is probably what the expert system has done for me—make me think about how I think. It's more than just putting my foot to the floor—it lets me fine tune the carburetor, too."

Kevin Strehlo hunts for PC tales from an office overlooking Silicon Valley.

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Circle 921 on reader service card

July Preview

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- **A Typesetting Primer**
  How the PC handles the basic tasks of a centuries-old craft
- **The Corporate Printshop**
  How some businesses are saving big bucks on small jobs–and enhancing corporate communications in the process
- **State-of-the-Art Publishing**
  A preview of two new page-composition programs for the PC
- **Making Book**
  A hands-on tutorial for producing a book by integrating text and images with *Microsoft Word,* Datacopy's image digitizer, and the Word Image Processing System
- **Reviews**
  In-depth assessments of major personal computer publishing hardware and software
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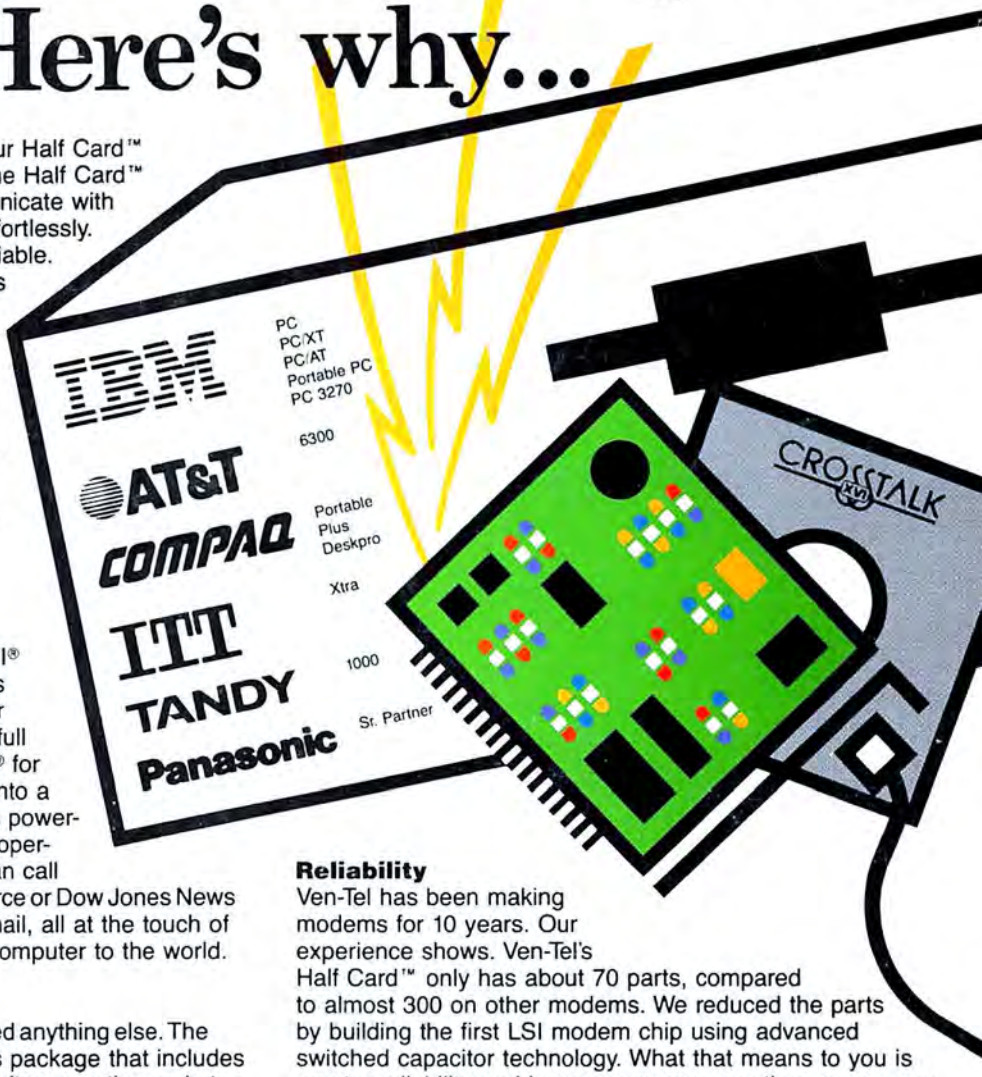

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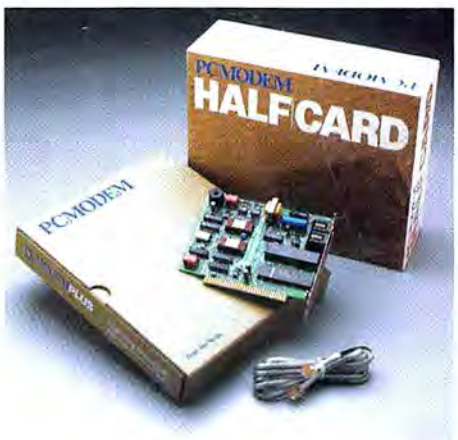

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