

PC WORLD

April 1985 \$2.95

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*The Comprehensive Guide to
IBM Personal Computers and Compatibles*

A Brighter Star?

MicroPro's WordStar 2000
has lots of new features, but
will it set a new standard?

**Special Report: The New
Breed of Data Base Managers**

Easy-to-Use Programs Reviewed

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Effortless Communication

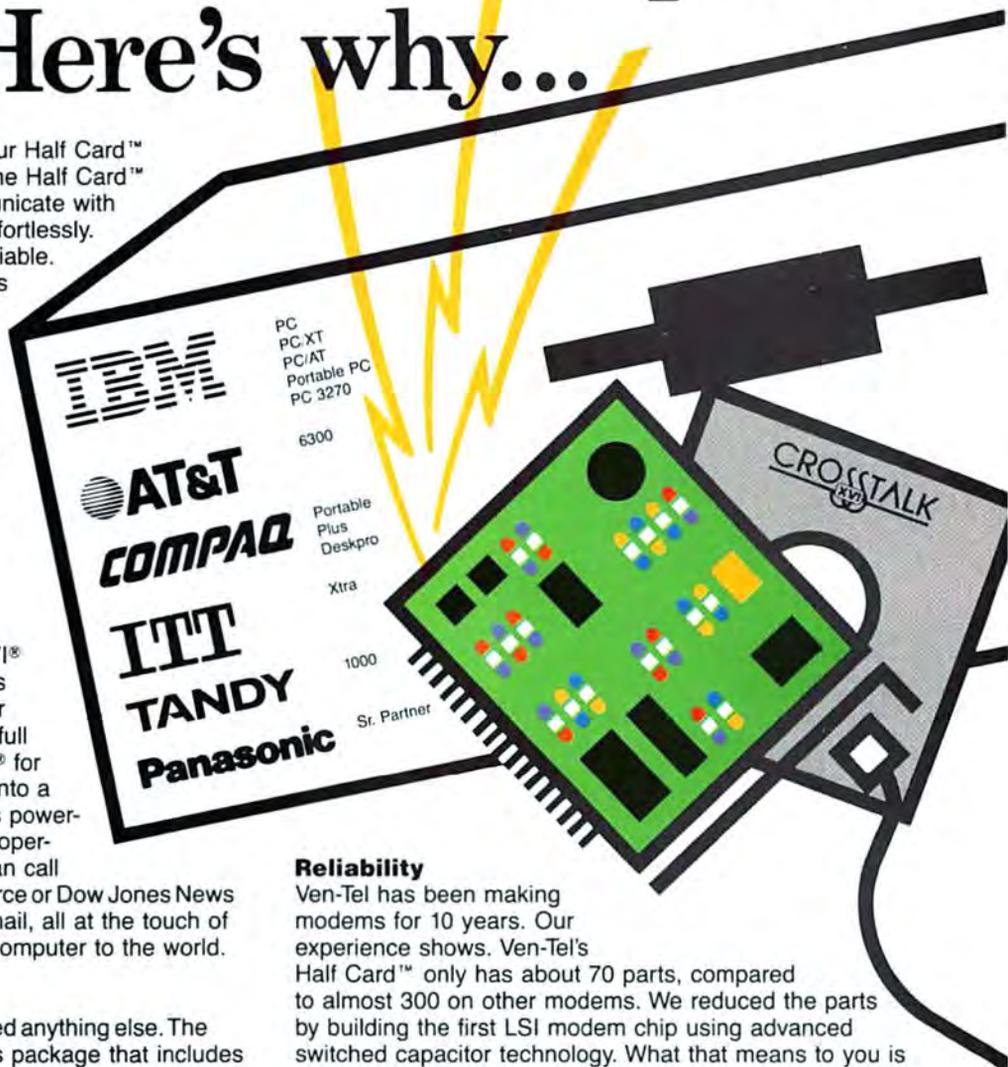
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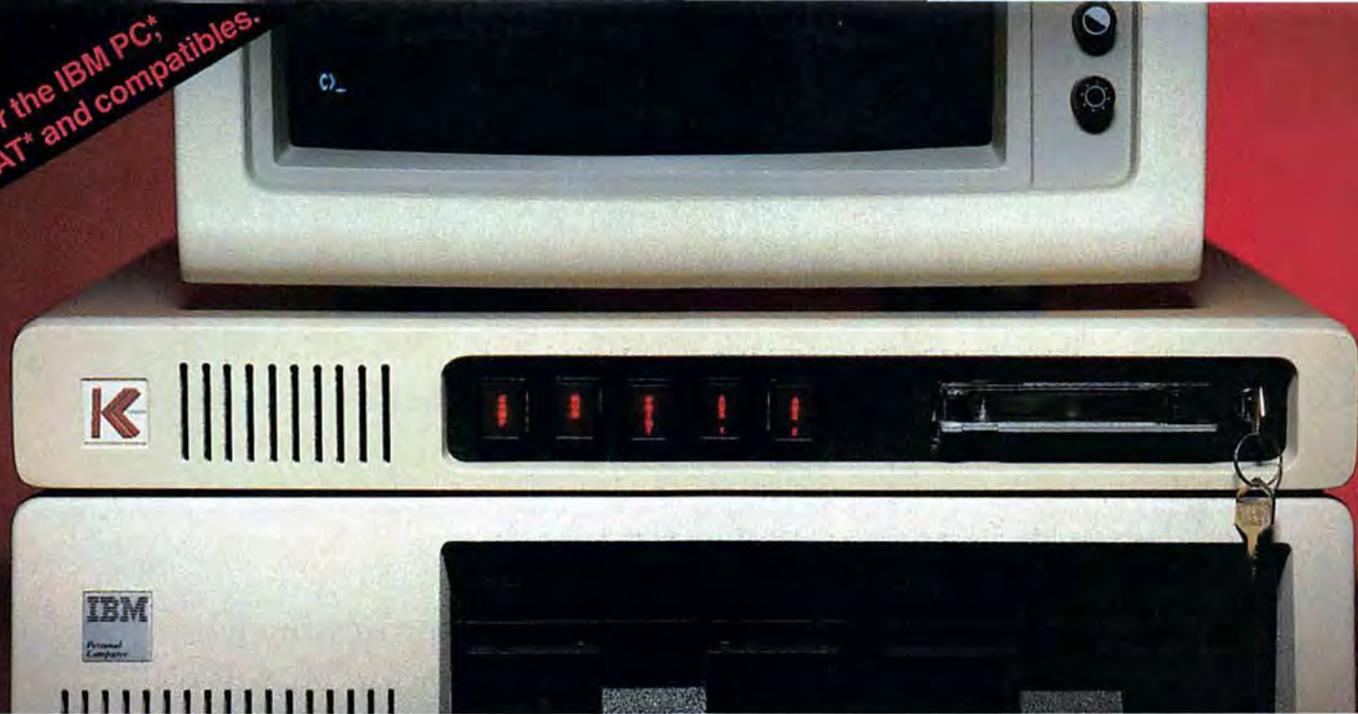


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Circle 683 on reader service card

PC WORLD

The Comprehensive Guide to IBM Personal Computers and Compatibles
April 1985



116 A Brighter Star?

WordStar, that word processing workhorse, has moved over for MicroPro's newly minted *WordStar 2000*. Although MicroPro hopes *WordStar 2000* will carry it profitably into the next century, this may be a case of too much, too late.



128 Easy to Relate

Power-base and ASAP's *Six* straddle the middle range of relational data base management software and strive to make difficult DBMS tasks easy to master.



178 The Myth of the Virtual Device

IBM muscles into the world of graphics with new graphics boards and displays and *GSS-Drivers*, a programmer's tool kit that promises to translate graphics commands for any output device on the market.

● Getting Started

- 52 Program Patchwork, *Alan Hoening*
Tinker with or fix (or ruin) programs with DEBUG.

● Community

- 76 Rx: Custom Software, *Michael K. Guttman*
A look at one prescription for software success.
- 86 Thinking Big on Silicon Prairie, *Ron White*
Texas researchers lay the groundwork for the computer of the 1990s.

● Review

- 116 A Brighter Star? *Terry Datz*
- 128 Easy to Relate, *Manuel Sotomayor*
- 136 Tunnel Vision, *Michael K. Guttman*
A data manager with more pizzazz than performance.

● PCjr World

- 168 WordStar for Jr, *Rick Altman*
The world-famous word processor comes to the PCjr.

● State of the Art

- 178 The Myth of the Virtual Device, *David McCune*
- 190 Hi-Fi Floppy, *Keith Yates*
With a PC and the CompuSonics DSP-1000 you can tailor recordings to your musical whims.

● Hands On

- 206 Upwardly Mobile dBASE, *David Jenkins*
How to upgrade your *dBASE II* command and data files to *dBASE III*.
- 216 Setting the Data Table, *Eric Weiss*
Can 1-2-3's Data commands meet your data management needs?
- 226 The Practical Portable, *Edward Fischer*
Tips and tricks to stay productive on the road.

Departments

- 11 David Bunnell
- 19 Ken Greenberg and Cindy Hamburger
- 29 Letters
- 40 PC World View, *Katie Seger*
- 61 The Help Screen, *Karl Koessel*
- 97 Compatibles Update, *Edited by Ken Greenberg*
- 150 From the Software Shelf, *Edited by Robert Luhn*
- 239 *.*, *Edited by Steven Cook*
- 265 Just Announced, *Seth Novogrodsky*

PC World Directory

- 301 A classified guide to products and services

Index

- 317 Advertisers

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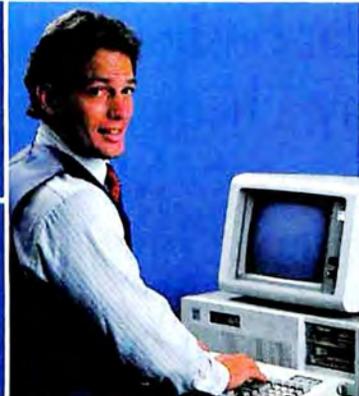
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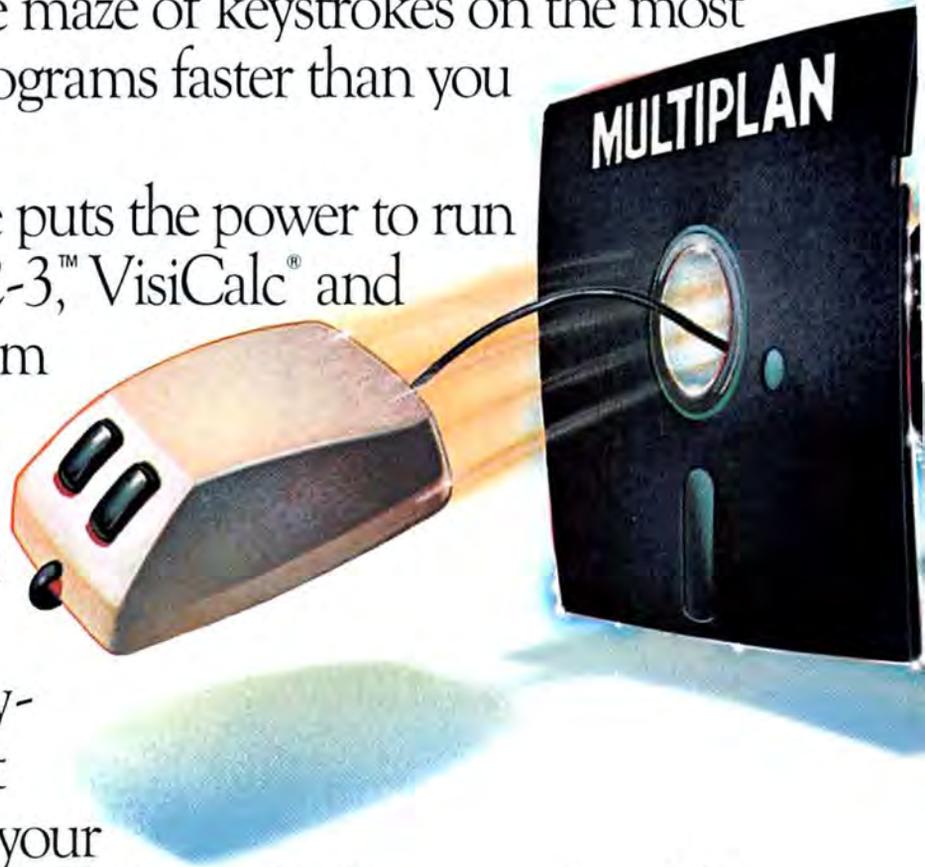
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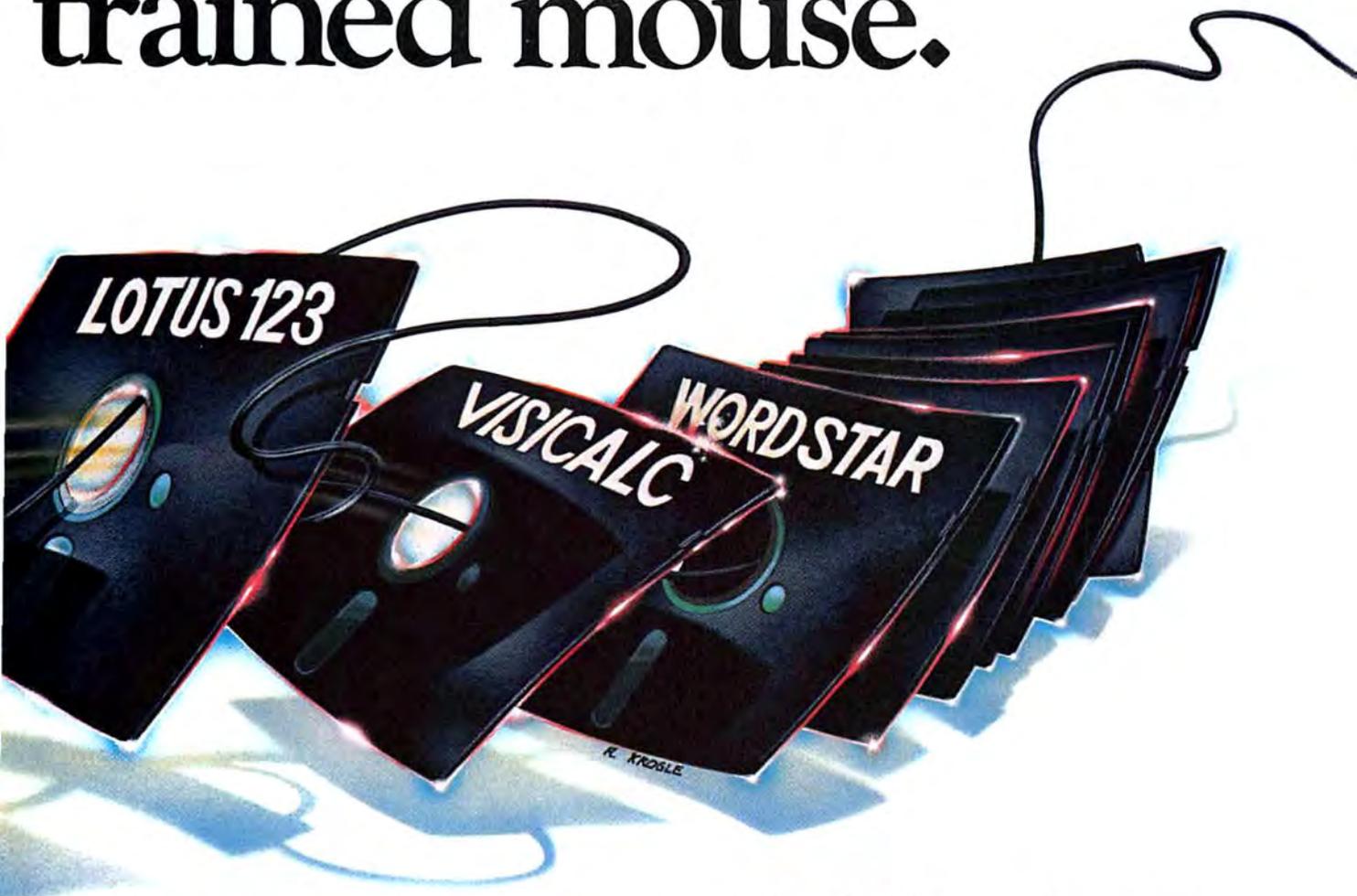
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A hand is shown from the bottom right, holding a large, black, three-dimensional cutout of the Microsoft logo. The logo consists of the word 'MICRO' stacked on top of 'SOFT'. The hand is positioned as if presenting the logo.

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The BMS programs work alone or as a team. You can start with one, such as General Ledger or Payroll, and add others later. Or, buy all at once. If you plan to own several, consider an IBM computer



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To learn more, see an IBM Product Center or authorized IBM PC dealer.

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like the PC/XT. It lets you store them, permanently, inside your machine. Very handy. Here's another tip. IBM's new Personal Decision Series (for spreadsheets, writing, graphing, etc.) can

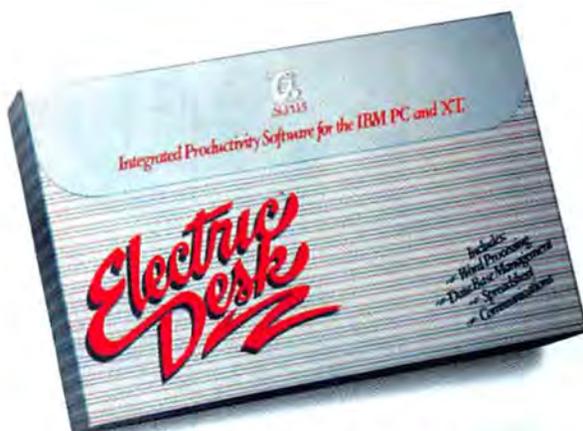
take information directly from BMS. Very, very handy. And ask about IBM Extended Support, a way to get software updates and telephone assistance, direct from IBM.

IBM
Personal Computer Software

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Fantasies of a PC Prophet



David Bunnell

PC World Publisher David Bunnell looks into the future of the personal computer industry.

The other day I overheard one of my colleagues complain about a seminar she was attending that supposedly taught how to predict the future of technology. She had no interest in the course but was elected to attend since we had paid a hefty registration fee. She stated that it was impossible to predict the future of technology, particularly in the personal computer business. I disagree—anyone can make predictions on any topic. It's the low rate of accuracy that gives us seers a bad name.

Since this is the April issue, it's the perfect time to have a little fun and consciously make a fool of myself. Our editorial staff has frequently toyed with the idea of predicting the future of personal computing, but with my publisher's prerogative, I'm taking the first shot. Although I was tempted to set the stage for the next ten years, my column isn't long enough, so here are some five-year projections for the personal computer industry:

By 1990 the shakeout will have taken its toll. A handful of start-up companies will continue to try to break into the personal computing arena, but new brand names won't sell. The leading personal computer manufacturers, as delineated in Figure 1, will control the industry.

IBM will continue to dominate the PC market but will not achieve the monopoly that other gurus foresaw. As its personal computer division becomes less entrepreneurial, Big Blue will begin to lose momentum. Banking solely on internal creativity, IBM will lose much of its inventiveness—and a large part of its potential market share.

The major new players in the marketplace will be the Japanese companies. Their late entry into the American market in 1986, fueled by a powerful 16-bit MSX home computer with a 2-bit price tag, will successfully recharge the home computer market and redefine low-end standards. Both Atari and Commodore will be forced to file for Chapter 11 in 1987, and their machines will be put on display in the Smithso-

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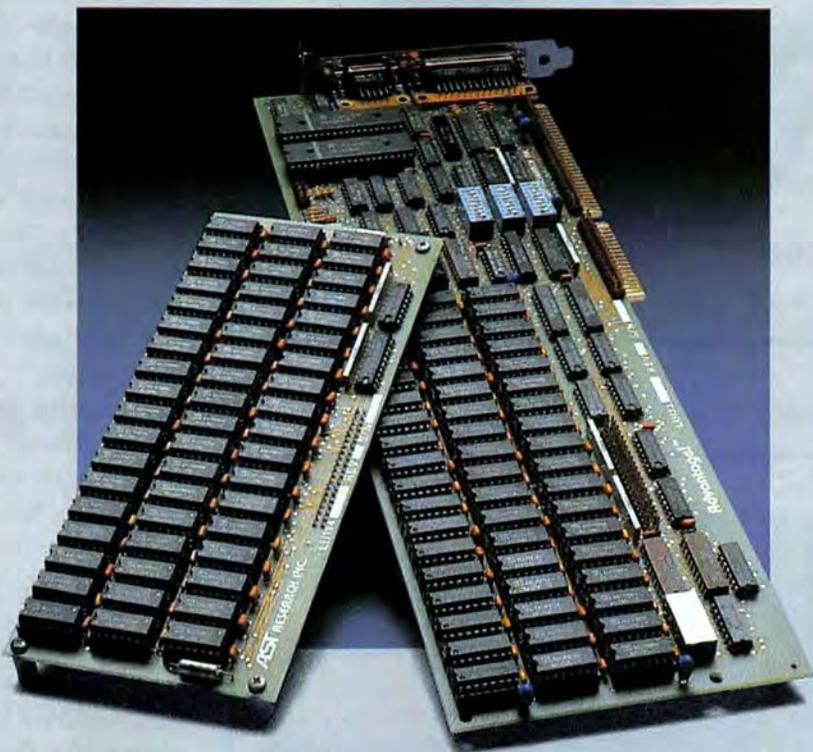
AT's high performance bus and faster program processing speed.

The I/O Advantage! Connect printers, plotters, mice and joysticks. Add a modem to tap into CompuServe[®], EasyLink[®], Dow Jones[®] and other information networks. Or with the appropriate software, connect other terminals and create multiuser environments.

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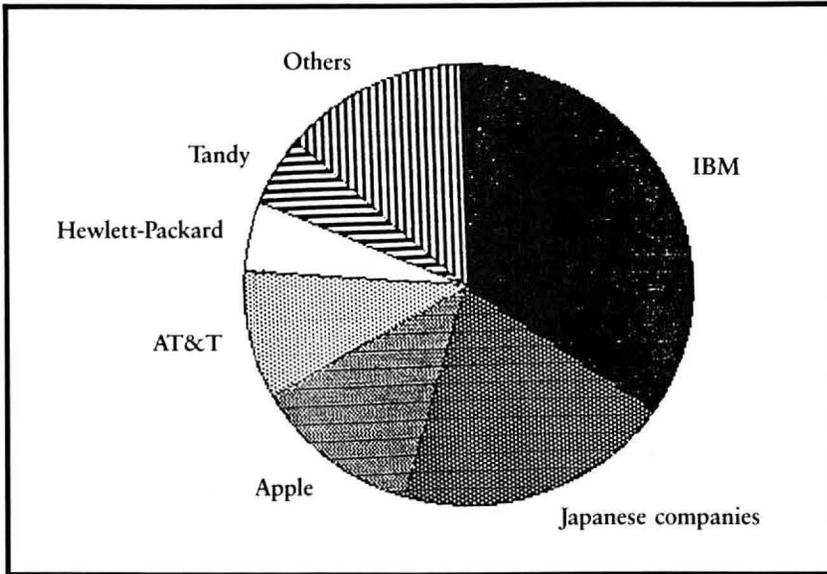


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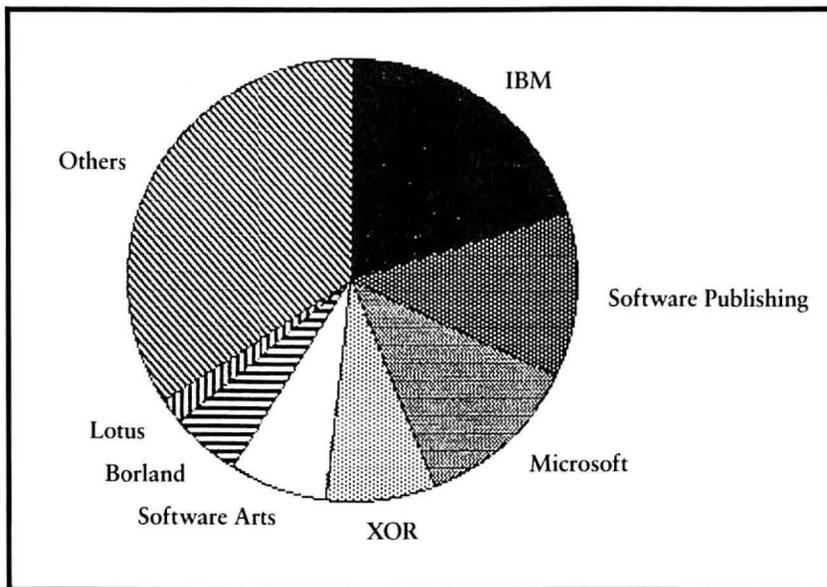


Figure 2

nian—next to the Altair. As a final historical injustice, Compaq Computer will be sold to Texas Instruments in 1988 and—because of its portability—will soon be misplaced.

On the other side of the coin, the software publishing business will have raged through a particularly bloody battle with few survivors (see Figure 2).

After a public boycott of impossible programs, Software Publishing will emerge as the big winner in software development. Their ease-of-use formula will prove to be an invaluable long-term strat-

egy. By 1986 any program that requires more than 30 minutes to learn will never make it to the shelf.

By continuing to diversify, Microsoft will generate enough best-sellers to maintain its dignity. And a few smaller companies will unexpectedly rise out of the software ruins: Upstart XOR will have made a name for itself with its *NFL Challenge* game and a subsequent series of successful simulation games. XOR founder Buddy Diamond will join Fred Gibbons and Bill Gates as one of the three richest people in personal computing.

During the first quarter of 1987, application software will seek out new frontiers in problem-solving techniques. Software Arts will knock Lotus out of the spreadsheet race with the introduction of an intelligent version of *VisiCalc*. *WordStar 2010* will be the king of word processors. MicroPro, however, will have folded six months prior to *2010*'s release, as this particular software becomes the first package to literally have a life of its own. Borland, the company responsible for *Turbo Pascal* and *Sidekick*, will continue to be the world's most innovative software publisher. And IBM, having gathered up the best of the entrepreneurial crop, will maintain an unsurprising first place with a 20 percent market share.

Software distribution will have developed into a lucrative sideline for the communications industries. Programs will be available via telephone, radio, and cable television.

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The Everex Hard Disk/Backup Systems Are Your Expansion Systems too...with little additional cost.

More Room To Expand, Not More Money

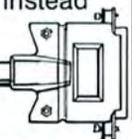
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New software supermarkets, dwarfing today's computer stores, will become a standard stop for the modern consumer.

The industry will be buzzing about the latest technology in read/write laser disks, which will replace both floppy and hard disk storage. This innovation and the ability to interface with it will give the Japanese and their enhanced MSX computers the opening they need to break into the U.S. market.

Standard CRT screens will begin to disappear as the new computer developers opt for advanced LCD flatscreens—available in both monochrome and color. The Japanese will also be responsible for

the advanced LCD technology—which will be spurred by the increasing evidence of health problems (particularly vision problems) associated with CRTs.

The magazine industry will continue to support personal computing with avid interest even though it has to cut back on several publications. In 1988 Ziff-Davis will startle the publishing community by announcing an electronic publication called *PC: Up to the Minute*. Wayne Green will reemerge as a publishing mogul with an extensive stable of ROM-based magazines that plug into lap-size computers. *Sports Il-*

lustrated will become the first magazine to be published on videodisc—an idea that will quickly be mimicked by *Hustler*.

In 1989 popular demand will force several of the big names in the industry to step down. Steve Jobs will retire as chairman of Apple, marry Brooke Shields, and start a chain of high-tech pizza parlors. Mitch Kapor will replace Ted Koppel on ABC's *Nightline*, and Philip Estridge will leave IBM to become chairman of Ford—in charge of its newly founded robotics division.

It's almost too easy to let your imagination roam over the prospective events of the next few years. The most comforting aspect of playing the prophet in this business is that most people don't track your predictions for accuracy unless you consistently prove correct. Although I don't intend these forecasts to be taken seriously, no one can definitely prove me wrong until the decade's over. And as the Jules Vernes of this world have shown, sometimes even our wildest dreams come true. ●

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"What causes *low resolutionitis*? Experts point to ordinary monochrome graphics cards with coarse, hard-to-read graphics. A bad case of eyestrain may develop if action is not taken immediately.

"Fortunately for me, a Hercules Graphics Card was nearby. A quick change brought soothing 720 x 348 graphics. That's twice the resolution of ordinary 640 x 200 graphics cards.

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"Including Microsoft Flight Simulator, now Hercules compatible!

"Oh, and don't forget that a parallel printer port is standard on the Hercules Graphics Card, not an extra cost option.

"Now, if you're worried about buying a new product that hasn't had all the bugs

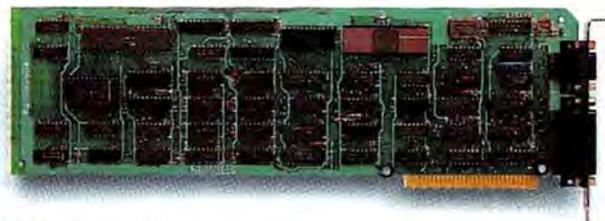
worked out, relax. Hercules has sold more monochrome graphics cards for the IBM[®] PC, XT[™] and AT[™] than anyone else in the world.

"So . . . you're convinced that you should buy a Hercules Graphics Card. Now, steer clear of cheap imitations. You may save a few bucks, but you won't get all of these five essential features which only Hercules has:

"1) A safety switch that helps prevent damage to your monitor, 2) the ability to keep an IBM or Hercules Color Card

in your system, 3) the ability to use the PC's BASIC to do graphics, 4) a Hercules designed chip that eliminates 30% of the parts that can go wrong, and 5) a two year warranty, because we think reliability is something you should deliver and not just talk about."

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Circle 77 on reader service card

The right network isn't a matter of choice. It's a matter of fact.

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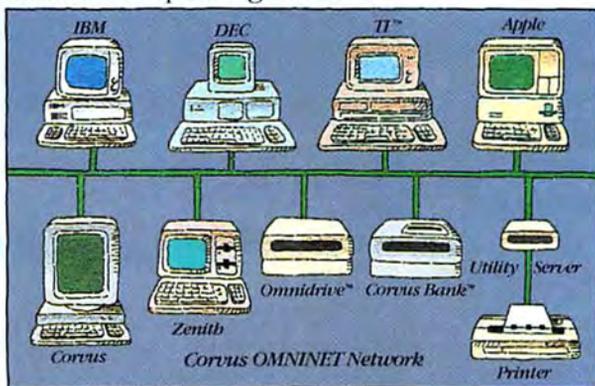
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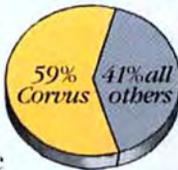
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All Data Bases Are Not Created Equal

*Ken Greenberg
and Cindy Hamburger*

To an even greater degree than an electronic spreadsheet, a data management program can be a superb managerial tool. A good data management package offers a quick and reliable means of storing, manipulating, and reporting information. A data manager can also generate new information in ways simply not possible without a computer.

Unlike the situation in the spreadsheet arena, in which 1-2-3 reigns supreme, the data management revolution is far from over. Indeed, there's ample room for dynamic new data management offerings. But the revolution persists also because of the universal nature of data management products themselves: the need to manage large quantities of data efficiently transcends disciplines and will only grow in importance as hardware capabilities increase.

In this month's "Review," "Community," and "Hands On" sections, we look at data management from a variety of angles. "Review" focuses on an approach to data management that is gaining momentum in the workplace.

The section highlights three offerings that bridge the gap between power and ease of use—a balance absent from the clumsy mainframe data base management systems (DBMSs) of old. Designed to appeal to the mainstream of American business, *Power-base* and *Six*—assessed in "Easy to Relate"—and *Infoscope*—evaluated in "Tunnel Vision"—are down-to-earth work tools for middle managers rather than playthings for programmers.

As noted in "Easy to Relate," data managers of this new type tend to be menu-driven, and although versatility and speed may suffer, most users are willing to pay that price if it means getting a DBMS they can have up and running almost immediately. Adding to their appeal, these products tend to be fairly economical, and some provide better report generation capabilities than does *dBASE*, the perennial market leader.

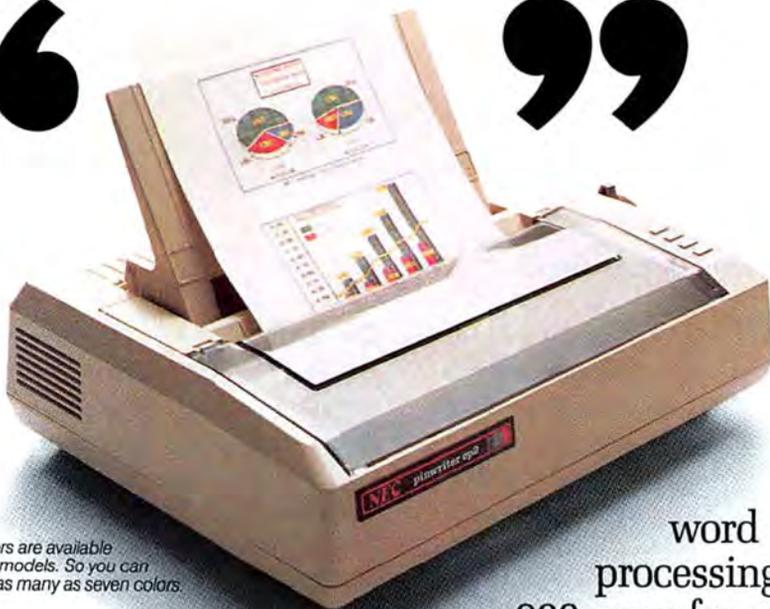
Not surprisingly, these DBMSs have shed some of the often obscure mainframe-style jargon im-

William Rodarmor

For business, the good news about data management software is that the software itself is becoming easier to manage. But as two PC World Editors observe, the challenge remains what to buy.

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“In the composition mode, I can type a letter or memo using common word processing commands. With the touch of a key, the text is sent to the printer.

“In the typewriter mode, I can print text on a line by line basis — just like a memory typewriter. It’s great for printing checks or addressing envelopes.

“In the forms mode, I can complete our own office forms using my pc and printer. I fill out the form on-screen, put the blank form in my printer, and hit the “print” command. The form is printed out — everything in place.

“ProType lets me take full advantage of my printer’s capabilities because it allows me to select any type characteristic my printer will support. If I want, I can even print my spreadsheet in bold-green-condensed-italics.

“ProType is fast and easy to use — it’s menu driven and has on-line help.

“Now that I’ve got ProType, I don’t think we’ll be buying any more typewriters!”

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ported by the first personal computer-based data managers. Yet today’s DBMSs come with their own lingo—the key words may be “scopes,” “zoom-links,” or “screen directories”—and it is far from certain that this new vernacular isn’t merely substituting new jargon for old.

New products are still judged according to traditional standards, and we’ve included a checklist that enumerates criteria essential to any good DBMS (see “A DBMS Compendium” on page 145). All DBMSs are not created equal, as the table indicates. As objective as you try to be, however, limitations are invariably as subjective as your needs: If your company is churning out 1200 armor-plated gizmos per month, for example, you’ll obviously have to bypass a data management system restricted to 1000 records.

It’s clear that the newest off-the-shelf data management packages can’t escape the ATTAP (All Things to All People) Syndrome—a condition characterized by asking perhaps too much of a commercial program. As companies define their data management needs and refine their expectations, the questions posed evolve from How can we adapt to this program? to How adaptable is the program? This emphasis on flexibility is at the core of “Rx: Custom Software,” a “Community” case study on creating software-to-fit with DataFlex, a highly malleable DBMS tool kit.

Malleability is no stranger to dBASE and 1-2-3; that capability may, indeed, be responsible for those programs’ success. In

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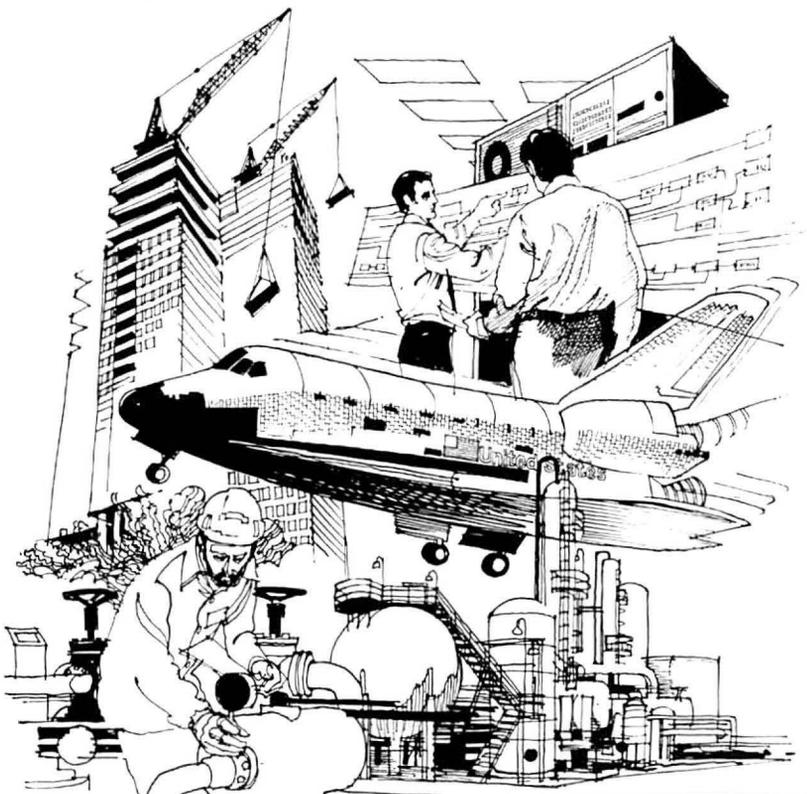
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“Hands On” we show you how to get more out of these stalwarts. Upgrading *dBASE* promises to be an increasingly common exercise during 1985; “Upwardly Mobile *dBASE*” gives you techniques that take the fight out of switching from *dBASE II*, Ashton-Tate’s popular DBMS, to *dBASE III*, its heftier, friendlier successor. While single-function data management packages grab the headlines, *1-2-3*, the top-selling integrated program, includes sophisticated data management features. “Setting the Data Table” guides you through *1-2-3*’s /Data functions and serves as a primer on generating various reports from a single data base.

And now a confession: we too have fallen into the ATTAP Syndrome. Surveying the field, we’re envisioning the Ultimate Data Base Management System—one that is effortless to use, driven by an English-language interface, relational but quick, tightly written but with a prodigious capacity, replete with graphics and statistical functions, generous with its report formats—and available for a song.

We’re still waiting. ●

Ken Greenberg is an Associate Editor for PC World. Cindy Hamburger is Editorial Manager.



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Letters

Reactions and responses from the PC World community



Reader Rates Survey

Your article titled "Executives Rate Their PCs" [PCW, Vol. 2, No. 10] is one of the best pieces of journalistic chicanery I have ever encountered.

I see that Arthur Andersen and Company is at it again. Its so-called survey reminds me of the time about two years ago when it sent letters to hundreds of non-IBM shops offering them a free audit of the EDP environment. Of course the audits revealed how ineffective and inefficient those shops were. Arthur Andersen to the rescue. It would come in and revitalize their environment—for a fee, of course—and sell IBM solutions requiring IBM computers.

It reminds me of the Lucky Strike commercials; but this time it's A-A-M-S-F-P—Arthur Andersen Means Self-Fulfilling Prophecies.

*James J. Spinelli
New York, New York*

Surveyor Rates Reader

We are flattered that Mr. Spinelli feels that our predictions can influence the direction of the multi-billion-dollar computer industry, but that is not the case. Executives contemplating purchases gather advice from many sources, but they always make their own decisions.

Mr. Spinelli does not seem to understand how a consulting firm stays in business over time. Favoring one hardware vendor over another would do nothing for our business. Satisfied clients—not hardware vendors—keep us in business. Because an overwhelming portion of American businesses use IBM hardware for their

applications, we often favor IBM solutions. Again, the clients make the decisions, not us.

The comments I have received from readers suggest that our survey confirmed what many had suspected: Micros are rapidly being acquired by American businesses, and they are helping companies compete.

*Robert Leach
Arthur Andersen & Co.
Los Angeles, California*

Hard Disks Without Software

The utility of the personal computer is in jeopardy due to the incompatibility of copy-protected software and hard disks. Until now, it was perhaps inconsequential that users always had to use a floppy disk drive to run their software. But volume production of affordable hard disks has arrived. What use is the tremendous speed and utility of a hard disk if software can't reside on it?

Software is ostensibly copy protected to prevent unauthorized reproduction and use. I suggest, however, that most of this software is not worth what is asked for it, and that the reason for copy protection is to present an image of something valuable. Inflated retail prices are needed to pay for expensive advertising.

We end up with a pile of disks, sore fingers, worn-out floppy disk drives, and a hard disk gathering dust. Perhaps software publishers should bundle a low-cost floppy disk drive with their software. Then we could all have a bank of 15 to 20 drives, each holding copy-protected software.

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

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

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

THE LA210 DELIVERS WHAT YOU NEED WHERE YOU NEED IT.

The LA210's system inde-

pendence is rivalled only by its general versatility.

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

But when your needs

change, so can the LA210.

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

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

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

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

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

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

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

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

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There's even a cut sheet

feeder to speed up correspondence on your letterhead.

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

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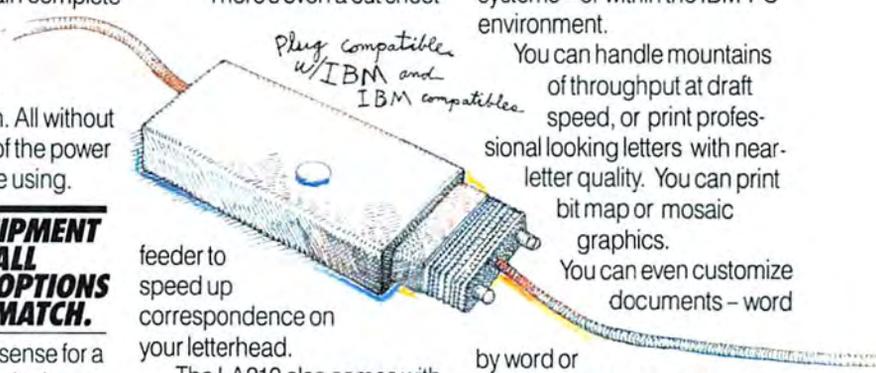
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Hard disks represent the expansion of computer technology as a whole. And if software remains incompatible with hard disks, the entire industry will suffer.

Dan W. Weller, Jr.
Silverdale, Washington

Fund Accounting

In the October issue the article "How to Choose an Accounting Package" [PCW, Vol. 2, No. 11] mentioned that there is special software for fund accounting. How we need this! We've found 1-2-3 and Peachtree Business Accounting Software to be less than successful at keeping track of expenses by fund grant. So where do we get fund accounting software?

Jack Ewing
Knoxville, Tennessee

There are only a few accounting packages available specifically for fund accounting. However, since each organization and each funding source generally has unique reporting requirements, I doubt that canned packages can meet the needs of every user.

If you can't find suitable off-the-shelf software, and you can't afford to have a consultant write a custom system, consider using a data base manager, rather than a spreadsheet, to keep track of your expenditures. With dBASE, for example, each expense entry could

have a fund field and a line-item field, which could be used for sorting or indexing for reports and inquiries. This approach might not be as elegant as professionally programmed software, but it would give you a lot of control over the system.

Without offering any recommendations, here are two fund accounting packages for the PC. PC-Fund is from American Fundware, Inc., P.O. Box 773028, Steamboat Springs, CO 80477, 303/879-5770. It costs \$1990 to \$7960 and requires 128K and a 10MB hard disk. Fund Accountant is manufactured by Computer Center, 366 U.S. Rt. 1, Falmouth, ME 04105, 207/781-2260. Its list price is \$6000, and it requires 128K and a 5MB hard disk.

—Michael Guttman

Omniterm 2

There was an error in the comparison chart in the article "Intelligent Communications" [PCW, Vol. 2, No. 10]. Larry Jordan indicated that Omniterm 2 does not have a capability for filtering control characters.

In fact, Omniterm 2 handles this problem by giving the user a complete set of translation tables for all 256 ASCII codes for each I/O device. This enables the user to set up the program to handle control characters in any manner desired. For example, if the remote computer sends a form feed, the user can set up Omniterm 2 to send the form feed to the printer but ignore it on the screen. We

have one customer who has set up his PC to act like a Hazeltine terminal by translating the received tilde and control character to a form feed to clear the screen.

I should add that Omniterm 2 does allow the user to return to the operating system without breaking the connection.

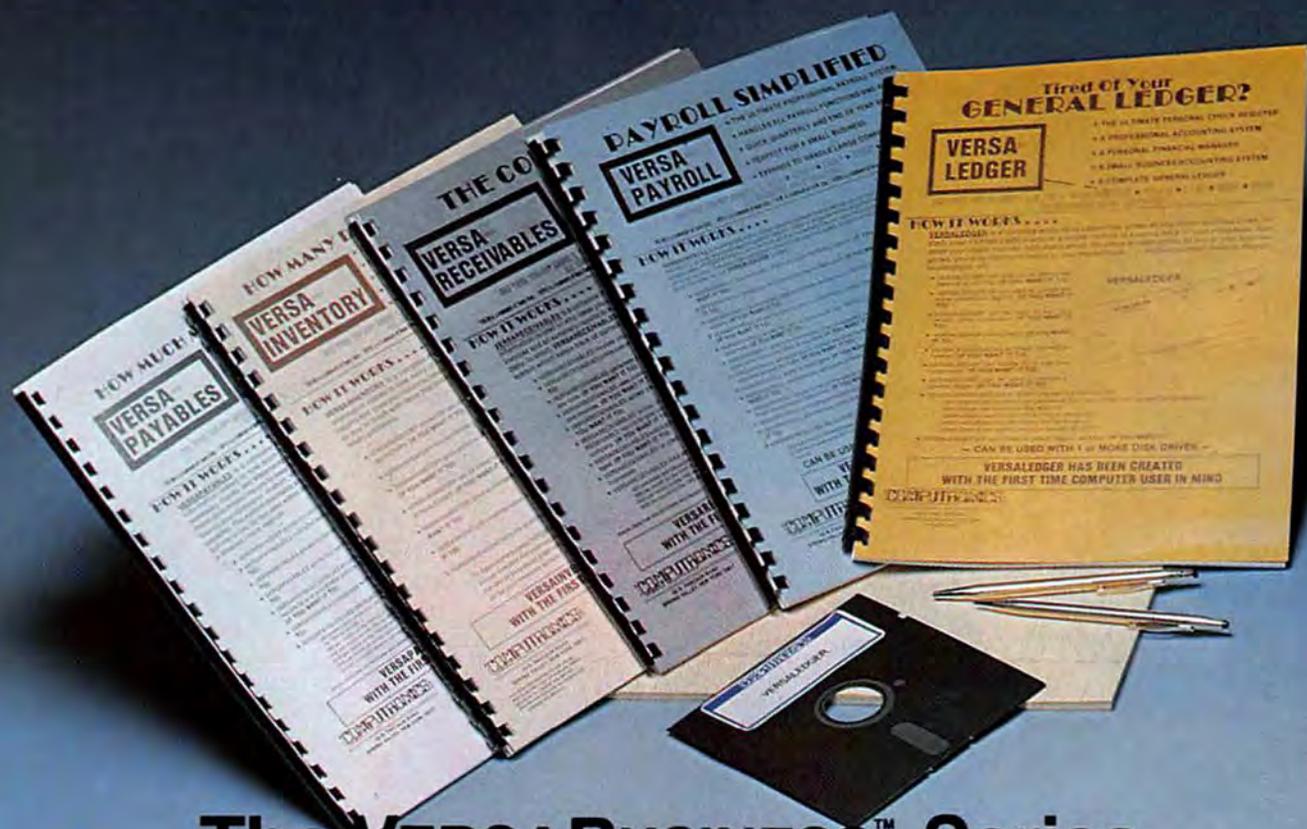
Mary Holmes, VP Marketing
Lindbergh Systems
Worcester, Massachusetts

Regarding the question of control-character filtering, Lindbergh Systems and I describe the feature in different terms. My definition of control-character filtering is the removal of control characters before they are sent to the PC display or a disk file. My definition of translation tables is the translation of specific received or transmitted characters to a predefined set of substitution characters. Omniterm 2 performs control-character filtering using translation tables rather than a global filter. This method achieves the same objective but requires significantly more user expertise.

Regarding the question of return to DOS without hang-up, Omniterm 2 does provide that capability, but the manual does not document the feature well. A hands-on test confirms that return to DOS does not break the telephone connection. Despite these few defects, Omniterm 2 software is an excellent, feature-rich package. —Larry Jordan

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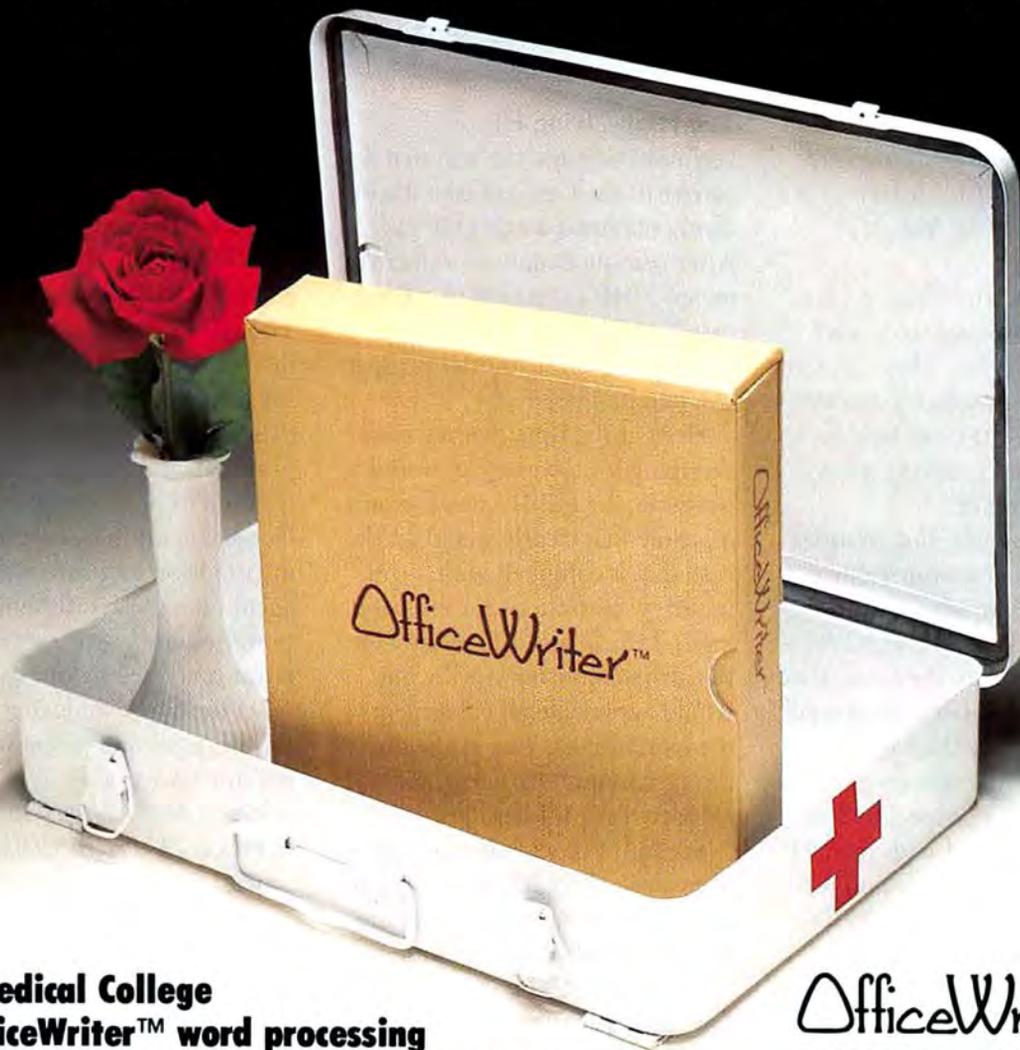
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More on dBASE III

I have some corrections to make to my review of *dBASE III* ["dBASE III," *PCW*, Vol. 2, No. 13].

First, I stated that Private variables are not available to lower-level command files. They are. Unfortunately, the manual's description of the Private command is ambiguous, and I initially misunderstood this point.

Second, I thought that in order to run a word processor from within *dBASE* (in place of the Modify command) the word processor had to be on the same drive as *dBASE* itself. I later discovered that you can place the word processor on any drive, as long as you tell DOS where to expect to find *COMMAND.COM* with the SET *COMSPEC* command from DOS. If DOS can't find *COMMAND.COM*, *dBASE* won't pass you over to the word processor. This information is not in the manual; it is documented in Ashton-Tate's *dBASE* notes, which are available from the company's hot-line service (213/558-0086).

Third, *dBASE II* allowed only 1000 bytes for memory variables. *dBASE III*'s default allows 6000 bytes for memory variables. But this can be modified in *CONFIG.DB* by the *Mvarsiz* variable to any number as large as 31K. This is documented in Appendix B of the user manual.

David Jenkins
Berkeley, California

The High-Flying HP

Cayman Airways, the national flag carrier of the Cayman Islands, recently obtained its first HP 110. After reading Danny Goodman's review, "HP's Desktop in a Briefcase" [*PCW*, Vol. 2, No. 13], I have a few points to offer prospective purchasers.

First, at the time that we were shopping for a battery-powered portable, the HP 110 was the only machine that clearly stated on the case that it complied with airline industry restrictions for emission levels. I think it is safe to say that the airline industry worldwide would appreciate all equipment manufacturers giving as much thought to aircraft safety as Hewlett-Packard has done.

Second, I've already run into occasions where 272K is not quite enough for a big spreadsheet unless the RAM disk is reconfigured.

Third, with *1-2-3* on a chip, how long will it be before *Symphony* is available? *1-2-3* and *MultiMate* are used most frequently in our company, but I haven't figured out how to transfer *MultiMate* into RAM and still have room left for RAM disk storage.

I've been using the HP 110 extensively on business trips. With 16 hours of operating time, I can take a three-day trip without the charger. The only drawback to in-flight use seems to be people stopping a spreadsheet at Mach 250 to ask about that little computer.

George Ure
Grand Cayman, British West Indies

Credits in Hollywood

In "Hollywood PC" [*PCW*, Vol. 2, No. 13], Eric Brown and John Faulkner credit me exclusively with the design of the *1-2-3* budget template we currently use. Though I gave some small practical assistance initially and have subsequently made some changes to suit my preferences, the template remains substantially the creation of production accountant Douglas Burdinski, currently serving as Orion Pictures' accounting agent on a theatrical film production. Because of the surprising interest generated by our use of *1-2-3* for movie budgeting, Mr. Burdinski should properly be credited for his work.

Kevin McLaughlin
Orion TV Productions
West Los Angeles, California

Correction

In the February 1985 issue we listed the telephone number for Rapport Corporation incorrectly. The correct number is 801/292-9454. We regret the error.
—Ed.

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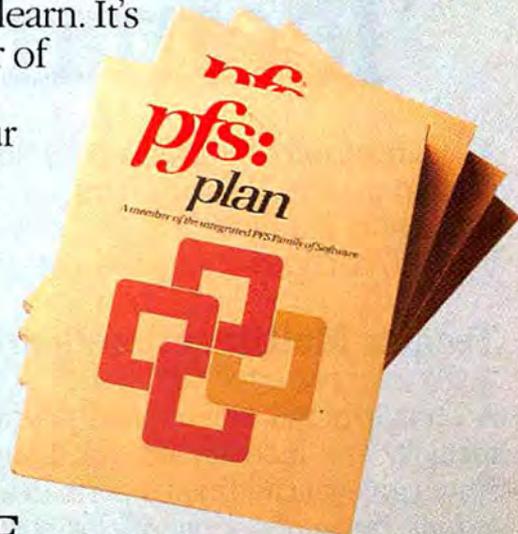
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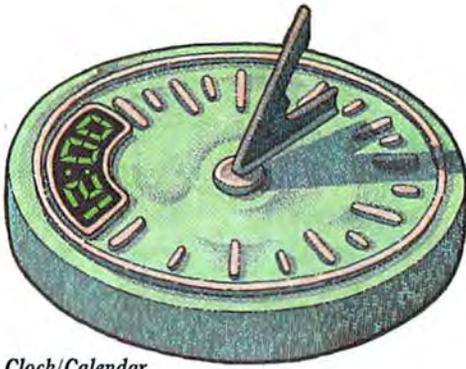
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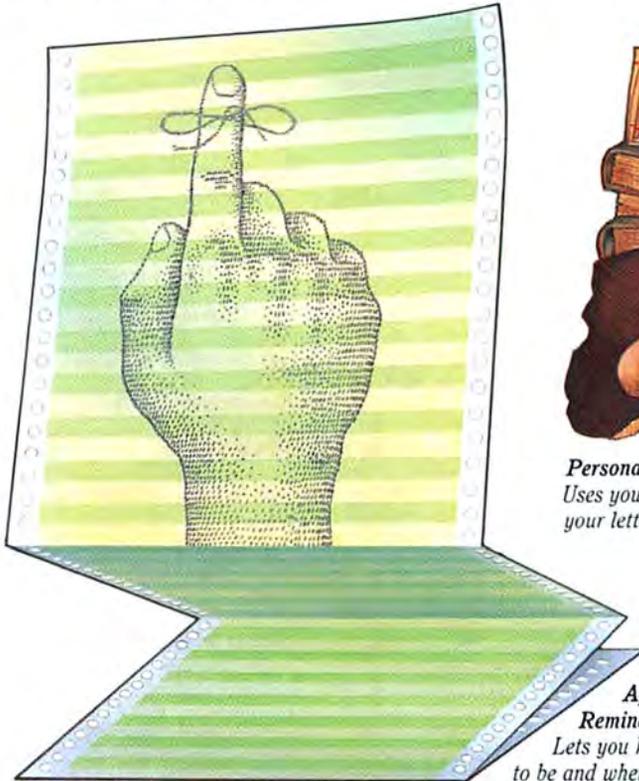
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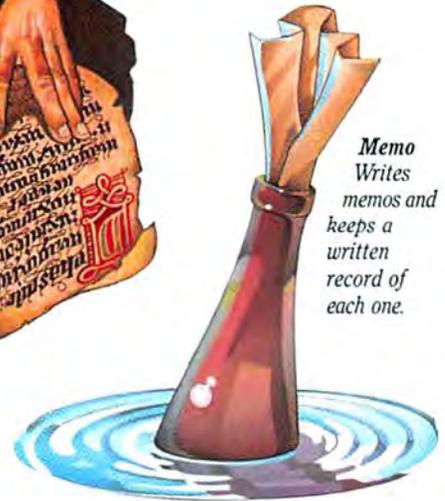


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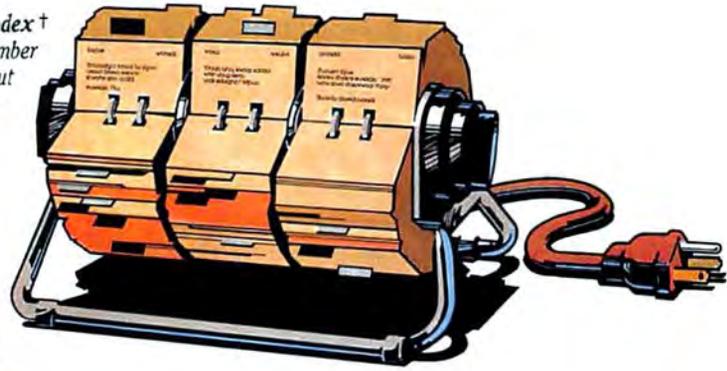
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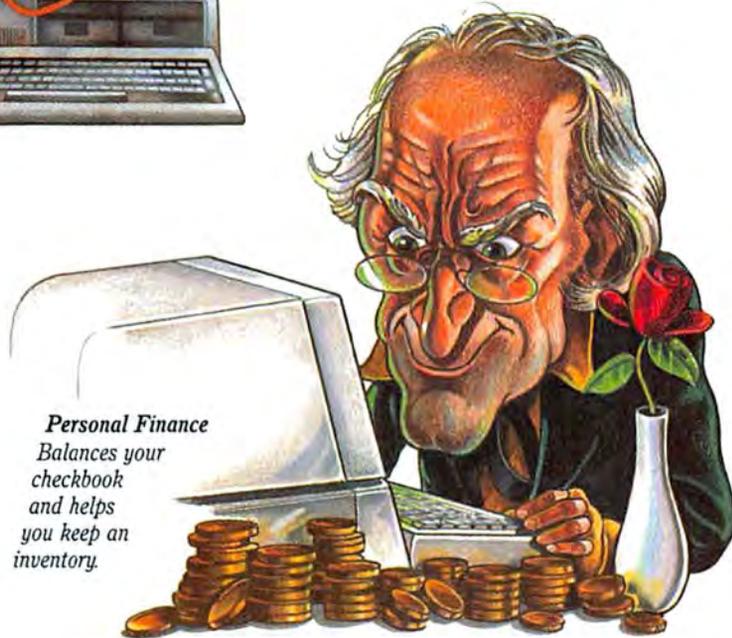
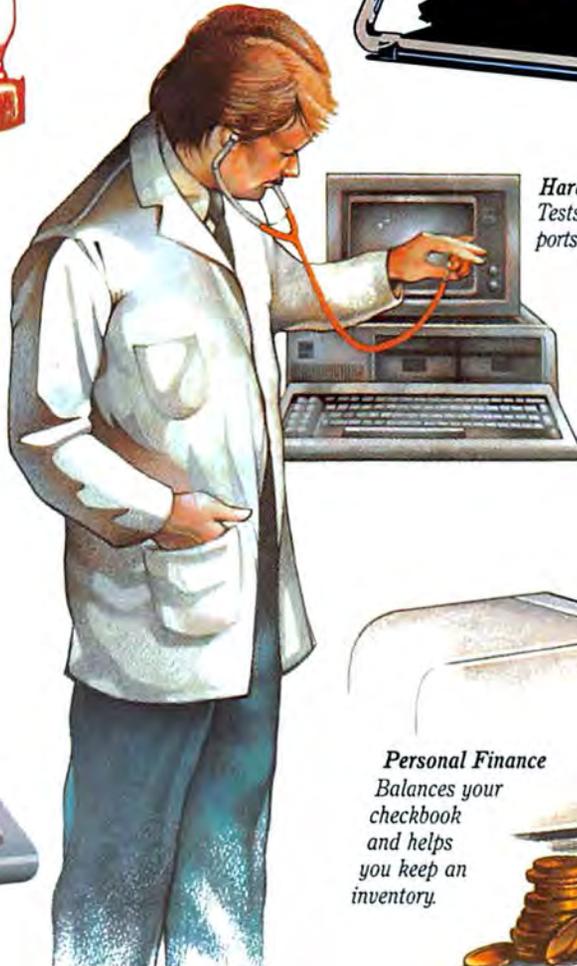
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PC WORLD

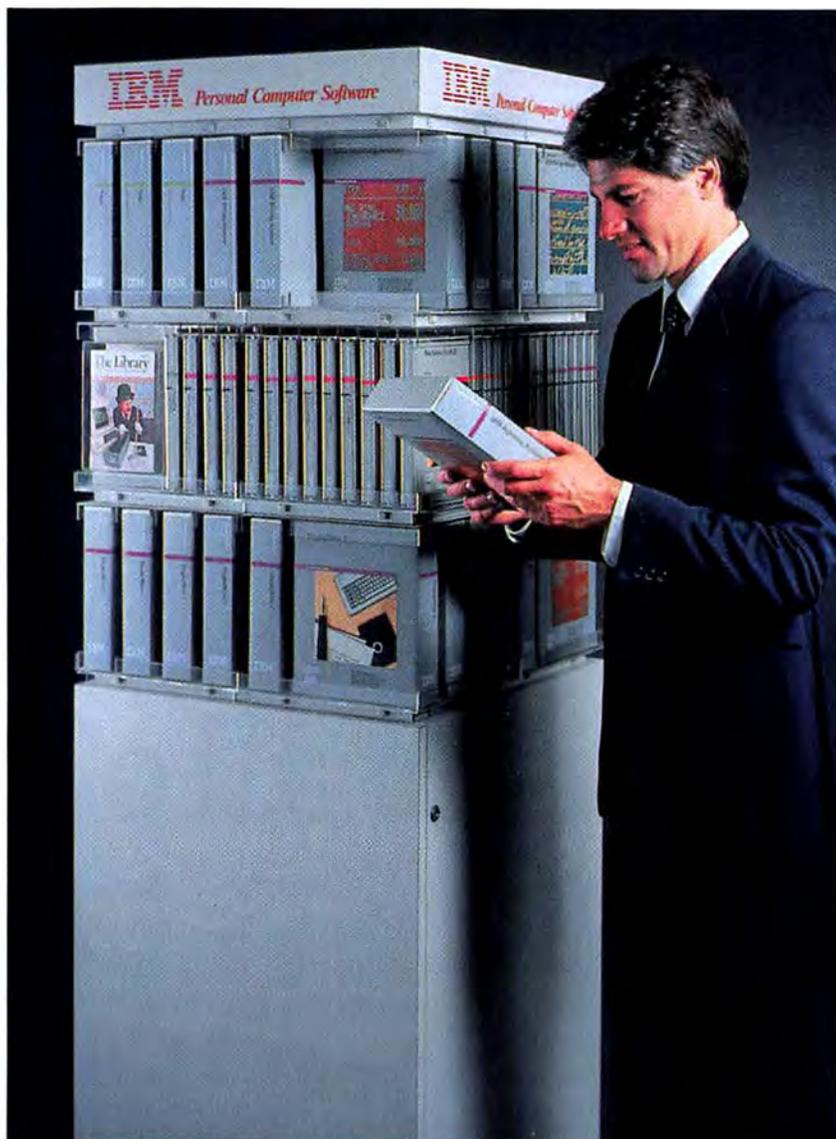
Big Blue's News

IBM is pushing its software—hard. A new distribution and display plan may change marketing patterns in the software industry.

IBM's latest customer-grabbing, eye-catching ploy is a kiosk floor display, imaginatively dubbed the "Software Showcase." These monoliths are but another sign that Big Blue is in the software market to stay. The Showcase program, which began last fall, is being extended to the more than 1900 authorized IBM dealers. Participating dealers receive up to 70 IBM software packages but pay only when they reorder—an advantage for dealers who want to get

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

—Katie Seger



An IBM Software Showcase kiosk

View

News and notes for the computing community

up and running with IBM software quickly. The most expensive software collection in the kiosk costs \$15,800.

IBM spokesperson Rick Scott says that most of the Showcase programs are recent IBM releases, such as *DisplayWrite 2* and the *Business Management Series*. Participating dealers can choose from four software bundles that include business, vertical market, education, and entertainment programs. Dealers are required to restock all software as it is sold.

The Showcase program is a departure from standard retail billing practices. Most software companies send programs C.O.D. to small independent retailers and bill larger dealers, chain-store buyers, and distributors on a 30- or 60-day basis.

To ComputerLand's Bob Frey, director of product marketing and merchandising, IBM's unique approach reflects both changes in the industry and IBM's desire to expose its products more prominently. "The market is in transition from being hardware-driven to being software-driven," says Frey. IBM's scuffle for floor space is also likely to push other software vendors to follow suit in some modified form, he says.

Software Showcases will also be sprouting up in Inacomp Computer Centers. Russell Smith, Inacomp's vice president of operations, says that the quasi-consignment software plan ensures that IBM programs get shelf space. Smith thinks that the plan will succeed because of IBM's traditionally strong dealer support and the horde of customers who feel secure with the IBM label.

Larger software houses will follow IBM's lead, according to Paul Schuman, Businessland's software product manager. "The major players, the Microsofts and the Lotuses, will have to adopt this approach." However, Schuman doesn't foresee a market-share decline for independent software firms. In fact, he says, independent firms "may cement their positions in the marketplace" by copying IBM's distribution plan. Schuman predicts that the software market will benefit under such a consignment plan.

Independent software vendors acknowledge the seriousness of IBM's marketing ploy, but few think that the new program will force the software houses to change their distribution practices. Marty Taucher, Microsoft's senior public relations manager, views the Showcase program as "very aggressive" but says the plan could

backfire if retailers don't meet payment deadlines. Without such pecuniary incentives, "dealers don't have any reason to sell the products."

One smaller company that will certainly feel the heat is Alpha Software, producer of *Electric Desk*. Vice President Selwyn Rabins is not ignoring IBM's challenge. "Nobody can outmuscle IBM in distribution power," says Rabins. The only way independent software houses can remain competitive is to "produce better, more innovative software and bring it to market quicker than IBM," he says.

Though no one disputes the sales appeal of the IBM logo, Big Blue will have to counter its competitors' name-brand recognition and loyal user base. Toby Hufham, president of The Ad Works, Microstuf's advertising agency, doesn't think that IBM's plan will hurt the big independent software houses. "People won't replace *Crosstalk* or *dBASE II* with an IBM program," Hufham says. "Even with IBM's horsepower, the plan won't knock these vendors out of the ring."

Floppy Disk Jockeys



The "Top Ten" may never be the same. In a move that looks like it could open up a new—and free—software distribution channel to microcomputer users, the Federal Communications Commission (FCC) has ruled that AM and FM radio stations can use their main channels to broadcast computer data. Until now all radio data broadcasts (used mostly by banks and other institutions) have been transmitted over FM "sub-carrier" channels that can't be picked up by normal radios.

The FCC ruling came at the request of Microperipheral Corporation, a Redmond, Washington, company that has developed the "shuttle communicator," a modemlike device that attaches to

a radio and can download information to a computer. The \$69.88 device translates analog radio signals into digital form at the rapid pace of 4800 bits per second.

Microperipheral developed its shuttle communicator to accommodate a weekly half-hour radio show the firm is producing. Tentatively titled "Download," the show will dispense public domain programs along with computer news and information. At press time a distribution schedule for the nationwide syndication of the radio show was not yet formalized.

When You're Hot, You're Hot

Comedian David Steinberg was the big winner at the second annual Hot List Awards, a black-tie-optional ceremony held during COMDEX. Master of Ceremonies Steinberg interjected some much-needed humor into the Softsel and *Business Week*-sponsored awards show—a show that, as one attendee complained, "makes Hollywood's Oscar telecast look like a thrilling, fast-paced extravaganza."

Mitch Kapor and Lotus Development Corporation walked away with five awards during the evening, but it was Steinberg, with lines like "Reagan's image is that of a senile cabbage patch doll," rather than the winners' speeches, who kept the audience awake.

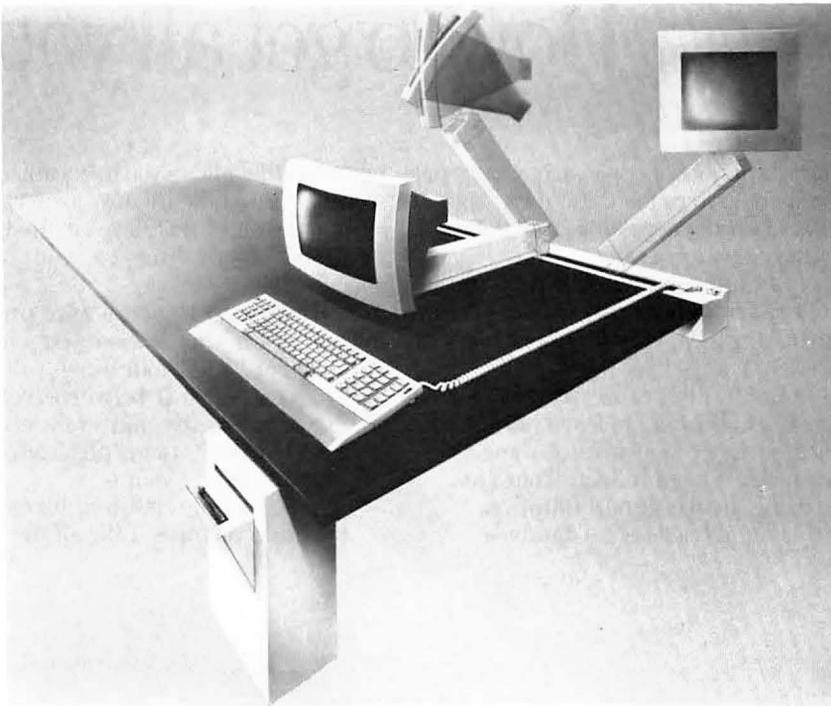
The crowd patiently sat through award presentations for such achievements as Overall Best Seller and Best-Selling New Product in a Hot List Category (business, recreation, education). But no one seemed to care who won some of the stranger awards, such as Most Unusual Name for a Serious Product (*Mac the Knife* from Miles Computing).

Maybe next year Softsel and *Business Week* will forgo any attempt at razzmatazz, announce the winners at the start of the show, and then let Steinberg do his nightclub act. With that strategy, at least fewer people might slip out the back door.

Birds of a Feather

How do you get Ferdinand A. Porsche, of sports car fame, to design a computer workstation for you? Michael Roberts, president of Australia's Time Office Computers, says all it took was a phone call. Roberts says Porsche was intrigued with the idea of designing a large systems terminal; the result of his labors is the Emu (see photo).

The workstation features some attractive ergonomics, such as a monitor connected to a movable arm that allows more positions than the *Kama Sutra*. The Australian Taxation Office took an immediate liking to the terminal, placing a \$15 million order shortly after the Emu was unveiled in Sydney.

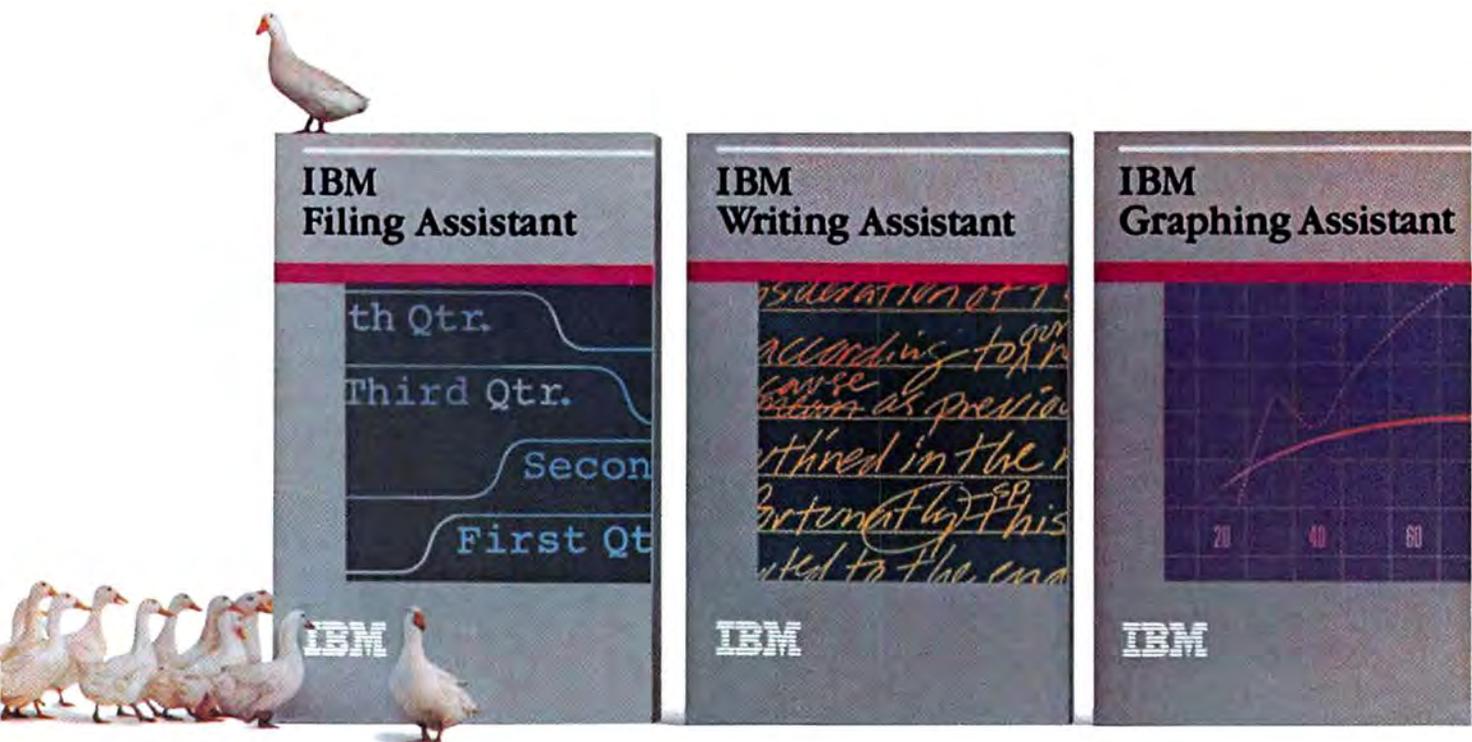


The Emu, designed by Ferdinand A. Porsche, has some attractive ergonomic features.

PCs Scrub Up

Eagle-eyed Karl Koessel, *PC World's* Technical Editor, noticed a Compaq and an Apple IIc computer in news shots of artificial-heart recipient William J. Schroeder's operating and intensive care rooms. Our search for further information led us to Symbion, a Salt Lake City medical device manufacturer. Frank Maguire, Symbion's manufacturing manager, told us that the Compaq and the Apple alternated as peripheral devices for the Utahdrive Heart Controller. "The Utahdrive takes in clean, filtered air and pumps it into both the left and right sides of the artificial heart," he explained. The pumped air drives the heart.

The Apple and the Compaq are part of Symbion's COMDU (cardiac output monitor and diagnostic unit). The computer in no way controls the artificial heart, Maguire stressed. Instead, the computer simply monitors the Utahdrive Heart Controller by measuring the cardiac output—the amount of air delivered to the heart over time—and the stroke volume—the liters of blood per minute pushed through the heart.



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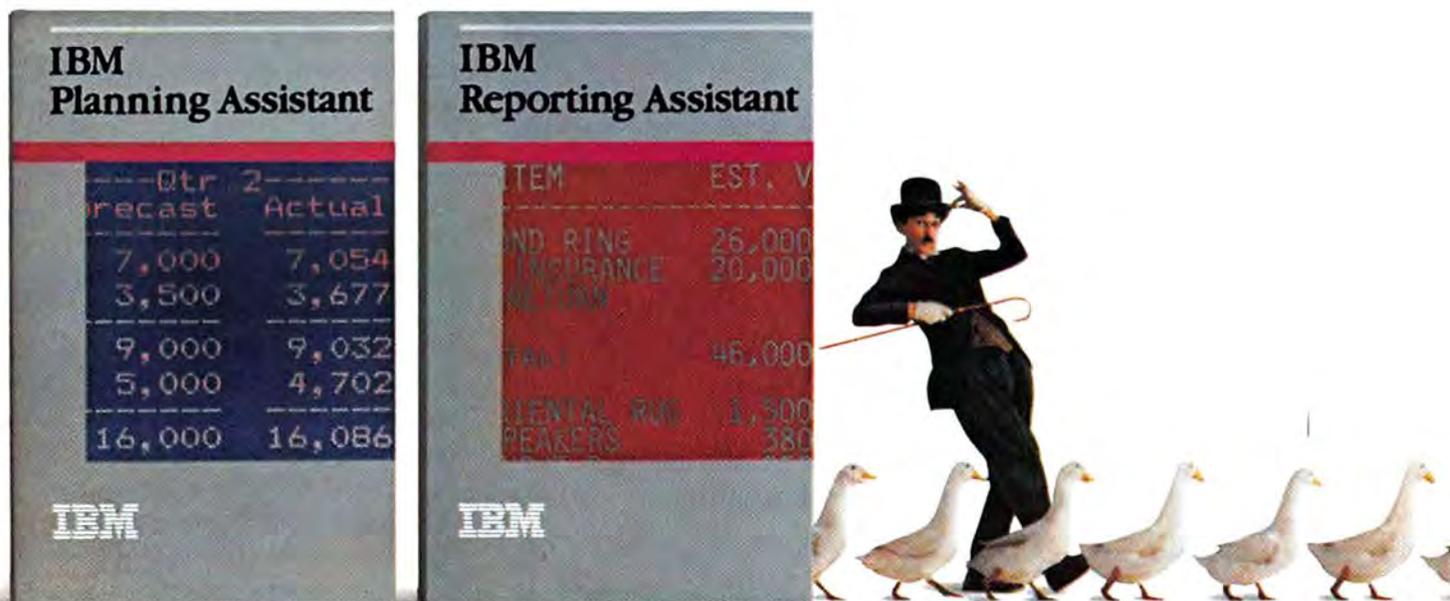
Filing Assistant is a database

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ducks in a row.

tants, it accepts information from the keyboard, or directly from Filing Assistant. So you can see what the bottom line looks like as a pie chart, a bar chart or a line chart. Or all three. In minutes.

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Flash! Trash!



Persoft's tongue-in-terminal approach to selling software

PC World is, not surprisingly, flooded with thousands of press releases every month. Some are interesting and useful. Some are educational. Many wind up in the dumpster.

Since P.R. firms naturally don't want their efforts to end up in recycle heaven, they have developed "concept" press releases. These information sheets usually come with something sufficiently bizarre, cute, or eye-catching to cause even jaded journalists and editors to wake up and take notice.

Unfortunately, these concepts don't always get the intended messages across. Take, for example, two recent efforts from Persoft. Both releases extol the glories of the company's *SmarTerm* series of terminal emulation/file transfer

software. One press release notes, "Persoft has recycled a DEC VT100 terminal into a high-tech aquarium." According to the second press release, Persoft has converted the DEC terminal into a "huge cookie jar."

Both releases featured attractive photos that caught our eye (see photos). However, Persoft couldn't leave well enough alone. Stapled to the first release was a bag of goldfish crackers, while the second release was accompanied by two forlorn, shrink-wrapped chocolate chip cookies.

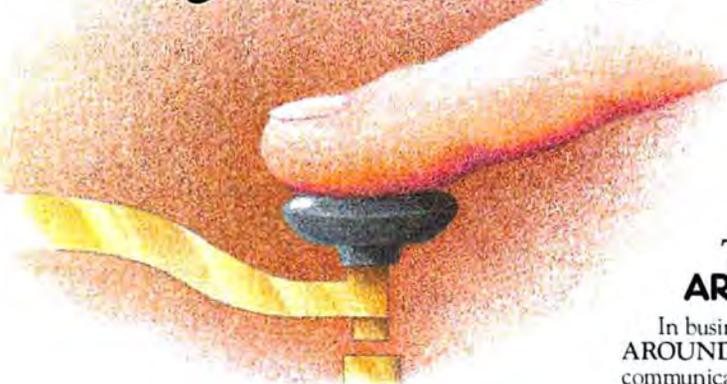
The U.S. Postal Service is not kind to unprotected food sent in thin envelopes. Given the precarious state of the software business, we hope other companies will drop their cookie money into the R&D jar, give their employees raises, or perhaps write out checks to local charities.

Grapevine

A ComputerLand PC? How about a Businessland XT? If OSM Computer Corporation of Mountain View, California, has its way, the company will market its PC compatibles—labels off—to several major retail outlets. At the moment OSM is marketing its computers through OEMs; however, the company is talking to major retailers like ComputerLand and Businessland in the hope of breaking into the retail channel in a different fashion. According to a source at OSM, the company is apparently offering retail computer chains the chance to sell their "own" PC compatibles under their house label. Another strong incentive to carry the OSM line is its 50 percent profit margin, almost double the industry norm—which OSM can offer because it manufactures the machines overseas.

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

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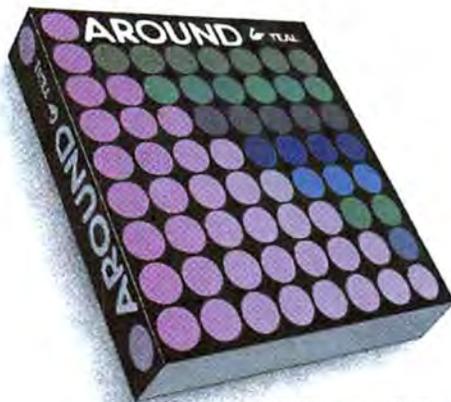
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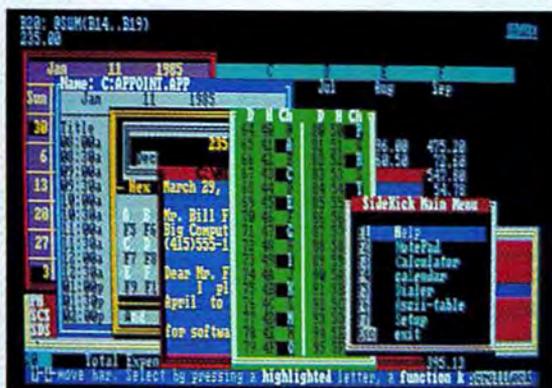
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InfoWorld Report Card - 1984 by Popular Computing, Inc., a subsidiary of CW Communications Inc. Reprinted from InfoWorld, 1060 Marsh Road, Menlo Park, CA 94025.

Jerry Pournelle, BYTE: "If you use a PC, get SideKick. You'll soon become dependent on it."

Garry Ray, PC Week: "SideKick deserves a place in every PC."

Charles Petzold, PC Magazine: "In a simple, beautiful implementation of WordStar's block copy commands, SideKick can transport all or any part of the display screen (even an area overlaid by the notepad display) to the notepad."

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Program Patchwork

The DOS utility DEBUG is a sophisticated programming tool, but you don't have to be a hard-core hacker to take advantage of it. With a few simple steps, you can use DEBUG to customize off-the-shelf software to suit your whims and hardware.

Alan Hoenig

It's hard to believe, but the time will probably come when you discover that the slick software you've outfitted your computer with isn't perfect. The problem might be an irritating error message or something more serious, like an inability to work with a new peripheral. When that happens, don't panic and don't give up; right within DOS is a program that may give you the power to fix the problem. The DOS utility DEBUG allows you to customize, or *patch*, commercial programs that don't suit you. Learning how to make those patches doesn't take long.

Here's a case in which a patch was necessary. I have a Hercules monochrome display board installed in my PC; recently I tried using the popular *MultiMate* word processing program, and it wouldn't work. A quick call to *MultiMate*'s publisher revealed that the program seeks hardware connections slightly

different from those on my alien (non-IBM) board. Fortunately, the company had already researched the problem and found that making a small patch with DEBUG solved it. The program was up and running in no time.

Software companies won't always have the right patch at the right time. Fortunately, there are other sources. Patches to streamline the operation of popular software packages can often be found on electronic bulletin boards, at user groups, and in computer magazines. *PC World*, for example, publishes patches in the *Help Screen* and **.** columns. This article will show you how to make those patches.

The Language of DEBUG

Patches are usually implemented by making small changes in the program file, which is coded in *machine language*. Machine language is based on eight-digit binary numbers called *bytes*. To make reading these strings of 0s and 1s less confusing, DEBUG represents these bytes as two-digit *hexadecimal* numbers. Before you use DEBUG you must become familiar with the basics of hexadecimal arithmetic.

Our own decimal system uses 10 digits, due to the biological accident that our ancestors had 10 fingers to use as counting tools. A computer works with numbers as if it had 16 fingers, and that hexadecimal

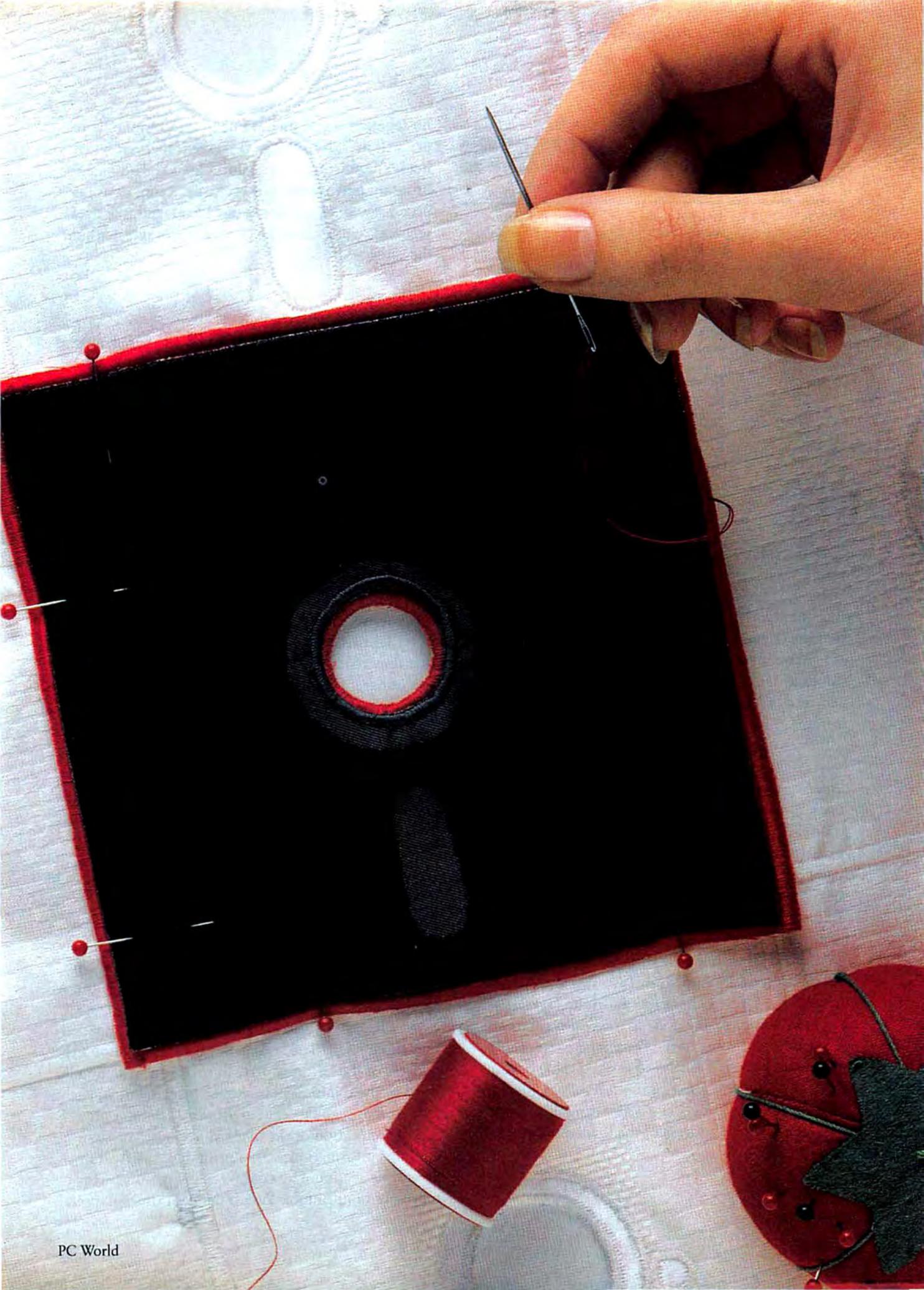


Table 1: The basic DEBUG commands

Command	Use	Syntax
Dump	To display the contents of the file	d <i>address</i>
Enter	To overwrite bytes in the file	e <i>address list</i>
Search	To find the text to be changed	s <i>range list</i>
Write	To write alterations to disk	w
Quit	To quit DEBUG and return to DOS	q

system requires 16 digits. To save the sanity of printers and typographers, those digits are given conventional labels, namely 0 through 9, which retain their standard values, and A through F, which represent the decimal values 10 through 15.

You must give addresses, offsets, and some byte values to DEBUG in hexadecimal form. DEBUG uses addresses to locate information within a computer's memory, much as the U.S. Postal Service uses your address to find your house. Each address in DEBUG is written in two parts. The first part is the *segment address* of the byte; it tells DEBUG the location of the block of memory, or segment, that holds your program. The second part of the address, separated from the first by a colon, is called the *offset*. It tells how many bytes away from the beginning of the segment the byte is located. For example, an address like 108F:0100 indicates a location 100 bytes into the segment that begins at the location noted as 108F.

When specifying an address for DEBUG, you generally give only the offset. If you've looked through the DEBUG instructions in the DOS manual, however, you probably noticed the code *cs:* preceding offset values in some of the command examples. Specifying *cs:* tells DEBUG to use the value held in the *code segment register* of the computer's memory as the segment address. The code segment register holds the segment address of the loaded program. If

no segment is specified, most of the commands you use will default to the *data segment register*, which holds the starting address for a loaded data file. For program patchwork, however, specifying *cs:* is not necessary, since with only one file loaded, the data segment register and the code segment register hold the same address.

DEBUG Commands

You'll find DEBUG.COM on the Supplemental Program disk that came with your original DOS package. To patch a file with DEBUG, start by typing **DEBUG filespec <Enter>** at the A> prompt. The *filespec* tells DEBUG the file you want to work with. It can be ornate if necessary, including the disk drive designation, the path, the file name, and the extension, as appropriate. If the file DEBUG.COM is not in the default disk drive, you must type the disk drive designation before the word *DEBUG*. When you press <Enter>, DEBUG loads the contents of the file you named into the PC's memory, beginning at offset 100. When you see the hyphen prompt, DEBUG is ready to accept a command from you.

DEBUG commands consist of single letters (either uppercase or lowercase), often followed by a series of parameters. You execute a command by typing it and pressing <Enter>. DEBUG contains many functions and features, but you will need to know only a few to make patches. These are the Dump, Search, Enter, Write, and Quit commands, signified by the letters d, s, e, w, and q, respectively. Table 1 shows how each of these commands is used in this article.

The Dump Command

You use the Dump command to view the contents of the file you're debugging. Each dump display contains eight lines of 16 bytes each, beginning with the first block in the file, which starts at offset 100. A typical dump appears in Figure 1.

The dump display, like ancient Gaul, is divided into three parts. The left part of the display shows the address of the left-most byte in each row. The middle third of the dump display shows the contents of each byte in that segment. The right third contains an ASCII translation of the bytes. Since not every byte contains information with a printable ASCII equivalent, this section may contain many periods, which represent nonprintable ASCII data. At times nonsen-

```

A>debug test.com
-d
108F:0100  E9 4D 0B BA AD 09 3D 02-00 74 18 3D 05 00 74 13  iM.:-.=.t.=.t.
108F:0110  BA 11 09 3D 08 00 74 0B-BA FD 08 3D 0B 00 74 03  :..=.t.:).=.t.
108F:0120  BA EE 08 0E 1F E8 25 05-EB 0C CD 21 72 D5 B4 4D  :n...h%.k.M!rU4M
108F:0130  CD 21 2E A3 5E 0A E9 EE-00 FB 2E F6 06 BF 0A 03  M!.#^.in.(.v?...
108F:0140  74 0C 2E F6 06 BF 0A 04-74 03 E9 14 0F CF 0E 1F  t..v?...t.i..O..
108F:0150  B4 OD CD 21 F7 06 OD 0A-FF FF 74 03 E9 ED 02 33  4.M!w.....t.im.3
108F:0160  C0 8B E8 A2 6A 0A A2 6B-0A A2 C0 0A 39 06 66 0A  @.h"j"."k."@.9.f.
108F:0170  74 06 C7 06 66 0A FF FF-38 06 5D 0A 75 03 E9 EB  t.G.f...8.J.u.ik
-
-

```

Figure 1: A typical dump display. Each dump shows 128 bytes. The left third of the display gives the address of the first byte in each line shown; the middle lists the contents of the 16 bytes following that address; the right third gives an ASCII translation of the bytes in each line.

sical sequences of recognizable characters will occur because by sheer coincidence a byte contains information that can be converted to ASCII.

If you enter successive Dump (d) commands, DEBUG obligingly displays successive 128-byte blocks, beginning with the first block or with the block following the last dump display. The Dump command can be followed by an offset address. If you specify an offset, DEBUG displays the 128 bytes beginning at that address.

The Search Command

Sometimes you'll want to make changes to a byte whose value is known but whose location isn't. Somewhere in a file, let's say, is the numerical sequence corresponding to the misspelled word *computer*. The first step in the correction process would be to use DEBUG's Search command to locate that double *u*.

The Search command requires the following form:

s *range list*
 The range parameter tells DEBUG the range of bytes to search through for the listed values. To give the range, type the offset of the byte where DEBUG should begin its search, a space, and the offset of the byte where DEBUG should end its search. Remember, offsets are expressed in hexadecimal notation, and

the lowest possible value is hex 100. Normally, you'll search through the whole file, so your starting offset would be 0100. If you know the length of the program file, your ending offset would be the last offset address in the file. If you don't know the length of the file, pick *FFFF*, the highest legal offset.

Following the range, you need to list the information for which you're searching. You may enter either an ASCII character string surrounded by quotation marks or the hexadecimal values of the bytes.

All hexadecimal values in the command must be separated by spaces; it is good practice to put spaces between all values in a command. For example, to search for *uu*, enter the command **s 0100 ffff "uu"**. Since *u* has a hex numerical value of 75, you could also use **s 0100 ffff 75 75** or **s 0100 ffff "u" 75**, for that matter. Since *U* and *u* have distinct ASCII values, you could not use **s 0100 ffff "UU"**.

If DEBUG finds a match, it displays the addresses where the characters appear in the file. You can use this information in a Dump command to see the surrounding information. If no match is found, DEBUG will display just the hyphen prompt.

The Enter, Write, and Quit Commands

To make changes, use the Enter command. With this command you can "poke" particular values into specified locations. The command format is **e** *address list*

The *address* parameter is the offset at the beginning of the data you want to replace, and *list* consists of the new values you want to enter, expressed either as hexadecimal values or an ASCII string. If you use an

ASCII string, the values must be enclosed in quotation marks. The Enter command overlays as many bytes as necessary to contain the values in your list, starting with the byte at the specified offset. Enter behaves like a word processor in overtype text entry mode. The command `e cs:145 "uter"` would fix the double *u* in *computer*, if the first *u* was located at offset 145.

So far, the changes and manipulations you've orchestrated are only on the copy of the data that sits in your computer's memory. To save these changes permanently, you must write the modified file back to the disk with the Write command. The form of this

If you return to the operating system without using the Write command first, you consign your changes to oblivion.

command is simply `w`. If you return to the operating system without using the Write command first, you consign your changes to oblivion.

To return to DOS, enter the short and sweet Quit command: `q`. Remember, Quit will not automatically save your changes. You must use the Write command first.

Customizing COMMAND.COM

For practice, try making a patch to the DOS command processor, COMMAND.COM. Make sure that you work with a copy of this file, not the original. If you destroy the original, you can't run DOS, and therefore, most of your software.

To start, boot the computer without benefit of an AUTOEXEC.BAT file. If no AUTOEXEC.BAT file is present, DOS will display its sign-on message at start-up. On IBM machines, this message says something like
 'The IBM Personal Computer DOS
 Version 3.0 (C)Copyright 1981, 1982, 1983, 1984'

Users of MS-DOS see similar messages. In this exercise, you'll learn how to change this message to anything you want—greet yourself with your name, your company name, or anything you'd like. The

steps of this procedure are illustrated in Figure 2.

Copy DEBUG.COM and COMMAND.COM onto a disk and place that disk in the default disk drive. (This example assumes that A: is the default drive.) Then get things rolling by entering `debug command.com` at the A> prompt. Wait for the DEBUG hyphen prompt.

Your first task is to discover where the text of the standard sign-on message sits in memory. A lazy way is to give the Dump command without parameters until you see the text you need. Press `d <Enter>` a couple of times, keeping your eyes glued to the right side of the screen.

You'll see some strange things, but not the message you're looking for. Indeed, the message text occurs somewhere deep within the file, so dumping the whole file 128 bytes at a time is not the best way to go about it. Searching for the message is faster. You want to search for some distinctive pattern, such as *The IBM Personal*. Enter a command like `s cs:0100 ffff "The IBM Personal"` and see what addresses DEBUG displays.

The exact address of the message string varies depending on the machine and the version of DOS you use, but suppose the address is 0FD0:1072. To see the context of this string, enter a command like `d 1070`. Notice the address is rounded down. That enables you to see some of the bytes preceding the text. If you seek a string located in the middle of the sign-on message, you must carefully count backward—in hexadecimal—to find the starting offset.

You should see the text of the message embedded in the right grid. Microsoft reserved between 80 and 90 bytes (depending on the version of DOS

```
The IBM Personal Computer DOS
Version 3.00 (C)Copyright IBM Corp 1981, 1982, 1983, 1984
```

```
A>debug test.com
-s cs:0100 ffff "The IBM Personal"
OFDO:1072
-d 1070
OFDO:1070  OD 0A 54 68 65 20 49 42-4D 20 50 65 72 73 6F 6E  ..The IBM Person
OFDO:1080  61 6C 20 43 6F 6D 70 75-74 65 72 20 44 4F 53 0D  al Computer DOS.
OFDO:1090  0A 56 65 72 73 69 6F 6E-20 33 2E 30 30 20 28 43  .Version 3.00 (C
OFDO:10A0  29 43 6F 70 79 72 69 67-68 74 20 49 42 4D 20 43  )Copyright IBM C
OFDO:10B0  6F 72 70 20 31 39 38 31-2C 20 31 39 38 32 2C 20  orp 1981, 1982,
OFDO:10C0  31 39 38 33 2C 20 31 39-38 34 0D 0A 00 4C 69 63  1983, 1984...Lic
OFDO:10D0  65 6E 73 65 64 20 4D 61-74 65 72 69 61 6C 20 2D  ensed Material -
OFDO:10E0  20 50 72 6F 67 72 61 6D-20 50 72 6F 70 65 72 74  Program Propert
-e 1072 "Welcome to MasterPC Theatre!" Od 0a
-w
Writing 561A bytes
-q
```

Figure 2: The DEBUG session during which the DOS sign-on message is changed. See how you enter DEBUG from DOS, and note the sequence of commands you give to effect the change. At the end, you install the change by rebooting. Notice the sign-on message at the top of the display.

you're working with) to contain this sign-on message. Each line of the message ends with the byte sequence *0D 0A*, which signals DOS to return the cursor to the beginning of the next line. Your own message must not go beyond the final *0D 0A* sequence that ends the original message. Indeed, any patch you make cannot take up more bytes than you are replacing. Since the Enter command overwrites the data in the file, you can replace data only on a byte-for-byte basis.

Enter the new message with the command **e cs:1072 "Welcome to MasterPC Theatre!" od 0a** or with any words you choose between the quotation marks. The characters you insert lie right on top of part of the original message; the balance of the original message remains. To eliminate the rest of the message, enter a sufficient number of spaces (hex 20) to wipe it out.

The changes you've just made reside only in the computer's memory. To make them permanent, you must use the Write command. Type **w <Enter>**. When this is done, you're free to exit DEBUG with the command **q <Enter>**. To observe the effect of your work (i.e., the new message), reboot the computer.

DEBUG to Grow On

You now know enough about DEBUG to carry out simple program patches and to customize several features of your software. But DEBUG's features extend far beyond the basics you've learned here.

For more information about DEBUG, turn to the DOS manual; there you'll find a description of the many DEBUG commands and their uses. This article should help you understand that documentation. Once you know the basics of hexadecimal notation and how to address bytes in a computer's memory, DEBUG can give you a degree of control over application and system programs that you never thought possible. ●

Alan Hoenig is a professor of math at John Jay College in the City University of New York and the author of five books on microcomputers. His latest books are A Hands-On Guide to PC-DOS and MS-DOS (Little, Brown, Boston, 1984) and Framework for the IBM PC (Wm. C. Brown, Dubuque, Iowa, 1984).

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Circle 120 on reader service card

The Help Screen

PC World offers answers and advice at every level

This month we clarify information from December's column, explore moving a range of values from one 1-2-3 worksheet to another, and investigate the case of a seemingly immortal subdirectory.

Karl Koessel

Mea culpa. Attentive readers have rightly challenged several recent observations in this space (*PCW*, Vol. 2, No. 13). One batch of correspondents noted that contrary to the statement in "Single-Sided DOS Disks," "COMP *.* B: compares only one pair of files at a time," the COMP commands of DOS 2.00 and later versions accept the global specifier *.*. Other readers wrote to rectify the offset values for "Bright or Light Word-Star," also in December's column. The values 248 and 24B should have been 284 and 28B, respectively.

And thanks to Paul Penfield of Weston, Massachusetts, who advises that a conditional test for a blank DOS parameter should use "if x == %1x command" rather than "if %1x == x command" (see "Batch Test for Empty DOS Variable," another December entry). The %1 should be placed after the == to avoid the strange behavior that ensues when the right string begins just like the left string but turns out to be shorter. To demonstrate this bug, create two different batch files, A.BAT and B.BAT, as follows:

```
A>COPY CON: A.BAT < Enter >
ECHO Batch file A < F6 > < Enter >
      1 File(s) copied
```

```
A>COPY CON: B.BAT < Enter >
ECHO Batch file B < F6 > < Enter >
      1 File(s) copied
```

Then type

```
IF NOT CONCEPT == CONC A B
< Enter >
```

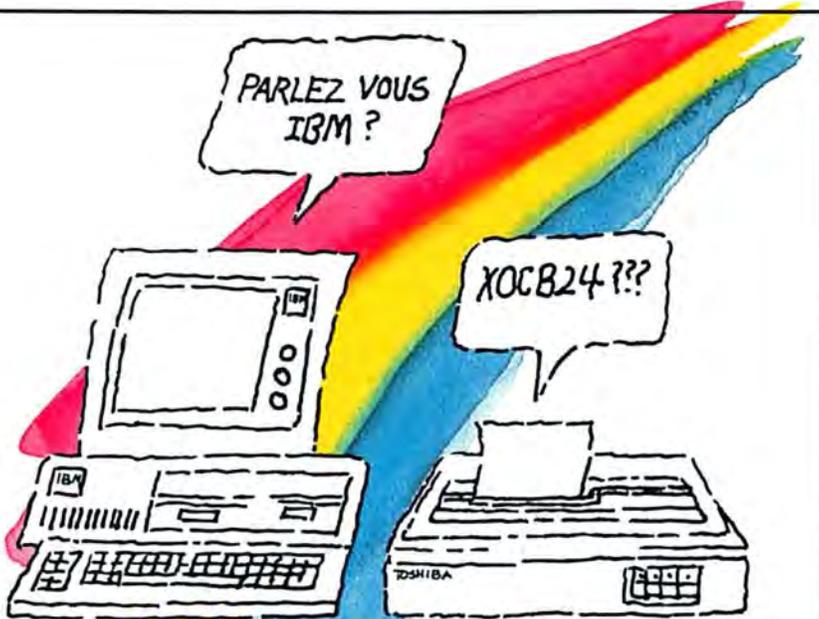
Try it again with more than one space between CONC and A.

Transferring Worksheet Ranges
Q. My question concerns using 1-2-3 worksheets. Assume I have two worksheet files called ONE and TWO that are too large to combine in a single file. Calculations in worksheet ONE produce results in the range V102..V152. I then write down these results and manually enter them into worksheet TWO's cells C22..C72. I then recalculate worksheet TWO. Is there a method that automatically enters the results obtained from worksheet ONE into worksheet TWO and then recalculates worksheet TWO?

*Carl Lucas
Carbondale, Pennsylvania*

A. There is, and the process is fairly straightforward. First, load worksheet ONE with the command */File Retrieve ONE* and move the cell pointer to cell V102 (*< F5 > V102*). Next, use the command */Range Name Create*, enter a name such as **TRANSFER LIST**, and specify the range **V102..V152**. Then save worksheet ONE by invoking the */File Save ONE Replace* command, thereby saving the range name with the worksheet file.

Now load worksheet TWO with */File Retrieve TWO*. Move the cell pointer to cell C22 (*< F5 > C22*), and give the command */File Combine Copy NamedRange TRANSFER LIST*. The entries in cells V102 through V152 of worksheet ONE will then be copied into cells C22 through C72 of worksheet TWO. If formula recalculation for



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worksheet TWO has been set to manual (*/Worksheet Global Recalculation Manual*), press the Calc key (<F9>) to recalculate worksheet TWO's formulas.

Fortunately, this procedure can be abbreviated to just two keystrokes by using two 1-2-3 keyboard macros. Load worksheet ONE (*/File Retrieve ONE*), move the cell pointer to an empty area of the worksheet, and enter the following macro:

```
{goto}V102~
/rncTRANSFER LIST~
V102..V152~
/fsONE~
r
/frTWO~
```

To name the macro, move the cell pointer to the cell that contains the first macro command. A specific form of range name is used for 1-2-3 macros. You name macros with a backslash followed by a single letter. In this case, let's use the letter *T* for *transfer*. Select the */Range Name Create* commands. Type \T and press <Enter> twice. Finally, save this worksheet and its newly created macro with */File Save ONE Replace*.

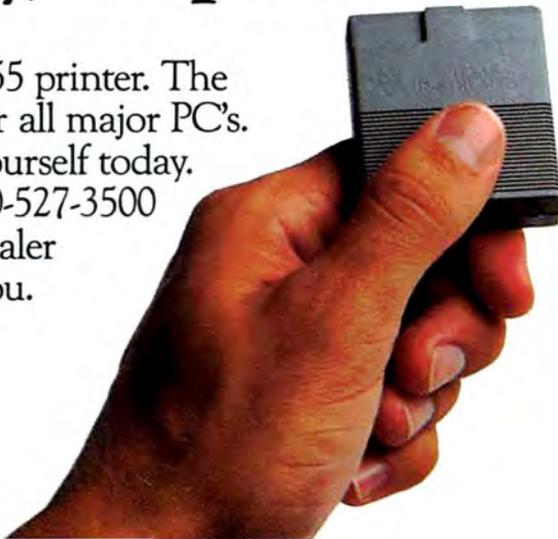
You can invoke this macro at any time by pressing <Alt>-T. Note that the macro contains only half the keystrokes needed for your routine. Because the macro's last command retrieves another worksheet, that macro is no longer accessible. Accordingly, the remainder of your routine must be in worksheet TWO. For the sake

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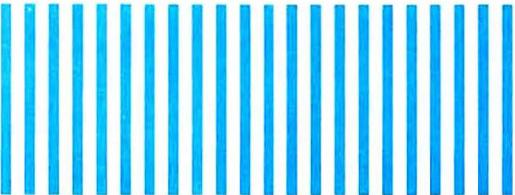
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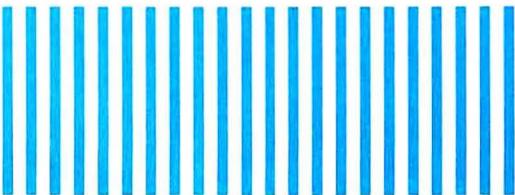
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of convenience, you might as well refer to it by the same <Alt> key combination as the macro in worksheet ONE.

Load worksheet TWO (*/File Retrieve TWO*), move the cell pointer to an empty area of the worksheet, and enter the macro commands that follow:

```
{goto}C22~
{/fccnTRANSFER LIST~
ONE~
{calc}
```

To name this macro, repeat the procedure you followed to name the macro in the first worksheet, then save this worksheet with */File Save TWO Replace*. Because the macros in both worksheets share the same name, whenever worksheet ONE is loaded and 1-2-3 is in the Ready mode, you can transfer the list of values from cells V102..V152 in worksheet ONE to cells C22..C72 of worksheet TWO simply by pressing <Alt>-T twice.

The Stubborn Subdirectory

Q. I recently encountered two instances of what seems to be a stubborn subdirectory. Here's the problem: I want to delete (that is, remove) a subdirectory. I realize that for me to do so, the directory must not contain any files or other subdirectories; I also know that the current directory must not be the one destined for deletion.

*I begin by making the subdirectory that I want to delete the current directory [CD\directoryname]. Next, I do an ERASE *.* to delete all the file entries that*



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Neck pain 15%

Back pain 43%

Shoulder problems 25%

Hand/wrist
problems 18%

Computers can only perform as well as the people who use them.

The chart below is disturbing. It shows the kinds of problems computer users are having.

Computer-induced problems (%)	
Eye strain	55%
Back pain	43%
Headaches	30%
Shoulder	25%
Hand/wrist	18%
Neck pain	15%

(Source: "Ergonomic Principles in Office Automation" Pub. 1983 by E.I.S. AB, Sweden.)

(Source: "Ergonomic Principles in Office Automation." Pub. 1983 by E.I.S. AB, Sweden.)

Before you dismiss them as trivial, consider two things: First, more than twenty states are now preparing

legislation to protect computer users from problems like these.

Second, it's not just a people problem.

It's a business problem. Because computers do what they're told.

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this directory contains. I follow this by taking a directory listing [DIR] to check that this directory does not include any subdirectory entries. The only entries left in this directory are the period, which indicates that this is a subdirectory, and the double period, which DOS uses to locate the directory's parent (the higher-level directory that encompasses this directory). I then change the current directory to the root directory [CD \] and execute RD \directoryname. Unfortunately, I receive the standard error message, 'Invalid path, not directory, or directory not empty'. What is preventing me from removing this subdirectory?

Morris W. Stemp
 Jamaica Estates, New York

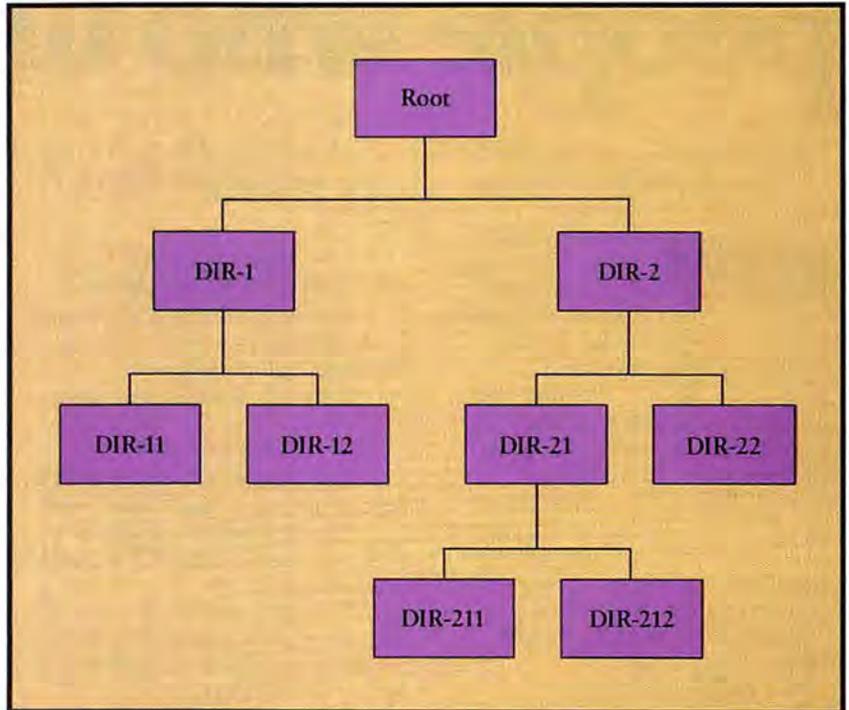


Figure 1: A sample directory structure

A. The steps you're following to remove a subdirectory are essentially correct. But let's back up a moment and review the three possible errors enumerated in the DOS message.

Directory not empty. Although the DOS manual notes that ERASE *.* deletes all the files in the current directory (and that ERASE [drive:] path deletes all the files in the path-specified directory), ERASE does not delete hidden or system files. Hidden and system files are excluded from directory listings and from the 'number of files' report in a listing's last line. Hidden and system files within a subdirectory are difficult to delete without a special

utility that can list such files and change their attributes, converting them into "normal"—ERASEable—files.

Not directory. In most cases, this error message refers to a misspelled directory name, but I doubt that applies here. It's also possible that a directory name may have been altered to include a nondisplayable character. Such a situation, however, is very rare.

Invalid path. To locate a specific subdirectory, a DOS command must be supplied with a path parameter that includes, in the correct order, every subdirectory level, from either the root directory down to the desired directory; the current directory down to the desired directory; or the current directory up to a common ancestor and then down to the desired subdirectory.

Let's assume that the directories of your disk are structured as shown in Figure 1. If DIR-22 is the current directory and you want to remove DIR-212, you could begin the path parameter with the root directory:

```

C>CD < Enter >
C:\DIR-22
C>RD \DIR-21\DIR-212 < Enter >
    
```

Alternatively, you could use the double period to ascend the path from the current directory to a common directory, then specify the path down from that directory:

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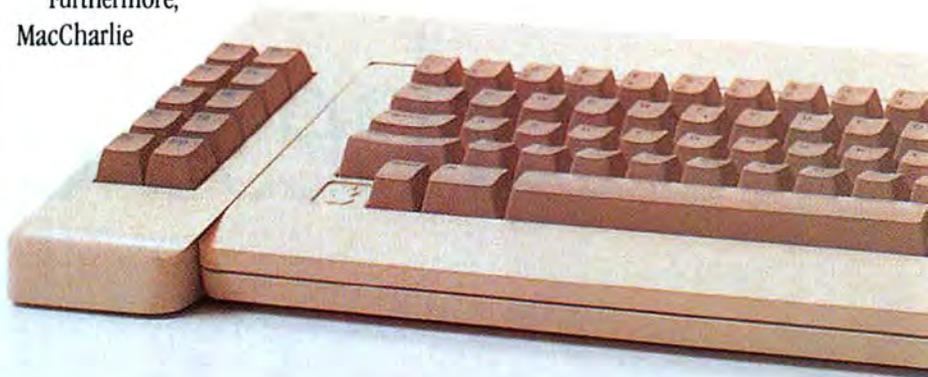
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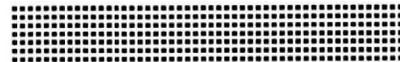
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Circle 973 on reader service card



C>CD <Enter>
C:\DIR-2

C>RD DIR-21\DIR-212 <Enter>

Instead of DIR-22, suppose the current directory is DIR-2. In that case, to remove DIR-212, a descendant of the current directory, you may begin the path parameter with the appropriate child of the current directory:

C>CD <Enter>
C:\DIR-22

C>RD ..\DIR-21\DIR-212 <Enter>

Note that in each example the path parameter includes every sub-directory name along the specified path. Even if the root directory were the current directory (instead of DIR-22) in the first example, the path parameter \DIR-212 would be invalid because the intermediate subdirectories have been omitted.

It may be that your stubborn directory is not a child of the root directory, in which case the command RD \directoryname omits the intermediate subdirectory or subdirectories.

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MicroSoft WORD + mse.	475	289	95	SuperCalc ³	395	209	79
MultiMate	495	269	99	Electric Desk	345	239	69
Volkswriter Deluxe	285	159	57	Electric Desk (jr.)	295	199	59
Volkswriter Scientific	495	349	99	Symphony	700	419	140
Word Perfect 4.0 (NEW)	495	259	99	COMPILERS			
WordStar	495	198	99	BASIC (MicroSoft)	395	259	79
WordStar (jr.)	195	139	39	Prof. BASIC 640K	99	89	20
WordStar Propak	695	279	139	C Compiler (MicroSoft)	500	319	100
Samna III	550	389	110	Cobol (MicroSoft)	700	459	140
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Knowledgeman 1.07	500	279	100	Lattice C (Lifeboat)	500	299	100
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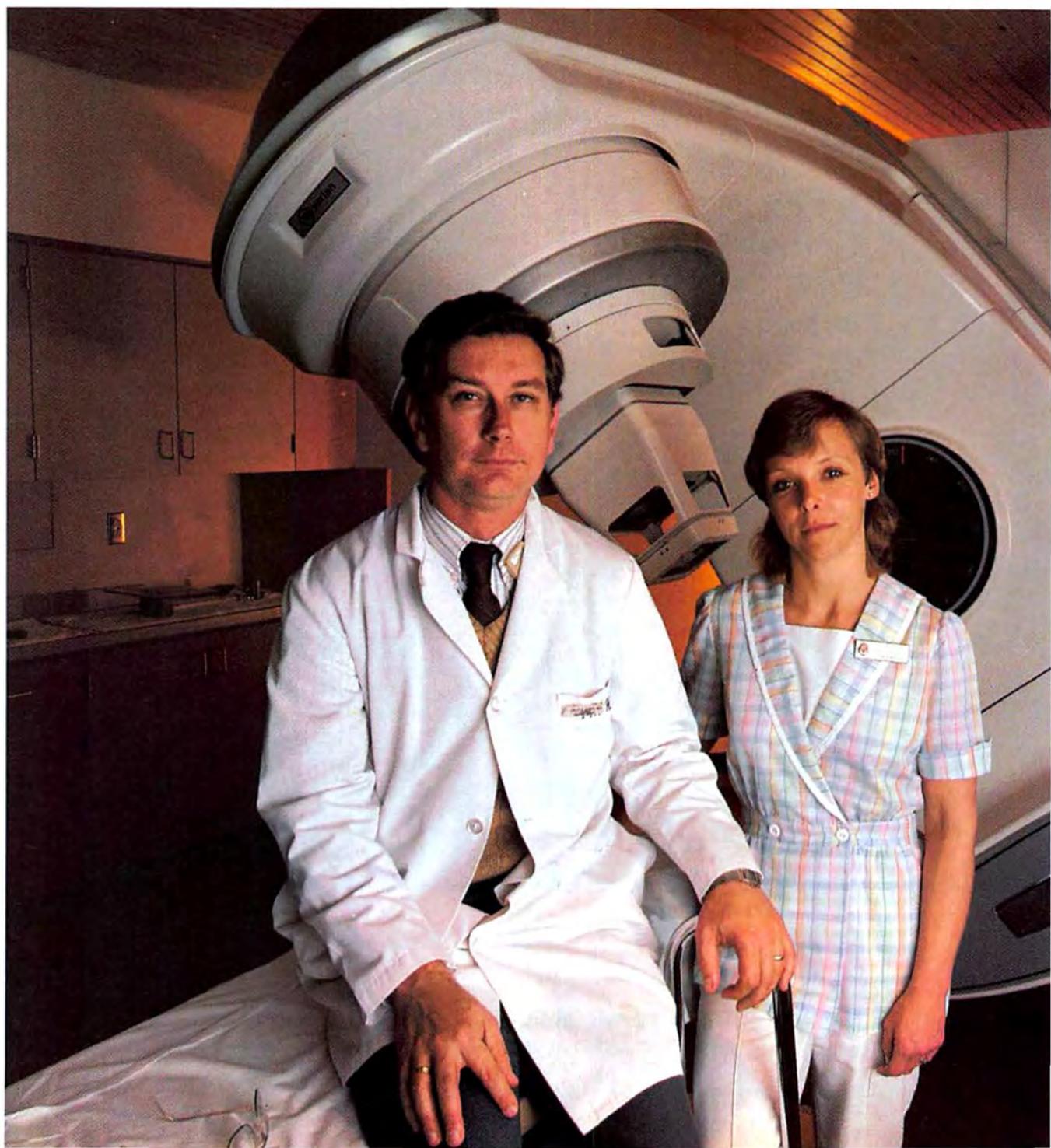
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Dr. Philip Heintz and Carole Michelson, manager of Enloe Memorial Hospital's Radiation Oncology department, guided the effort to automate the department's record keeping.



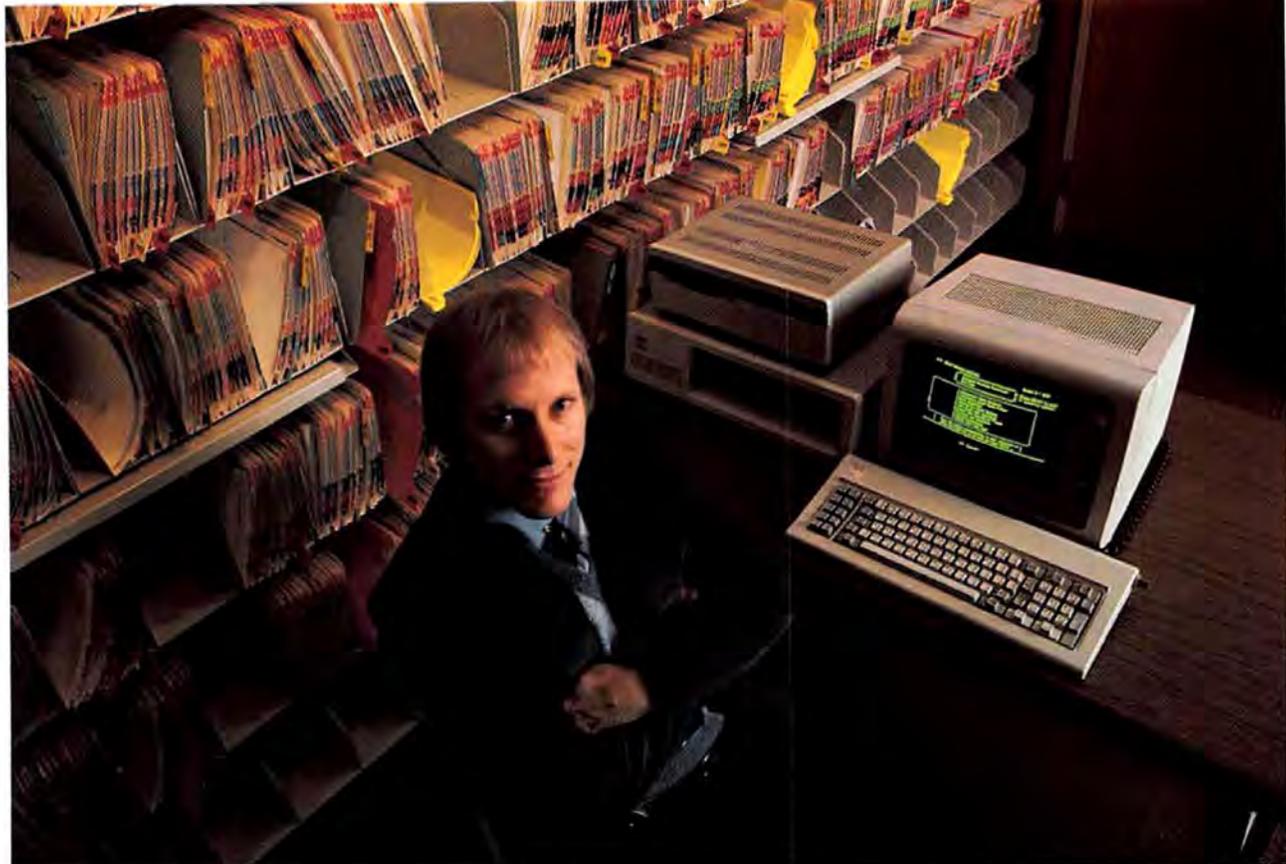
Rx: Custom Software



Personal computers teamed with application development systems have brought the cost of custom software within the reach of small businesses. Here's how a hospital department in Chico, California, went about getting a software system that fits its needs to a T.

Michael K. Guttman

Before the introduction of the personal computer, a company in need of custom software had to rely on programmers who worked on costly minicomputer or mainframe systems. This effectively put custom software out of the reach of many firms. The advent of inexpensive but powerful personal computers and off-the-shelf software packages has allowed small organizations to get their hands on the computing power they need without breaking the budget. Even so, if a firm cannot find the data management system, financial analysis package, or other off-the-shelf program that fits its needs precisely, it will probably discover that hiring a consultant to write applications from scratch in a traditional programming language has a high price tag—often many times the outlay required for the hardware. Application development software can dramatically reduce the time and effort required to produce a custom application and bring its cost in line with what most business computer users can afford to pay.



Programmer David Frankel, nestled against a wall of medical records, translated the radiation department's requests into a meaningful DataFlex application.

Such software, exemplified by *DataFlex* from Data Access Corporation, *Q-PRO-4* from Quic-n-easi Products, and *Revelation* from Cosmos, automates routine programming and design tasks that in a traditional programming language typically require detailed and often redundant coding. The developer can create applications quickly and modify programs as the user's needs change (see "Caveats for Custom Software," *PCW*, March 1985).

Better still, many application development systems are independent of specific computers and operating systems. Although different versions of a development system are written for different machines and operating systems, each version looks exactly the same to both the application developer and the user. As the user's needs grow, necessitating more complex hardware and perhaps a different operating system, his or her application can be "ported" (moved) to the new environment with little or no modification. This feature is particularly useful when an application is transferred from a single PC to a local area network or a multiuser system.

■ A Case for Customization

How do you go about getting the perfect custom software system? A look at a particular custom application—and how an application development system made it feasible—illustrates the process.

Our story begins in late 1983 at the Department of Radiation Oncology at Enloe Memorial Hospital in Chico, California. (Radiation oncology is the specialty of treating diseases, particularly cancer, with radiation.) The department at Enloe had been growing rapidly; it included two full-time physicians and several supporting technicians, and there were plans to add more staff in the near future. As the problems of scheduling patients and staff appointments began to exceed the capacity of the department's manual system, it became clear that some kind of automated scheduling system was necessary.

Unfortunately, commercial systems for hospital scheduling were available only for minicomputers. Even if an off-the-shelf system could have done everything desired, a minicomputer would not have been cost-effective for such a small department.

Dr. Philip Heintz of the Radiology Oncology staff had used personal computers in his work as a consulting physicist to the department. Heintz's experience convinced him that the department's problems could be managed with a personal computer but were complicated and specialized enough to require custom software. "Following recommendations from colleagues, I interviewed several computer consultants who specialized in custom personal computer applications," Heintz recalls. "Although each had different ideas about how to implement a system, all agreed that the process would be hastened by the use of some sort of application development software."

■ The DataFlex Solution

Heintz eventually selected David Frankel of Frankel Computer Services to head the project. Frankel had created a number of custom applications using Data Access's *DataFlex*, and his experience indicated that the program could save the Radiation Oncology department time and money.

DataFlex quickly generates menus, data entry screens, and reports, making it easy for the programmer to create a "face" for the program that users will find clear and straightforward. Even more important, *DataFlex* takes care of the normally onerous "house-keeping" tasks of adding, deleting, updating, indexing, and sorting data files, operating rapidly even when files become quite large (see the sidebar "The Flip Side of Automation").

The Flip Side of Automation

An application development system such as *DataFlex* is not a panacea. The Enloe project included extensive manual programming that probably could never be automated. Like any commercial package, *DataFlex* contains certain limitations that frustrated programmer David Frankel. For example, it takes as much as 20 minutes to compile a large *DataFlex* module on a PC, even when all the file-related activity occurs on a large RAM disk. Since any change Frankel made to a module required compiling the program again, debugging and fine-tuning were time-consuming.

Although it supports some date arithmetic, *DataFlex* lacks a convenient way to process time-of-day information. Unfortunately, this seems to be a common failing among application development packages. "To index files by time of day, I had to

write a set of routines that convert standard clock time to a special format," Frankel explains.

In general, Frankel is happy with *DataFlex*'s forms, which are used to generate data entry screens and report formats. However, *DataFlex* does not allow multiple windowing or partial screen scrolling, useful features found in many popular off-the-shelf programs. "The absence of these features severely restricts some screen displays; you can circumvent this limitation only with a good deal of programming," Frankel notes.

Fortunately, none of these limitations seriously affected the Enloe project. Although *DataFlex*'s idiosyncracies inconvenienced the developer, they had little effect on the actual performance of the final system, which runs smoothly and efficiently.

DataFlex contains its own high-level language, which makes it nearly as flexible for many tasks as BASIC, Pascal, or C. The language, while not always as powerful as some traditional languages, has the distinct advantage of being completely integrated with *Dataflex*'s superior screens, forms, and data file-handling capabilities.

The big advantage of *DataFlex* is that many of its functions, particularly those associated with report writing, are easy to learn. Once adequately trained, a user can create custom reports and perform a certain amount of system maintenance. A real go-getter can learn to modify the system without always running for a consultant.

That feature appealed to Heintz, who wanted to retain as much control as possible over his new scheduling system without focusing full-time on programming. He had done some programming, "enough to know that I should let someone else take care of the tricky parts and not try to create a complete scheduling program by myself," he says.

Creating the system with *DataFlex* meant that Heintz could have an elaborate custom system and still retain control over it. Frankel would ensure that the system worked as required and be available for major maintenance and upgrades. "I would be free to customize reports or make minor changes in program logic just by taking the time to learn some *DataFlex* fundamentals," Heintz explains.

■ Up and Running

The design process involved five steps. At each stage, the department staff reviewed the product and made suggestions before Frankel went on. First, program specifications were determined and a contract agreed on; second, Frankel prepared general and then specific system designs on paper (much like an architect's renderings followed by blueprints). Third, a prototype program was built and demonstrated to the staff. Fourth, the program as designed was completed and installed. Fifth, any needed changes were made to the system once it was up and running.

Work on the project began in February 1984. Frankel met with Heintz and Carole Michelson, the Radiation Oncology department manager, to develop specifications and hammer out an agreement. The de-

partment had done its homework and had a "wish list" of desired features. It was Frankel's job to digest these and offer his own list of features that would be practical to implement, given the department's time and budgetary constraints. "It's extremely important to determine the client's real priorities before rushing ahead with any system," Frankel notes. "Clients often perceive their needs quite differently when they have

The system produces a variety of reports, including patient contact reminders, daily and weekly follow-up schedules, and client distribution statistics by geographical area.

an idea of what each feature will really cost. For example, the department wanted to ensure that each doctor had at least a minimum amount of unbooked time each day. To handle this precisely, a substantial amount of additional programming and expense would have been required. The department instead opted to approximate unbooked time using simpler methods."

Once the basic dimensions of the job were specified, Frankel worked out a detailed system design. One virtue of an application development system such as *DataFlex* is that it enables the user to quickly generate "mock-up" file structures, data entry screens, and reports that will ultimately make up much of the system as the user sees it. Frankel included these mock-ups in his system analysis and used *DataFlex* to change the program based on feedback from the department staff. According to Frankel, "A mock-up allows clients to generate much more feedback as to the look, feel, and function of the final product."

Getting What You Pay For

A data management package such as *dBASE III* costs \$695. Off-the-shelf software for specific applications, also known as vertical market software, generally runs from \$500 to \$10,000. A custom data management software system can cost anywhere from \$5000 to \$50,000 or even more. Why buy a custom package when there might be an off-the-shelf product that does a similar job?

Custom software offers a number of benefits that overcome the obvious price advantage of an off-the-shelf system. The purchase price of any software is only part of the system's total cost. You often must spend many hours learning the system, training others to use it, and entering a backlog of data from an existing manual system (add to this the hours and dollars spent choosing the right package).

A custom system, if well designed, will keep these costs to an absolute minimum—and shrink the price difference between prepackaged and custom software.

Furthermore, if a commercial software package doesn't perform as well as expected, or if your needs grow beyond its capabilities, the cost of scuttling a system and searching for another can be quite high. Some off-the-shelf programs include program source code, which allows you to program modifications. If the re-

quired changes are more than cosmetic, however, it is not always clear how they will affect program operation. Unless the original programmer is available for consultation (highly unlikely), the source code may seem like so much spaghetti to another programmer, and modifications, even if possible, may be costly.

Custom programming, if done correctly, sidesteps many of these pitfalls. A well-designed custom system includes only those features you really need and is easy to learn and use. Forms, input screens, and program terminology can be matched to your operation precisely. Most important, program modifications that compensate for unanticipated problems and new needs can generally be made quickly by the programmer.

But the most compelling reason to opt for custom software is the motivation behind automating in the first place: to increase the productivity of your business. If you succeed, the difference in outlay between tailored software and the ready-to-wear variety can be trivial.

The decision to break out of the strictures of off-the-shelf software is always a weighty one, but the toughest variable may be selecting the right consultant.

■ A Collaborative Effort

Frankel and the department staff's preliminary design was quite elaborate. The staff wanted their system organized around a consistent and easily understood set of menus and data entry screens. They also requested that the system have on-line help available at any point with a single keystroke.

System design in hand, Frankel began coding a prototype system in mid-March. The prototype served as a way of demonstrating the primary capabilities of the finished system without every last bell and whistle. Thus, the department could order substantial changes without waiting for a final product or requiring Frankel to reprogram every affected detail.

Using *DataFlex*, Frankel was able to complete the prototype in two months. "Considering the complexity of the application, achieving such progress with a traditional computer language would probably be impossible," Frankel says. "By saving so much programming time, I was able to focus attention on making the system efficient and easy to use."

After demonstrating the prototype to the staff, Frankel spent another month making changes, adding new functions, clearing up details, and preparing system documentation. By late June revisions to the project were completed—right on schedule; the installation could begin. Setup involved entering background data, learning to use the system, and identifying and correcting bugs. "If changes to the system are required later, I can make most of them without seriously interrupting the department's work," Frankel notes.

In its final form, the system includes modules for maintaining client and staff information, querying a calendar for appointment schedules, and creating new appointments. The system produces a variety of reports, including patient contact reminders, daily and weekly follow-up schedules, and client distribution statistics by geographical area. It generates medical diagnosis and referring physician reports, patient no-show lists, appointment conflict reports, and reports of times during which doctors are typically unavailable.

In addition, the system monitors ongoing daily, weekly, and monthly staff appointments and schedules them in advance. For example, a staff meeting every Tuesday at noon could be scheduled for the next six months and changed should the need arise.

■ Prognosis: Favorable

Today, the staff at Enloe is pleased with the system. Although implementation cost about \$17,000 (including \$995 for *DataFlex* itself), the department has exactly what it needs and retains complete control over the system (see the sidebar "Getting What You Pay For"). According to Heintz, "It will be some time before we're fully up to speed with our new system, but from what we can see, we're confident we can entrust the system with the scheduling duties of the department for years to come.

"If I were to change anything about the project," Heintz adds, "I would have budgeted more time for learning the system and converting data from our manual system. It is hard for an inexperienced user to realize just how much is involved in such an undertaking. I think, though, that the system would have been much more difficult to master and far less satisfactory if it were not of our own design." ●

Michael K. Guttman is a freelance writer and computer consultant. His company, Professional Computer Technologies, is based in Chico, California.

*DataFlex
Data Access Corp.
8525 S.W. 129th Terr.
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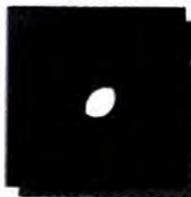
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Wine Emporium



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Rede Chateau - Chateau 2000 - Chateau 454 00	\$12.00	International			
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Thinking Big on Silicon Prairie

A consortium of companies moves ahead, without the involvement of IBM or AT&T, to create the next generation of computers.

Ron White

Until recently, the most exciting developments in the United States' computer industry occurred in either of two locations. On the East Coast, the action centered along Route 128 in Massachusetts, the location of a number of computer companies spawned by the academic resources of MIT. On the West Coast, the leading source of new technology was the cluster of younger, brasher companies snuggled in northern California's Silicon Valley and sustained by talent

from Stanford University and the University of California at Berkeley.

Now it appears that the future of the computer industry may be determined in a spot far from either of those traditional computing centers. In Austin, the small, laid-back capital of Texas, 19 companies have pooled their programming and engineering resources to form the Microelectronic and Computer Technology Corporation (which, for reasons no one associated with the consortium can explain, is abbreviated MCC). By tackling the basic research and development necessary to create the computer of the future, the consortium is affirming the United States' preeminence in computer science at a time when that status is being challenged by the Japanese and others.

Retired admiral Bobby Ray Inman is president and chief executive officer of MCC. Though not an engineer or a scientist, Inman is the former head of the National Security Agency and former dep-

uty director of the CIA—both intensive users of computers. “Those of us who put MCC together had a basic guideline,” said Inman, an easy conversationalist who emphasizes his words with arching eyebrows, looking like an establishment version of Jack Nicholson. “We decided that if we could envision a product, then we shouldn’t be doing the research—we weren’t reaching far enough. We’re working in areas for which we don’t yet know what the practical applications will be.”

Backing MCC are some of the greats and near-greats of high technology: Advanced Micro Devices, Allied, Boeing, BMC Industries, Control Data, Digital Equipment, Eastman Kodak, Gould, Harris, Honeywell, Lockheed, Martin Marietta, Mostech, Motorola, National Semiconductor, NCR, RCA, Rockwell, and Sperry. Others are expected to join, until a limit of 30 members is reached. Together, these companies hope to do what none could accomplish by itself: develop the world’s next generation of computers—or possibly something beyond that.

■ Big Kids Stay Home

Conspicuous by their absence from MCC are some high-tech industry titans, firms that have the resources—and the ego—to attempt to develop a better mousetrap all my themselves, including IBM, AT&T, Burroughs, and Texas Instruments. IBM may also be gun-shy after past battles with the Justice Department over alleged antitrust violations, although MCC has a conditional Justice Department clearance stat-

ing that the joint actions of what are normally competing companies will not be considered as in restraint of trade. But IBM has put in a bid to be part of a similar project sponsored by the European Common Market, a proposal that has met with mixed reactions by the participating European firms.

■ High-Tech Frontiers

Although MCC is not working directly on personal computer technology, results of the consortium’s work may begin to trickle down to personal computers in the early 1990s, much as results from research done in the 1970s at institutions like Xerox Corporation’s Palo Alto Research Center

“We decided that if we could envision a product, then we shouldn’t be doing the research—we weren’t reaching far enough.”

began appearing in the 1980s in personal computers such as Apple’s Lisa and Macintosh.

What will the personal computer of the 1990s be like? We can find some clues by looking at the four-pronged research program getting under way in Austin. One area of research involves the use of computer-aided design to pack increasingly complex circuitry into smaller and smaller microchips. A second area, known as semiconductor packaging, aims at improving methods of interconnecting microchips. A third area, software technology, focuses on decreasing the cost of software development by improving the methods and tools available to programmers.

A fourth area, called advanced computer architecture, is aimed at

providing the hardware and software basis for “fifth-generation” computers. In the preceding four generations—vacuum tube computers, transistorized computers, integrated circuit computers, and very large scale integrated (VLSI) computers—engineers found ways to pack increasingly complex circuits into ever smaller spaces. That trend will continue, but the distinguishing feature of the fifth generation will be a computer architecture that allows several processing operations to occur simultaneously. This parallel processing is considered to be more akin to the way the human brain operates, which explains the fifth generation’s close association to artificial intelligence.

In addition to parallel processing, MCC’s research in advanced computer architecture includes work on the “human interface” (how humans use and communicate with computers), data base architecture, and expert systems (see the sidebar, “What Is Artificial Intelligence?”).

■ Prototyping the Future

If the goal of duplicating the brain’s functioning in a machine sounds like science fiction, that may be because it still remains strictly futurist stuff. Some of MCC’s projects may result in usable technologies by 1987, but most of the research won’t come to fruition until the 1990s. Then

the job of developing specific, marketable applications will begin.

If, however, MCC's pure research does lead to a computer that can keep your books, make your stock investments, fix a dish of fettuccine Alfredo, and toss off some sonnets for your amusement, you won't find any MCC logo on it. The actual translation of technology into product will be carried on by the individual consortium members.

Price of the Ante

Each consortium member owns one share of stock in MCC and is entitled to one representative on MCC's board. The cost of that one share is \$1 million, a paltry sum in the world of high-tech finance: IBM alone budgeted \$1.5 billion for R&D in 1982. But in addition, each shareholder must participate in at least one of the research areas; some are involved in all four. The budget for each area is divided equally among its sponsors.

MCC's policy is not to discuss the specific investment made by any particular company, but Inman indicated that those companies participating in three or four research areas contribute \$7 to \$8 million a year each; MCC's total annual budget is in the \$60 to \$75 million range.

If a project yields usable technology, companies participating in that area will receive the exclusive right to license the new technology for three years, a good lead in a market in which generations are often measured in months instead of decades. At the end of that time, other share-

holders, as well as nonshareholders approved by the MCC board, will be free to license the technology.

Although the shareholders will not retain exclusive rights to MCC's technology, part of the

'What it comes down to is that united we stand, divided we couldn't afford it.'

royalties from licensing MCC patents will be divided among the shareholders, and MCC will use the remainder to finance further research.

R&D Motives

The motives for companies joining MCC go beyond short-term profit, said Inman. Some of the companies, such as Lockheed, are not heavily involved in production of computer products. But they are heavy users of computers and "want to know where the technology is going."

"Generally," Inman said, "the larger companies see the success of MCC as critical to their long-term profitability. For the smaller companies, it is critical to their long-term survival."

United We Stand

One thing all the companies have in common is a realization that MCC represents an opportunity to be part of expensive, long-term research that none of them would have the resources to undertake individually.

"What it comes down to is that united we stand, divided we couldn't afford it," said Gary Stechmesser, director of public relations for NCR. "The idea of [a

single company] developing some exclusive technology just isn't realistic. You can build a better mousetrap—at a tremendous cost—on your own, but somebody else is going to build a very similar mousetrap."

Another motive is a sort of high-tech altruism—a belief that this country's industry and society as a whole will benefit by the proliferation of technology. Japan and the European Common Market have their own next-generation computer research under way, and those projects are infused with healthy doses of government money. But outside the military, such federal funding does not exist in the United States, a gap MCC seeks to fill.

A Gentlemanly Maverick

Those who have observed the quick-buck, boom-or-bust mentality of the computer industry may find this last, altruistic motivation unlikely. But the man who conceived MCC and invited Inman to head the consortium is a decidedly unlikely character. William Norris, the 70-year-old chairman of Control Data, is a gentlemanly maverick whose ideas seem radical even to the Young Turks of the computer industry. Under Norris's leadership, Control Data spent millions of dollars and many years developing the Plato

What Is Artificial Intelligence?

In 1950 British mathematician Alfred Turing proposed a procedure that has become the classical definition of artificial intelligence (AI). According to Turing's Test, a machine has artificial intelligence if a questioner, communicating through a teletype, is unable to tell whether a human or a computer is responding.

Most work on developing artificial intelligence assumes a computer with the processing power—preferably parallel processing—to handle ambitious new software concepts. The major areas of software research include expert systems and natural language interfaces.

Idiot Savants

Expert systems are the forerunners of tomorrow's true artificial intelligence; some expert systems are already running on the IBM PC. These systems perform remark-

ably sophisticated analysis and problem solving based on a large bank of information. But that information and analytical ability is generally limited to specific, narrow applications, such as the diagnosis of tropical diseases that are difficult to detect with conventional methods. Such software is the computer equivalent of human idiot savants—people who are mentally handicapped but who are unusually good at one particular thing.

Machines with true artificial intelligence would imitate the functioning of the human mind. AI would allow a computer to examine a variety of heterogeneous facts and devise a specific solution to a problem by comparing those new facts with its vast storehouse of information from many fields.

With a natural language interface, a computer user would not have to learn a particular program's rules for commands and expressing information. Instead, conversational English could be used to give instructions; the computer would translate this imprecise form of communication into whatever commands or data the software required to operate.

The Law of Random Perversity

The next generation of computers may have an uncanny, and perhaps unnerving, similarity to the computers of science fiction movies—machines such as the *War Games* computer, which has access to every detail of human knowledge, can chat vocally with humans and, when it gets bored, calls you on the telephone and asks to play a game. But exactly what fifth-

generation computers will do, and how, is still up in the air—as is a solid definition of artificial intelligence.

Notes Nelson Winkless, a founder of Excaliber Technologies Corporation and a pioneer in artificial intelligence software, “We used to say that a computer would be intelligent if it could do this and do that, and so on. This was all perfectly clear 25 years ago when we couldn’t do anything about it. Now we can, and all the old ideas seem inadequate. We’re dealing with what we call the Law of Random Perversity—we won’t know what we can do until we’ve done it. There’s just no such thing as playing with a full deck anymore—there are always new cards.”

educational computer system before attempting to market it. And it was Norris who built Control Data plants in inner-city ghetto areas, believing that his company stood to benefit, at least indirectly, by providing training and creating jobs for the hard-core unemployed.

“William Norris is a man who doesn’t keep his eye entirely on what will give the highest return on an investment,” Inman said. “He’s always spewing out long-range ideas, and then he moves on and lets others implement them.”

■ Good Ol’ Boys and Yuppies

One of Inman’s first jobs for MCC was to find a location for the consortium’s headquarters. He considered factors that any corporation considers—cost of living, public transportation, and quality of life. He also wanted a location near a topflight academic center.

Inman rejected both California and Massachusetts because each had a high cost of living and was already overpopulated with high-tech companies vying for college graduates. Instead he chose Austin, Texas, because of its University of Texas campus, which boasts a solid academic reputation, and because of the enthusiasm with which Texas officials courted MCC.

Texas is already the home of Datapoint, Tandy, Compaq, Electronic Data Systems, and, of course, Texas Instruments. MCC’s selection of Austin—a town where the major industries are government and education and the population is a mix of good ol’ boys

and yuppies—was an important step toward fulfilling the ambitions of Texas leaders to transform the 75-mile corridor stretching along Interstate 35 between Austin and San Antonio into Silicon Prairie.

■ Staffing the Think Tank

Although the University of Texas was important to MCC’s selection, only about 10 percent of the organization’s research staff will come from college faculties. Said Inman, “We don’t want to destroy the base for producing graduate students. That would be robbing Peter to pay Paul.”

Instead, most of MCC’s staff—currently about 170 and scheduled to double—will come from private industry, about half on loan from shareholder companies and the rest hired directly from the computer community.

“The talent that is attracted to MCC [consists of] people who want to develop long-term projects. They don’t want to become instant millionaires,” Inman said.

■ Better Hammers

But just what all this research will lead to is anybody’s guess. The companies in MCC seem to be participating on faith that their investment in long-term research will bear profitable fruit. Actually, since it is up to individual participants to find marketable products for the discoveries MCC expects to make, a new technology could wind up being used in widely varying or competing products.

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"A rough analogy," Stechmesser said, "is the contracting business. You could get together [with your competitors] to design better hammers and saws, but you wouldn't share your plans about the kind of houses you were going to build with those tools."

Officials at MCC can't even speculate about how the consortium's research might change the personal computer; to stay well clear of any possible antitrust action, MCC personnel will not discuss even hypothetical specific applications. Still, by looking at the areas being investigated at MCC, it is possible to make some intelligent guesses.

Intelligent Boxes

One of the likely results of MCC's explorations is cheaper computer chips, which will further the trend toward more powerful, less expensive personal computers. As more complex designs and more memory are packed into fewer and smaller microcircuits, affordable personal computers with the capacities of minicomputers and mainframes will become entirely possible.

More powerful personal computers are important if business and home users are to benefit from such advances as voice recognition, video image processing, and artificial intelligence. Such complex tasks require machines with prodigious memory and processing power. Howard Dicken, president of DM Data, a research firm specializing in semiconductor and artificial intelligence markets, envisions the personal computer of the future. "I see the day," said Dicken, "when I'll have this little

box on my desk called, let's say, 'my associate.' I will hold ordinary conversations with it as I would with a human assistant. It will let me know my bills for the week and then pay the ones I tell it to."

Competing With Japan, Inc.

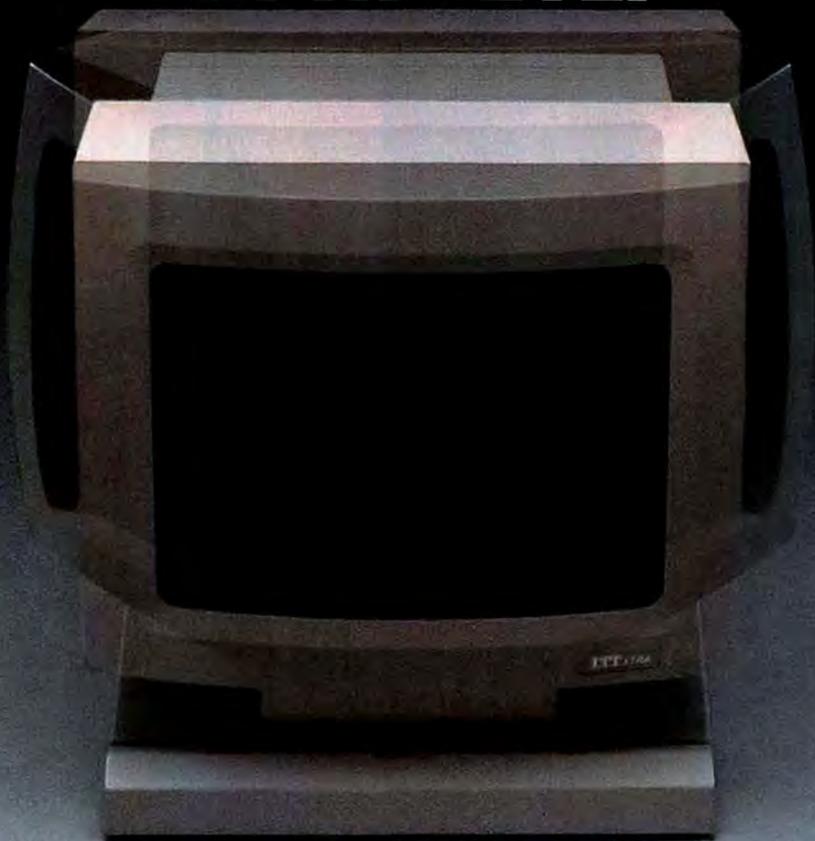
While Dicken and others see the significance of MCC in terms of the fifth-generation computer's transformation of our daily lives, Bobby Ray Inman's sights are on the global arena. "The real impact," he said, "will be on the number of U.S. companies that can remain competitive and profitable in this area.

"It's not a given that the United States will remain the leader in this field," Inman continued. "Others are moving aggressively and growing in what used to be essentially a U.S. market. If we weren't doing what we're doing at MCC, the United States could wind up a follower instead of a leader in the world computer market."

But whether the impact of the fifth generation will be personal or global—or both—the Texas-size thinking of Bobby Inman and the researchers at Austin makes MCC a story worth following in the coming years. ●

Ron White is a news editor at the San Antonio Light. He has written extensively on personal computers and is head of the IBM Compatibles User Group in San Antonio, Texas.

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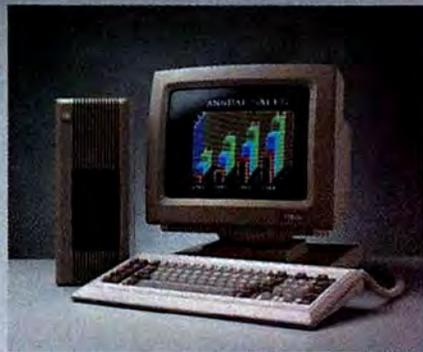
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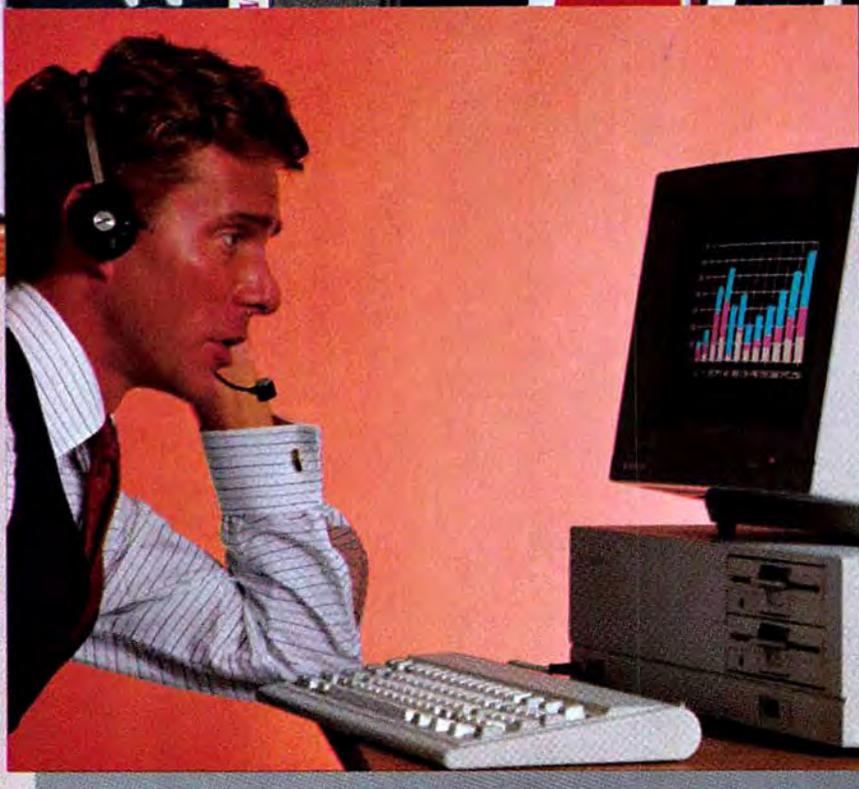
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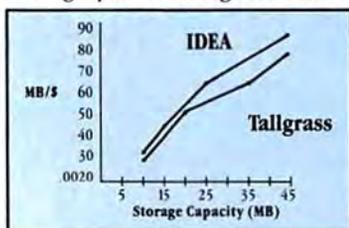
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Compatibles Update

The latest developments in the PC-compatibles marketplace



This month: some tough compatibles get a breath of fresh air, AT clones fail to materialize, AT&T picks up steam, and COMDEX offers a few surprises

Ken Greenberg

Trends

Racking Our Brains

A tough new breed of PC compatibles is forsaking the office for the factory floor. These machines have discarded their cuff links and rolled up their sleeves—and they don't mind getting dirty if that's what it takes to bring computing power to the job site.

These industrial-strength PC work-alikes are "rack-mounted," and their resilience has won them a place within a growing body of in-the-field applications. Rack-mounting isn't some bizarre ritual performed in dank dungeons but is a way of securing a computer in a 19-inch rack—a device that is to industrial settings what the desk is to offices.

Nineteen-inch racks have long cradled equipment in research labs, on civil engineering junkets, and on assembly lines. The popularity of steel racks in diverse work environments has inspired several companies to produce or sell these durable compatibles. A rack-mounted personal computer can easily connect to other machines in the rack, and wires don't get tangled beyond recognition.

Because each rack is equipped with its own power supply, personal computers can inhabit places where desks don't exist and environments are downright mean: on the floor of a steel plant as part of the fabrication process, for instance, or in a trailer jerked around the desert, testing oil exploration gear.

The rack-mounted PC clone isn't always so abused. It often hums quietly in corners as the overseer of a host of other machines, programming robots, test-

ing products, controlling processes. Applications are as varied as the industrial world itself.

Take, for example, the oversized washing machine monitored by a rack-mounted PC compatible called the IPC 2000, a product of Dallas-based Texas Microsystems. Hotels, hospitals, and other institutions with hefty demands for laundry rely on the washer, which is roughly as big as a barn. The company that manufactured this washday Goliath hired Texas Microsystems to customize the hardware and software that, among other things, measure and dispense the appropriate detergents. Blood and grease stains require heavy shots of cleansing chemicals; bed linens get a light spray and an application of starch. Screen graphics indicate the progress of the load as it wends its way through the suds to the squeeze-and-drip cycle and then to a conveyor belt that feeds several dryers and ensures that all clothes are pressed. When the job is done, the IPC 2000 calculates and dispatches a laundry bill.

Standard features on the IPC 2000 include an 8088 CPU; 64K of RAM; one shock-mounted 360K 5¼-inch disk drive; a dust filter adjoining the fan; and ten full-length expansion slots (with the motherboard occupying one slot). The basic unit lists for \$2500, and rack-mountable monitors are available for \$1500. Other options include a 10MB hard disk drive, a second floppy disk drive, a network board, a modem, and a speech synthesis module that can let a crew leader on the floor know that a jar of prunes is stuck 100 yards down the assembly line.



The RM 1600, from Materials Development Corporation, is mounted and ready for action.

Rack-mounted machines aren't pretty. The IPC 2000 is encased in steel; a separate lid covers the slots, and a door locks over the disk drives to shield the unit from the elements (and provide some system security).

Texas Microsystems is hardly alone in the rack-mounted world. ISI International is a Silicon Valley-based firm that manufactures PC-compatible desktop units and expansion boards that other companies market under their own label. ISI entered the business when company execs saw eye-popping projections on the growth rate of the factory market. They were particularly moved by an estimate that industrial and factory applications will comprise 30 percent of the PC (and compatibles) market by 1988. ISI promptly commenced production of the 6160.

The 6160, a PC XT compatible, is delivered with 128K of RAM (expandable to 640K), a single 5¼-inch floppy disk drive, a 10MB hard disk drive, five expansion

slots, a 125-watt power supply, and a removable dust filter near the fan. A detachable keyboard and rack-mounted monitor are not included in the unit's \$3930 list price. Options include up to 60MB of hard disk storage, a second floppy drive, and a tape backup unit. A fully equipped 6160 runs in excess of \$7000.

The company's hunches about the marketplace seem to have been validated. "The response to the product—with a minimum amount of advertising—has been almost overwhelming," says Mike Precobb, ISI's national sales manager.

Then there's Materials Development Corporation (MDC), a Chatsworth, California, company that offers a rack-mounted version of Corona Data Systems' highly PC-compatible portable personal computer. The RM 1600, MDC's basic unit, includes two floppy disk drives, an integrated 9-inch monitor, and a detachable IBM-style keyboard. An internal 10MB hard disk unit is also available. Although the RM 1600 isn't as rugged as units offered by ISI and Texas Microsystems, it does feature shock-mounted disk drives.

"We want to bring to research and industry the flexibility of off-the-shelf, low-cost, highly supported personal computers," explains MDC president Barton Gordon. Until it discovered the rack, Gordon's 14-year-old company manufactured only semiconductor testing equipment.

Why follow the PC standard in a market in which the PC itself re-

mains scarce? According to Lane Gorton, president of MTG Electro, a computer marketing and consulting firm based in Ithaca, New York, the PC model offers a good deal of power in a small package for a low price. Even more attractive is the confidence IBM inspires, especially in the somewhat staid industrial market. Still more compelling: "The whole philosophy of the IBM PC standard is third-party intervention," Gorton says. "Compatibles, like IBM, have left a number of open

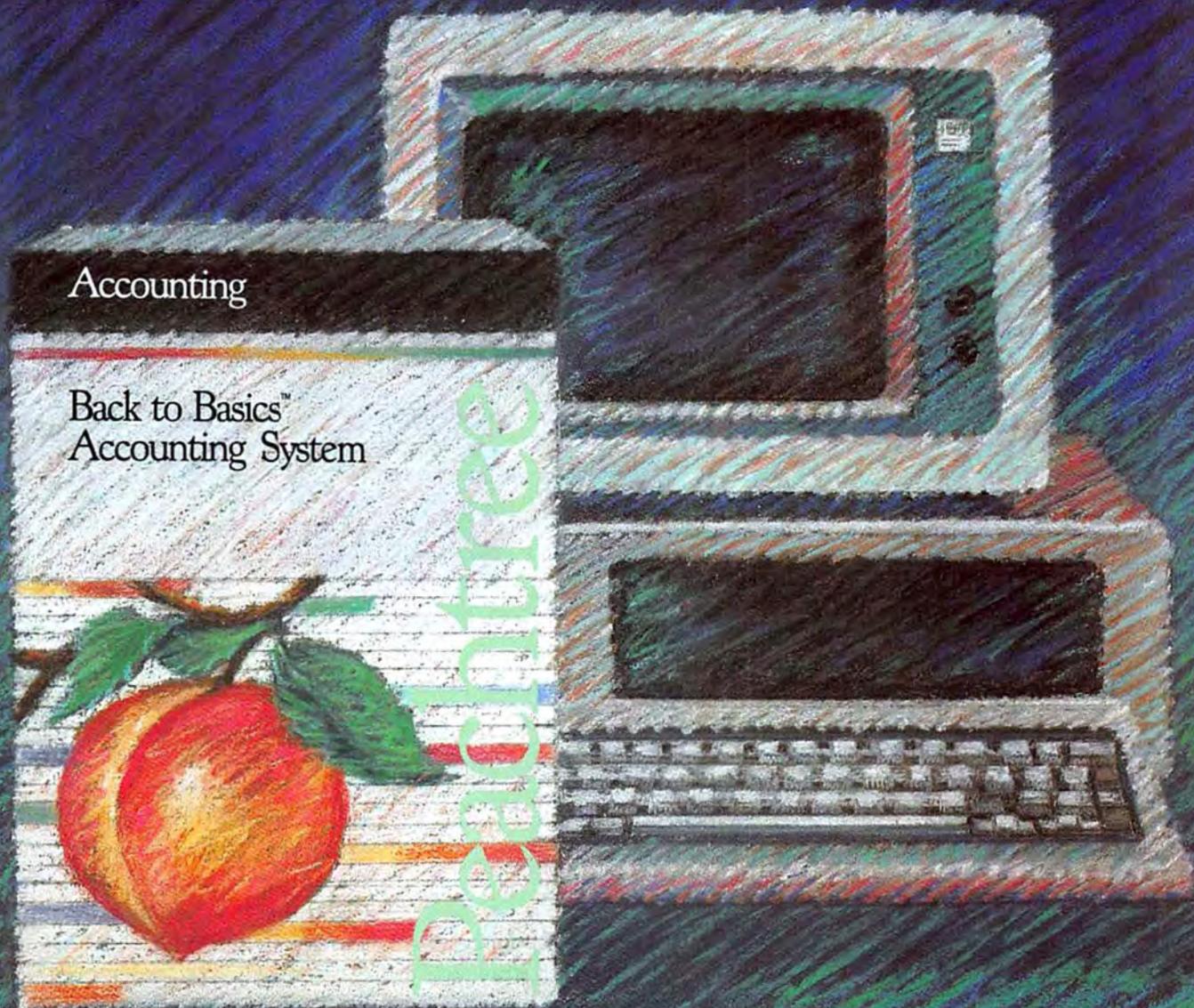


Barton J. Gordon, president of MDC.

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Jane Ferguson, former editor of the San Francisco Business Journal, is a freelance writer specializing in business issues.

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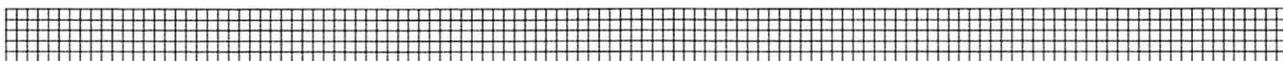
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A clutch of compatibles joins a murky market. New entrants (clockwise from top left): the Apricot Portable, Quadram's Datavue 25, Visual's 25-line Commuter, the OSM ZeusMate diskless workstation, Zenith's Z-150 PC Desktop System, TI's Pro-Lite, the Kaypro 16, Alpha Microsystems' AM-680 Entry Level System, and Seequa's Cobra.

COMDEX is The Place to Be Seen, but it remains to be seen whether these machines are sleepers, one-shot wonders, or the OEMs of tomorrow. What surfaced were highly compatible machines from companies that shunned that designation a year ago (the Canon Athena and the Sanyo MBC 775); a low-priced leader built around the Faraday motherboard (the Bell PC Twenty); a Compaq Deskpro compatible (the Seequa Cobra); an ergonomically correct import from Sweden (the Ericsson PC); and an interesting crop of portables (particularly the International Quartz 9242). Virtually all of these newcomers have 25-line screens; most have internal disk drives; and many are from the Far East (often via Canada).

The Difference a Year Makes

Après Fall 1983 COMDEX, le déluge. After Fall 1984 COMDEX, le trickle?

You may be muttering, why introduce a PC compatible now? but the industry remains (mostly) undaunted. Despite menacing moves from Boca Raton, noises from UNIX partisans, and innumerable start-ups gone belly-up, the PC standard is alive and thriving.

So a startling number of PC work-alikes—some from familiar vendors, some from faraway

places with strange-sounding names, some just with strange-sounding names—did go for the glitter in Las Vegas: Apricot, Quadram, Microvoice, Replitech, TeleVideo, Nelma Data, Gold Star, Alpha Microsystems, Wyse, Anderson-Jacobson, International Quartz, Aftek, and Honeywell. Anticipating a boom year for networks, Zenith and OSM stripped the floppy disk drives from their PC compatibles and dressed them up as diskless workstations.

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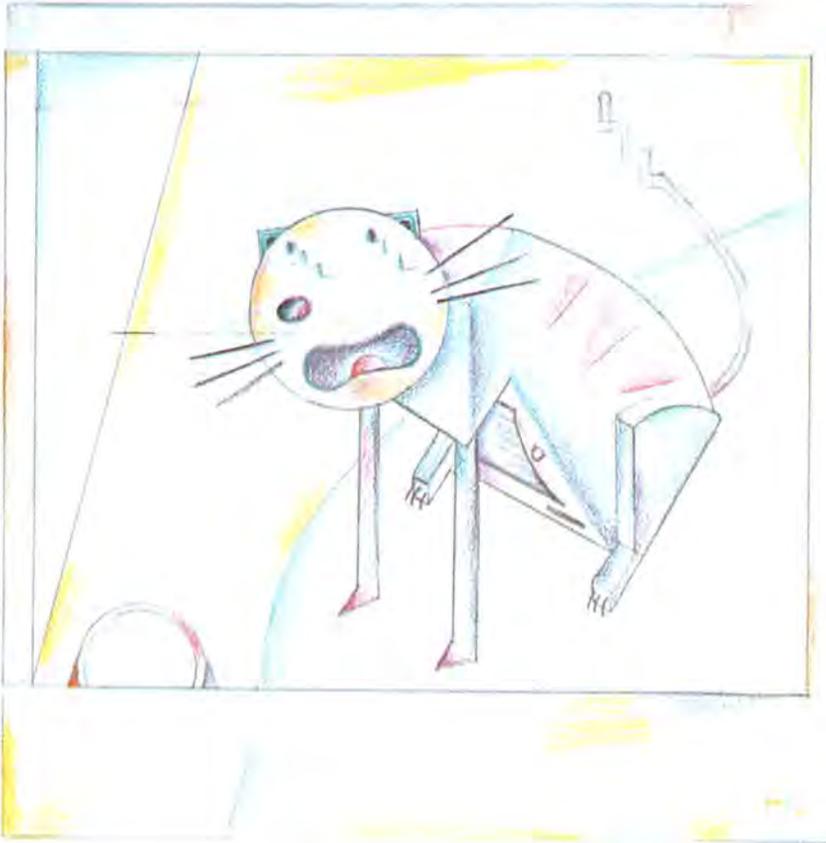
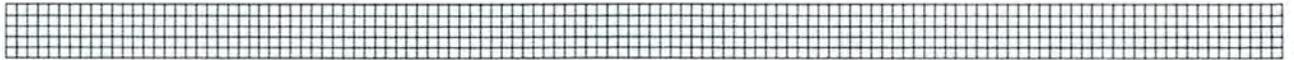
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Texas Instruments unveiled the Pro-Lite, a 10-pound portable with a 25-line liquid crystal display (LCD) that has more in common with the TI Professional line than with the PC. Although the specs are fine (256K upgradable to 768K, one 720K 3½-inch disk drive, two expansion slots, and a capacity for ROM software), the Pro-Lite can run only a smattering of PC programs, and then only when tied to the PC via an interface cable. TI isn't going disk-to-disk with Data General's DG One right away; for the time being, the \$2995 Pro-Lite will fill niche markets, not retail shelves.

The other notable unveiling came from Kaypro, which branched the Kaypro 16, its long-awaited (read long-delayed) PC

compatible. The remarkable thing about the machine—which comes with a 10MB hard disk, an 8088 CPU, 256K, one free slot, a PC-like ROM BIOS from Phoenix Software Associates, and bundled software from MicroPro—is that it's pure Kaypro, identical to its CP/M cousins right down to the familiar spartan chassis. At \$3295, the Kaypro 16 is priced for small businesses—the “five million” potential users that Marketing Vice President David Kay is counting on to help reverse a sharp decline in earnings. The 16 may be Kaypro's meal ticket for '85; Kay is reportedly counting on the machine to generate 40 percent of the company's sales this year.

Even if none of these machines makes a dent in an already banged-up marketplace, the pattern is still clear: if you want to play personal computer, you've got to play by IBM's rules. For Kaypro, Canon, Ericsson, and the rest, it's better late than never.

Clones: Not Where It's AT

If COMDEX was long on companies clinging to the 8088/8086 architecture, it was pitifully short on PC AT copycats.

Indeed, even though PC hardware and software manufacturers are crowing about the compatibility and quickness of their products on the AT, few have produced anything to date that truly takes advantage of the AT's multitasking and memory management powers. This may be due to the reluctance of vendors to commit resources to an essentially unproven machine. The AT's undefined role in the marketplace is enough to keep vendors straddling the fence, at least for a while.

Of the dozens of companies queried during COMDEX, only a handful admitted to having anything on the drawing boards. John Hill of Hercules Computer Technology described the AT as “fantastic,” but confessed that his company doesn't plan to jump on the AT bandwagon. A product manager for Sorcim/IUS, maker of *SuperCalc* among other programs, admitted that “we flat out don't have any answers about the AT.”

Which isn't to say that the AT was met with uniformly upturned noses at COMDEX. Several ex-

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INTEGRATION OF FUNCTIONS <ul style="list-style-type: none"> All tools work together—All information is shared automatically or can be transferred instantly between tools. All tools use free-form storage. All tools are fully user-tailorable. Notes—can be filed as appointments, or attached to calculations, reports or other notes. Telephone dialer—searches file for phone number then dials. Alarm Clock—triggers note recall when appointment comes up on calendar. 	NO integration.	NO integration.	Partial integration—cut-and-paste required.
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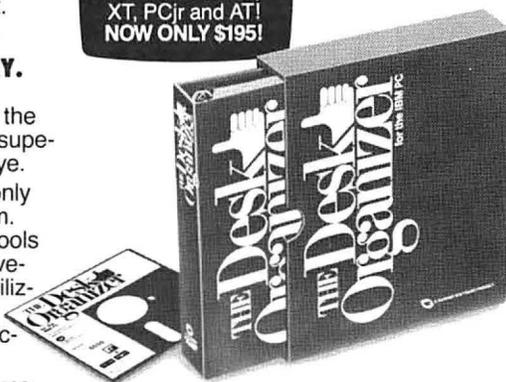
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pansion board companies have multiple megabyte RAM cards already on the market; there were also a healthy number of hard disk and streaming-tape backup systems for the AT. One particularly noteworthy product was *Multi-Link Advanced*, a PC-DOS 3.00 operating system enhancement that allows an AT to act as a multiuser server for up to nine PCs, compatible diskless workstations, or ASCII terminals. And 80286-based machines were out in force—all of them running a variant of UNIX (usually Xenix 3.0) rather than MS-DOS.

But as befits this occasionally temperamental industry, the potential star of the show failed to take a bow in Vegas. The Tomcat 3200-AT, the first known AT clone, did not creep in on little cat's or any other type of feet. Tomcat Computer, of Japan, a veteran manufacturer of PC and XT compatibles, skipped COMDEX entirely. The company modestly claims the machine is 99.9 percent AT compatible and has priced it 25 percent below the genuine article. Tomcat Computer reports that the \$4450 unit comes equipped with an 80286 CPU, 640K of RAM (compared to the AT's 512K), a 1.2MB floppy disk drive, and a 20MB hard disk.

It seems to be the AT's schizophrenic design that has both users and developers scratching their heads. As Compaq spokesperson Ken Price notes, "The AT is uncomfortably trying to fit into two worlds. It's being sold as a multiuser machine—but it comfortably supports only a few users. It's re-

ally a personal computer, but by market standards it's pretty expensive and it's not totally compatible with the PC. IBM hasn't really defined the AT's place—and maybe that's the idea." As always, only time and IBM will tell.

—Robert Lubn

Postmortems . . .

Continued

Although it was easy to detect a shudder and a creak as PC-compatibles manufacturers shut the door on 1984—a year that for too many of them only rhymed with rich—things aren't really that bad. There's a chance that companies who entered the IBM compatibility game humming "Me and My Shadow" will live to sing another day. As long as the stock is trading and the company is shipping products, there's always a chance.

Item 1: Columbia Data Products, rising star in 1983 and goat in '84, but stunningly PC compatible throughout. Columbia recently struck OEM deals with Honeywell and Control Data, perhaps banking on a strategy that has paid off handsomely for Corona and less so for Eagle. From Honeywell's point of view, however, no bailout was intended; at COMDEX a company spokesperson acknowledged that the computer giant signed up without fully appreciating how tough times were in Columbia, Maryland. Honeywell has thus far kept a low profile about its low-end PC clone. Ironically, the company is reselling the Columbia to Ultimate Corporation, a minicomputer vendor that is slapping its logo on the

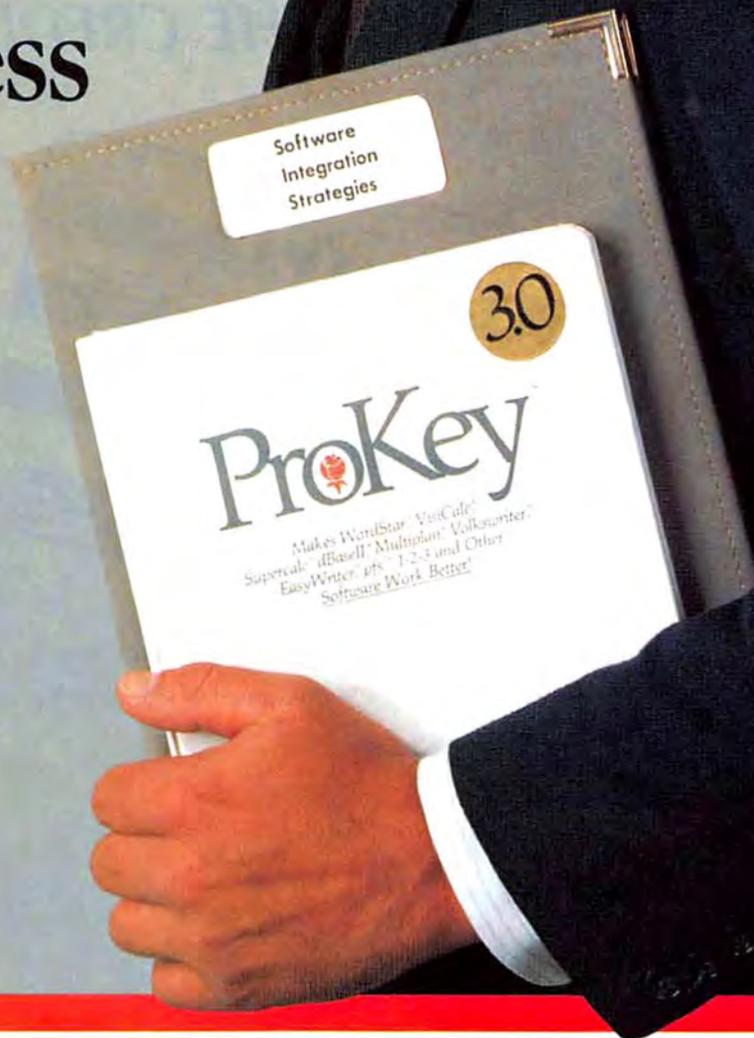
box. Another Tinker to Evers to Chance? Or a game of hot potato?

Columbia also appears to be taking a page from the revived Osborne Computer, sans the legal gyrations. Like Osborne, Columbia has shed its manufacturing arm and effectively become what Osborne chief Ron Brown calls "a trading company." Columbia spun off its Maryland and Puerto Rican production facilities to Evergreen Technologies, a newly formed concern. The move followed third-quarter losses of more than \$28 million and at press time figured to give Columbia a respectable fourth-quarter showing. Evergreen has assumed Columbia's production-related debts. And if there weren't already enough woe at the company, a group of shareholders has filed a class action suit against Columbia, alleging violations of federal securities laws.

Item 2: Visual Technology, venerable manufacturer of terminals; the 80286-based Visual 2000; and the Visual Commuter, a disappointing entrant in the quasi-portable compatibles field. Lee Data, the Minneapolis-based 3270 VDT maker, paid \$16.8 million in common stock for the privilege of swallowing Visual just before year's end. Ironically, Visual had just upgraded the Commuter's 16-line LCD to the more popular 25 lines, seemingly canceling out one strike against the machine. With Visual now a wholly owned Lee Data subsidiary, the Commuter will reportedly get a new lease on life as part of a desktop system.

Item 3: Eagle Computer, where the spirit is willing but the financials are weak. Eagle kicked off

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the first quarter of its fiscal year with a \$2.3 million loss but managed to satisfy both its major lender and its creditors committee with a revised debt repayment agreement. Stay tuned.

PC 6300 Gets Serious

It's more than mere status when third-party hardware vendors begin churning out products for your machine—it's a sign that the computer is apt to be around a while.

Mountain Computer evidently has faith in AT&T's PC 6300. The Scotts Valley, California-based peripherals manufacturer has released the Mountain 6300 Combo, an integrated 30MB hard disk and 27MB streaming-tape backup unit for the 8086-based PC compatible. The Combo represents the first major third-party addition to AT&T's line and is designed to allow quick, flexible file storage and retrieval. The system relies on the PC 6300's hard disk version of DOS 2.11.

Another plus for AT&T users is that they won't have to think hard about programs to feed the PC 6300, now that Ma Bell has published the *AT&T Computer Software Guide* (Reston Publishing, Reston, Virginia, 1985). The book cites every MS-DOS program certified for the machine, based on tests administered by the International Bureau of Software Test, a Prentice-Hall subsidiary. Updates of the guide will be released periodically.



Mountain Computer's 6300 Combo matches the look of the AT&T PC 6300.

Software

Professional Support

Despite its modest share of the personal computer market, Texas Instruments' Professional Computer line continues to impress software developers. Ashton-Tate has released versions of its *dBASE III* data management program and *Framework* integrated package for the TI series.

TI's MS-DOS-compatible desktop and portable units can now run Alpha Software's *Electric Desk* and *Data Base Manager II* as well. *Electric Desk* combines word processing, spreadsheet, data management, and communications functions in a memory-efficient, easy-to-use format.

DG One's New Clout

Software houses also continue to flock to the DG One, Data General's 9-pound wonder. Among the latest to do so is Microrim, which is distributing both its *R:base 4000* data management package

and *Clout* natural language software on 3½-inch floppies for the PC-compatible laptop.

ITT's Telex Emulation

"Stick to the knitting," business guru Tom Peters advises his audiences these days; it's Peters' polite way of reminding companies to play to their strengths. ITT seems to have taken the hint.

ITT's Communications Services Group has joined forces with American International Communications Corporation to market *DCS-300*, a program that reportedly enables a modem-equipped ITT Xtra or any PC compatible to serve as a telex terminal. It's a natural offering, since ITT World Communications links the United States and more than 200 countries via telex lines.

The package is designed to bypass the costs of leasing a dedicated telex line and terminal. With *DCS-300*, the Xtra can converse with any of the 200,000 telex terminals in the United States and the nearly 2 million terminals worldwide.

The Designer Wang

Autodesk has released its popular computer-aided design package, *AutoCAD*, for the Wang Professional Computer. The 8086-based Wang PC boasts speed that Autodesk spokesperson Walter Good says is well suited to his company's software. Wang intends to link *AutoCAD* to its VS/Series of minicomputers.

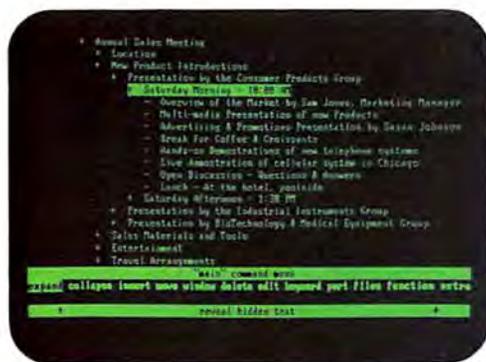
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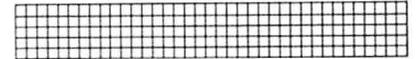
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Accounting for Burroughs

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The B25 is Burroughs' re-packaging of the Convergent Technologies N-GEN workstation, a modular MS-DOS compatible desktop built around the Intel 80186 chip.

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Rental Income	2.5	1.8	1.5
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A Brighter Star?

With WordStar 2000, MicroPro may once again outdistance the competitors snapping at its corporate heels. Though the package shows more marketing savvy than technical innovation, it does contain some important improvements. But is it too much, too late?

Terry Datz

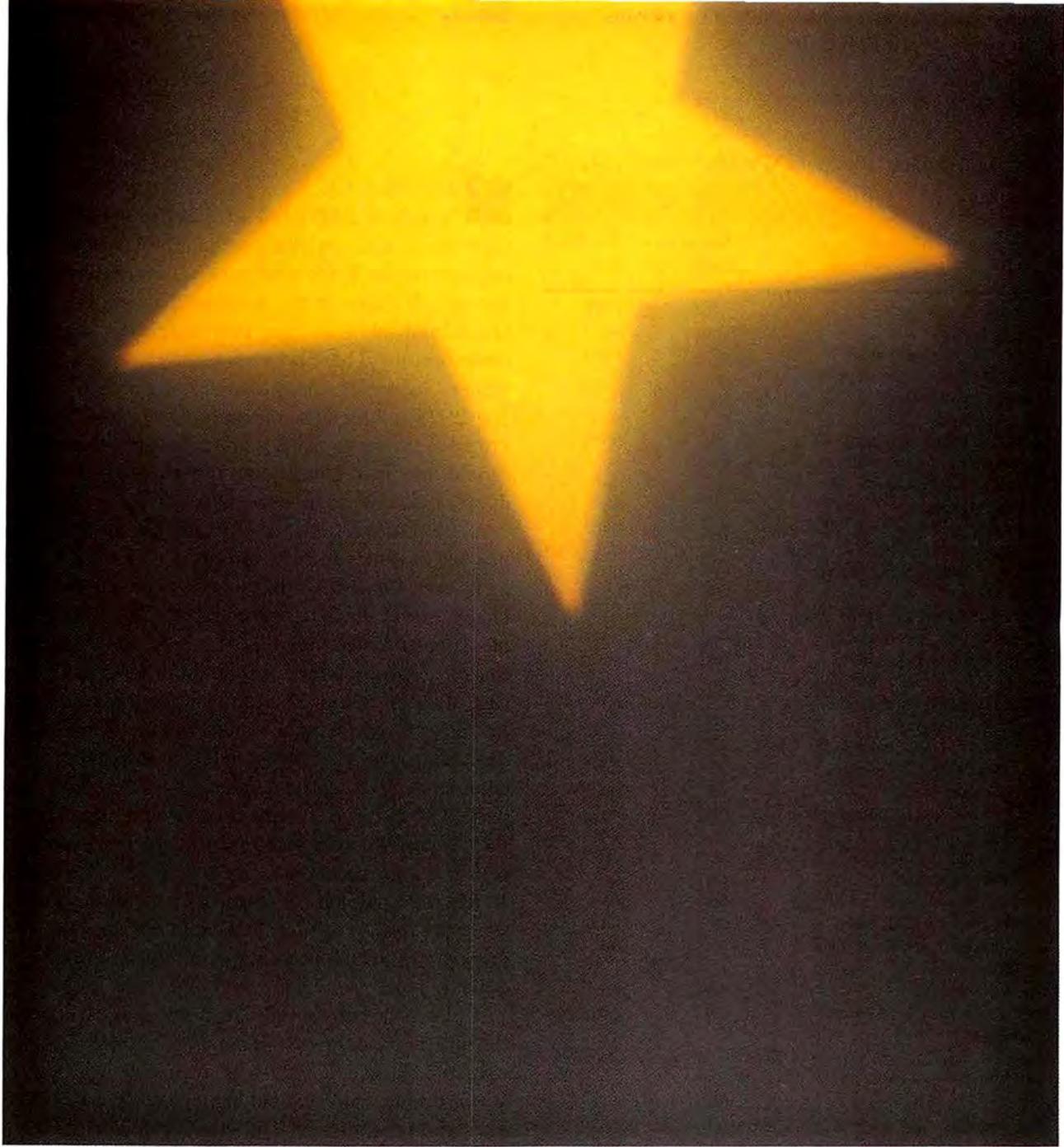
WordStar is one of those phenomena, like modern art, that bring out the critic in people. Whether they love it or hate it, people will tell you exactly what's good or bad about the program. But even WordStar loyalists, who blithely overlook the program's cluttered menus and arcane commands, are beginning to clamor for such state-of-the-art features as automatic paragraph reformatting, proportional spacing, keyboard macros, and multiple-window editing.

When new word processors bearing such features started cutting into WordStar's sales, MicroPro could no longer afford to ignore its critics. Armed

with reams of complaints and suggestions, the company spent a year and a half designing a word processor that would address market realities while seamlessly integrating existing MicroPro products such as MailMerge and CorrectStar. The result is WordStar 2000, a mammoth, seven-disk program that delivers much-needed enhancements, from proportional spacing to windows, while presenting a somewhat friendlier interface than WordStar. For those who lust after even more power, WordStar 2000 Plus adds an index and table of contents generator, a mailing-list data management system, and a scaled-down telecommunications program.

Mostly Welcome Changes

WordStar users will recognize many familiar landmarks in WordStar 2000. As with WordStar, <Ctrl> key commands keep both hands firmly on the home keys; by typing commands quickly, you can bypass menus, or you can suppress them altogether by changing the help level. But MicroPro has made some welcome changes (see Table 1). WordStar 2000 menus are spare and comprehensible, keyboard commands are mnemonic (QS, for example, quits an editing session and saves the file), and dot commands have been banished. Users who dislike typing multiple keystrokes can access 38 commands with the function keys, the numeric keypad, and the 12 top-row keys in combination with the <Ctrl>, <Shift>, and



<Alt> keys, respectively. Keys other than the super-shift and cursor keys can be reassigned with *WordStar 2000*'s install program.

Unlike *WordStar*, *WordStar 2000* recognizes DOS 2.00 path names, allowing program and data files to reside in different directories. The program's hard disk auto-install procedure places the necessary batch file in the system's root directory. By taking advantage of this convenient DOS 2.00 feature, MicroPro has implicitly acknowledged that, contrary to its

PR hyperbole, *WordStar 2000* is designed for use on the XT, the AT, and compatible hard disk systems. On a floppy-based PC, *WordStar 2000*'s lethargy coupled with the need to swap disks is enough to drive even the most unflappable user up a wall. (The program, for example, will make disk reads for operations as basic as a destructive backspace.) An XT or a similar system is a must for acceptable performance; on an AT, the program's execution is naturally quite swift. *WordStar* tinkerers take note: *WordStar 2000* currently won't work in a RAM disk, though enlarging your system's disk buffers speeds up program operation.

Table 1: WordStar 2000 and WordStar compared

	WordStar 2000	WordStar 3.3
Memory requirement	256K	128K
Copy protected	yes	no
User-definable function keys	32	10
DOS 2.00 path name support	yes	no
Mnemonic commands	yes	no
Dot commands	no	yes
Context-sensitive help screens	yes	no
Automatic paragraph reform	yes	no
Automatic hyphenation	yes	no ¹
Multiple windows	yes	no
Go to page, footnote, and character	yes	no
Deletes by sentence and paragraph	yes	no
Deletes to designated character	yes	no
Undo deletion	yes	no
Automatic footnoting (end notes)	yes	no
Keystroke and phrase glossary	yes	no
Five-function calculations	yes	no
Sorts lists by number and alphabet	yes	no
Multiline headers and footers	yes	no
Preset format sheets	yes	no
Margins and tabs remain with document	yes	no
Multiple ruler lines	yes	no
Boldface and underlining displayed	yes	no
Justification displayed	no	yes
Double spacing displayed	no	yes
Proportional spacing	yes	no
Print multiple copies	yes	no
Save and print immediately	yes	no
Save and automatically return to cursor position	yes	no
Typewriter mode	yes	no
Spelling checker/mail merge function	yes	extra cost

¹ User must confirm hyphenation

Not all of MicroPro's changes will be welcomed. For example, *WordStar 2000*'s install and program disks are copy protected. You can back up these disks three times, but only by going through a lengthy and tedious installation procedure. If a copy stops working, there's a roundabout routine for "uninstalling" it and making another copy. But if a copy is lost or melts in a car trunk, there's no reprieve. However, this reversible copy scheme makes it possible for *WordStar 2000* users to install the program on a hard disk and then later uninstall it and transfer it *in toto* to floppy disks or another hard disk system.

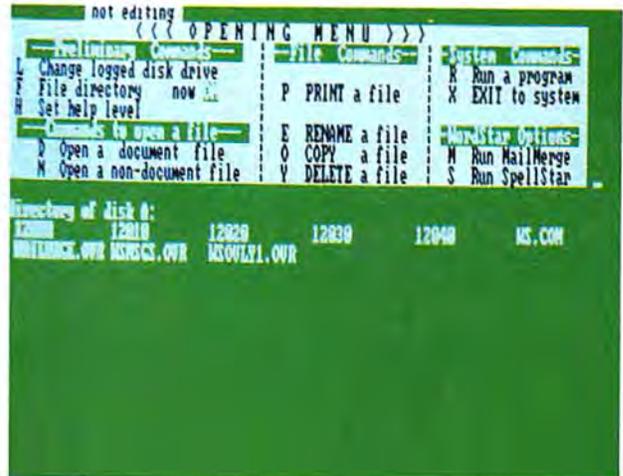
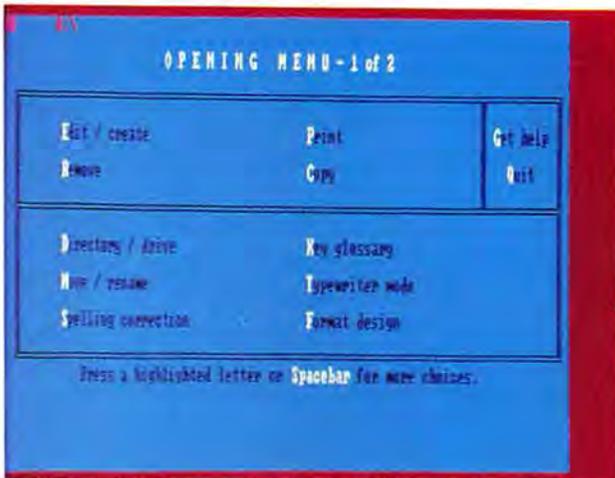
Editing

WordStar 2000's full-screen Opening Menu initially displays 12 options; pressing the <Space> bar replaces the six bottom selections with four others. As with all menus in the program, pressing G (for Get help) displays a screen that explains the relevant menu options. These help screens are at best a supplement to the user manual—don't expect to load *WordStar 2000* and then use the on-line help to learn the program as you go. This is one area that MicroPro should have paid greater attention to, given *WordStar 2000*'s bulk and relative complexity.

Selecting E from the Opening Menu creates a new file or opens an existing one. A major improvement over *WordStar* is the ability to open an existing file by moving the cursor through the directory to the file name and then pressing <Enter>. Unfortunately, this easier-to-use interface is not built into the structure of the program. You cannot select program commands in the same manner, for example, but instead must flip to the right menu and issue a <Ctrl> key command. While those familiar with *WordStar*'s packed and cryptic menus will no doubt appreciate the cleaner look of *WordStar 2000*, the new menus consume a great deal more display space (see Screen 1). MicroPro could have learned a lesson in menu structure from programs such as *MacWrite* and *Framework*, which have command lines and pull-down menus.

Users unfamiliar with its predecessor will find the mnemonic editing commands of *WordStar 2000* easy to pick up, while those who cut their teeth on *WordStar* may find that old habits die hard. *WordStar* aces who type <Ctrl>-T to delete a word will find themselves in the middle of the Tabs and Margins menu; those who expect <Ctrl>-Y to delete a line will get only an irritating beep. Seasoned *WordStar* users will also have to adjust to the new workings of the <Backspace> and keys. Unlike *WordStar*, *WordStar 2000* uses these keys logically: removes what's under the cursor, and <Backspace> erases to the left. One annoying quirk: When either key is held down and then released, the cursor hovers at the end of the line and then suddenly wipes out several words on the line above.

WordStar 2000 offers comprehensive text deletion. In addition to erasing entire words and lines,



Screen 1: WordStar and WordStar 2000 Opening Menus side by side. While WordStar 2000's menu is easier on the eye, it takes over the entire display space. Note, too, that a disk directory is not available at this first menu.

you can erase a sentence, a paragraph, or text up to a specific character. If you accidentally delete the wrong paragraph or simply change your mind, the Undo command will restore the most recent erasure.

Without a doubt, the feature that most *WordStar* users will appreciate is *WordStar 2000*'s automatic paragraph reform. No longer must you manually reform an edited paragraph with <Ctrl>-B and then return to your place with <Ctrl>-Q P. If you so choose, *WordStar 2000* will automatically hyphenate words that don't fit at the end of a line or a page. However, MicroPro has not yet attained its black belt in hyphenation. The automatic hyphenation feature is useful, but it recognizes only a limited number of words. Note, too, that results are displayed only on printouts.

WordStar 2000's new repertoire of advanced editing aids also includes a keyboard glossary, calculation and sorting functions, and, of course, windows. A glossary entry can be 560 characters in length and can consist of text or a series of commands; only one *WordStar 2000* glossary file can be used at any one time. Since these files hold only 2K worth of data, entries must be carefully picked. Program prompts ask you to name a glossary entry and define its contents. To embed a glossary item in a document, type in its name and press <Esc>. Depending on the glossary entry, the program will either insert a phrase in the document or execute a program command.

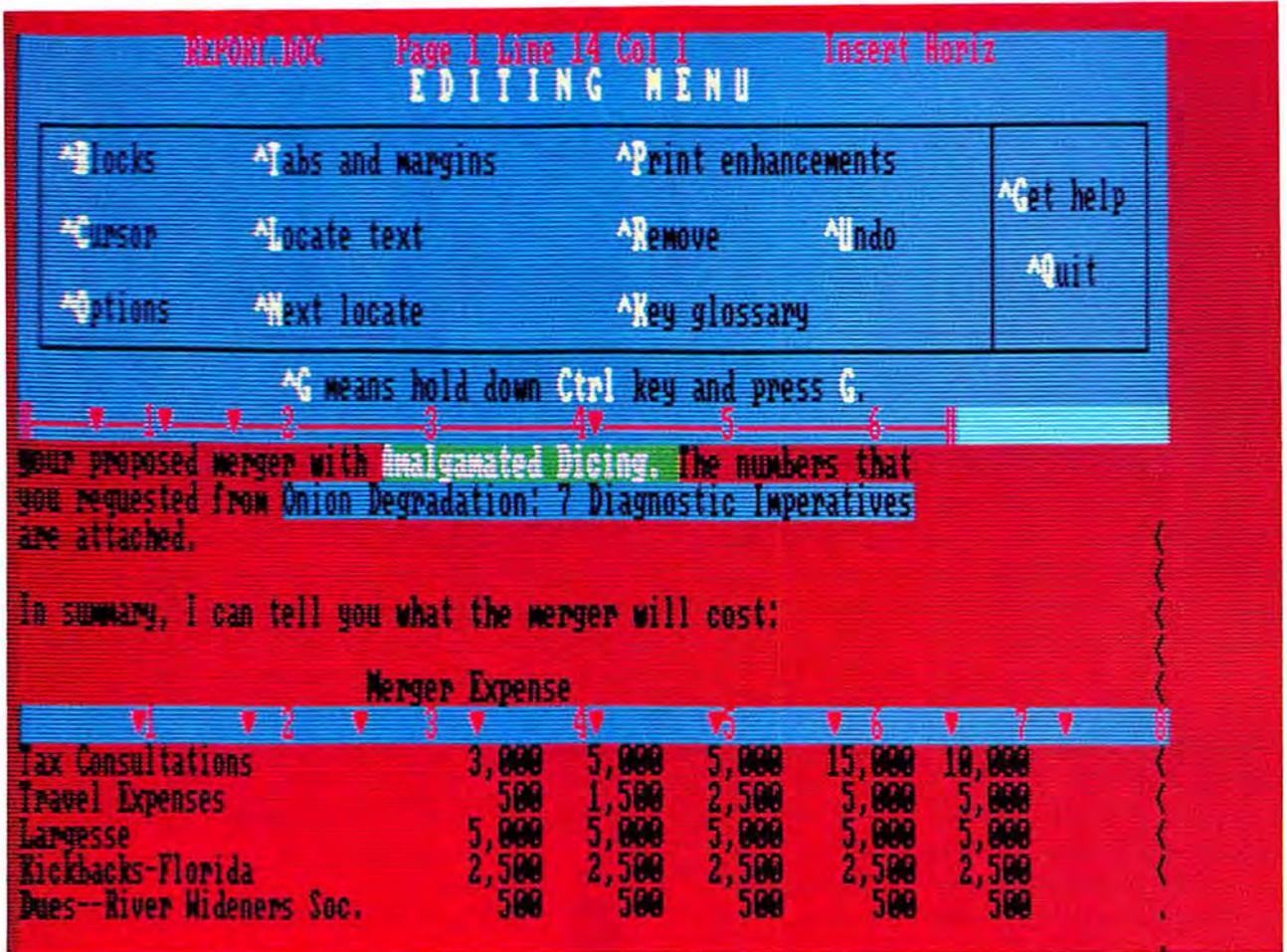
WordStar 2000's calculator function adds, subtracts, multiplies, divides, uses exponents, and delivers answers wherever the cursor is placed. The calculator even operates on compound statements, such as $(3 \times 5) + (6 \times 2)$. Using these math functions is straightforward. For example, to add a column of numbers, mark it like any other block of text and issue the <Ctrl>-B A command (for Block Arithmetic). The result of any calculation using whole

WordStar 2000 takes a simple, functional approach to window management, limiting the user to two or three equally sized horizontal windows.

numbers is always expressed to two decimal places. MicroPro says this bug will be fixed in future versions.

WordStar 2000's sort function can sort up to 50 lines of text alphabetically or numerically in ascending or descending order. This feature is likely to be used to organize mailing lists, tables, and other simply structured collections of data.

Unlike *Microsoft Word* and other window-happy programs, *WordStar 2000* takes a simple, functional approach to window management, limiting the user to two or three equally sized horizontal windows (see Screen 2). In each window you can manipulate different files or different parts of the same file. Mov-



Screen 2: MicroPro does windows. In this example, two WordStar 2000 documents—a letter and a financial plan—are viewed at the same time. This version of the program highlights bold and underlined words in different colors; control characters are not displayed.

ing the cursor from one window to another takes a single keystroke; cutting and pasting text between windows is similarly easy: Mark the text, pop the cursor into the appropriate window, and confirm the paste. If nothing else, MicroPro deserves kudos for doing windows right.

Formatting

Though WordStar 2000's editor more or less conforms to WordStar tradition, the program's formatting procedures are radically different. The most obvious change is visible: underlining, boldface, and other special printing effects are displayed on

screen—control codes are not shown unless you change the program's default setting. Unfortunately, MicroPro has taken one step forward and two back. WordStar 2000 displays all documents as single-spaced and ragged-right. At print time, of course, a differently formatted document will emerge in accordance with your specifications. Not surprisingly, MicroPro claims to be working on this problem.

To simplify document formatting, WordStar 2000 eschews dot commands and instead supplies ready-made format files that contain 13 settings for margins, tabs, hyphenation, lines per page, justification, and so on. When you create a document, you must choose one of the six formats offered by the program or a format that you have created. Most, though not all, format settings can be changed within a document by using keyboard commands. You can alter line spacing, tabs, and margins; you cannot omit

page numbering, change the page offset, or turn off automatic hyphenation unless you leave the editor and modify the format file. Keep in mind that the format file you choose for a file is permanently attached to that file—you can't save a document with one format and print it under another. You change a document's format file by selecting 'F' from the Opening Menu and entering the document's file name. *WordStar 2000* then asks a series of formatting questions. Saving the format file confirms your choices.

WordStar 2000's version of MailMerge doesn't require you to memorize commands such as .fi or .dm. The program asks questions, then generates the appropriate command lines.

WordStar 2000's handling of tabs and margins is a considerable improvement over *WordStar's*. <Ctrl>-T at the Editing Menu summons the Tabs and Margins menu; change the existing setting, and a new ruler is automatically inserted in the document at the point of the change. This new ruler affects all succeeding text until a different ruler is laid in place. Best of all, rulers are saved with a document at the end of the editing session. There is no limit to the number of rulers a document can hold.

Unlike its predecessor, *WordStar 2000* allows multiline headers and footers. MicroPro has also heeded user complaints and included footnoting functions. To insert a footnote at any point in a document, issue <Ctrl>-O N; a space bracketed on either side by the word *Footnote* appears in the text. When you have entered the footnote in the space, you move the cursor out and *WordStar 2000* confirms the entry. The program automatically numbers each footnote and will renumber the entire sequence if any footnotes are added or deleted. Alas, when the document is printed, the footnotes appear en masse at the end, with reference numbers printed as superscripts. MicroPro claims that future versions of the program will print footnotes within a document at the bottom of the appropriate page.

Graceful Exits, Good Printing

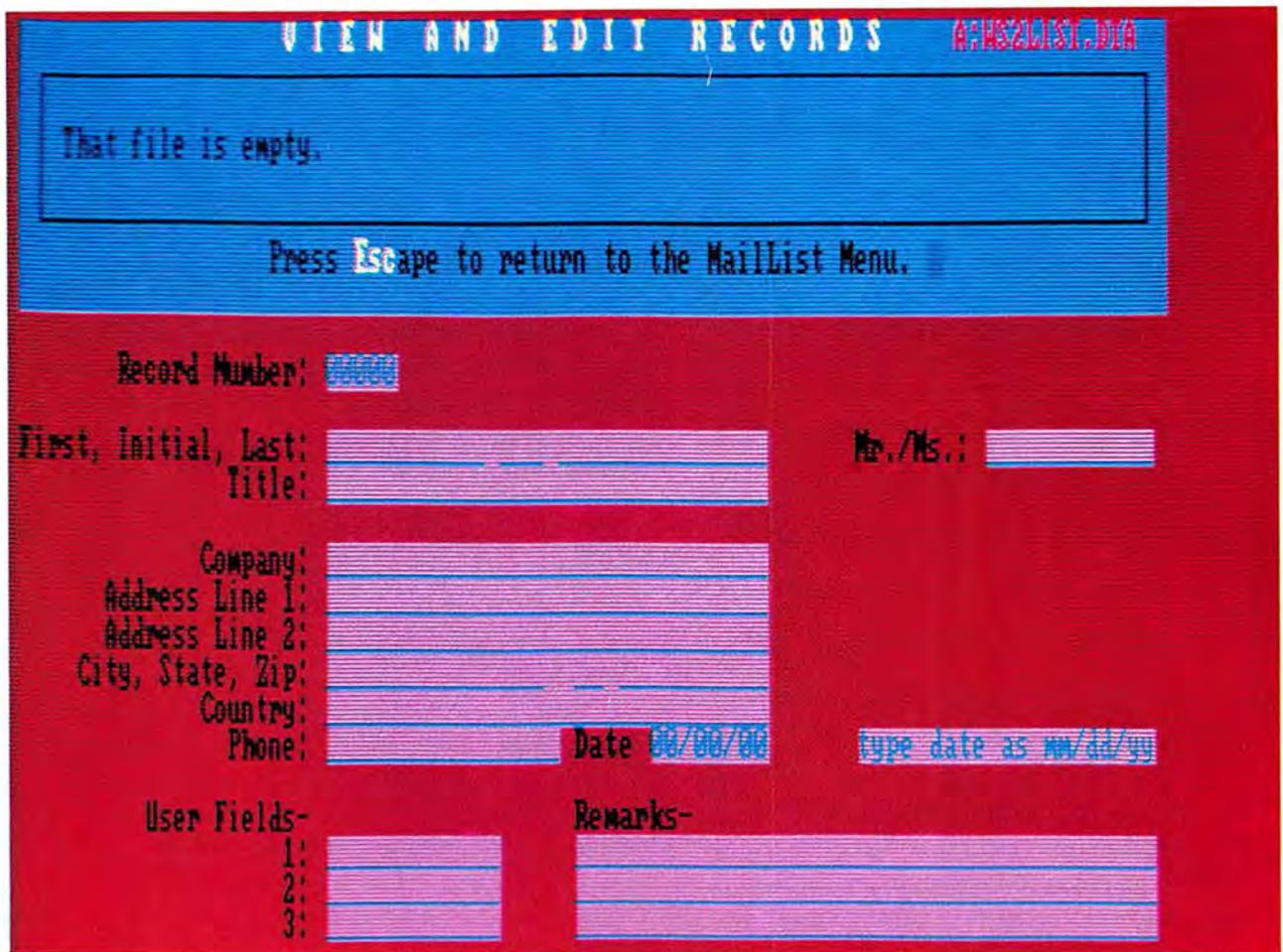
WordStar 2000 offers four options for ending an editing session. You can save a document and exit to the Opening Menu, save and continue editing at the current cursor position, save and print immediately, or abandon the changes made to the file. In true *WordStar* fashion, every time you save a document, the previous version of the document becomes a backup.

If you choose the save-and-print option, *WordStar 2000* bypasses the Opening Menu and displays the Print Decisions screen. There you determine the range of pages to print, the number of copies, whether a draft or formatted copy will be produced, and so on. In its bid to become everyman's word processor, *WordStar 2000* comes configured for nearly 70 printers and supports proportional spacing. As with *WordStar*, you can simultaneously print one file as you edit another, but the setup won't break any speed records.

WordStar 2000's typewriter mode is particularly useful for filling out a form or addressing an envelope. Depending on the program setting, you can send each keystroke immediately to the printer or enter a line, edit it, and send it at your leisure.

MailMerge

Those who know, love, and occasionally swear at *MailMerge* may have a hard time imagining this program without its dot commands, which are used to specify which files are merged and in what manner. *WordStar 2000's* version of *MailMerge* does the same job but doesn't require you to memorize commands such as .fi or .dm. The program asks questions, then generates the appropriate command lines and print options. Once all the questions are answered, you save the letter file and print it. The process of creating data files is essentially unchanged with *WordStar 2000*, although the unformatted document option is used in place of *WordStar's* nondocument mode. For serious *MailMerge* users, the program now accommodates records up to 30,000 characters long. Of course, *MailMerge* can still be used to chain files for batch printing or to nest commands within files for boilerplate printing.



Screen 3: A MailList data entry screen. Typical information—company, title, address, and so on—can be entered and manipulated by this simple data management utility and used in a MailMerge.

■ **CorrectStar**

WordStar 2000's spelling checker is a slightly revamped version of the *CorrectStar* spelling checker designed for *WordStar*. Like its predecessor, the new *CorrectStar's* main dictionary contains 65,000 words; up to 1500 new words can be added to special dictionaries, though only one such dictionary is available during a spelling check session. What distinguishes this version of *CorrectStar* from its *WordStar* counterpart is its ability to check the spelling of a single word, sentence, or paragraph. However, unlike many spelling checkers, *CorrectStar* won't provide a total word count.

■ **A Two-Way Street**

Since *WordStar* and *WordStar 2000* don't share the same file structure, *WordStar* users who upgrade to the new package must convert their old data to the new format. MicroPro has naturally anticipated this eventuality with a utility program that converts *WordStar* files to the *WordStar 2000* format and vice versa. The utility can convert a 20K file in just over a minute. Most control characters translate successfully, though some *WordStar* dot commands and compound *MailMerge* dot commands don't. Unsuccessfully transferred items are flagged in the converted file.

■ **2000 Plus**

WordStar 2000 Plus adds three additional modules: *MailList*, *StarIndex*, and *TelMerge*. (For information on *TelMerge*, see the sidebar "MicroPro's Mailer.") All three reside on a seventh advanced features disk and are accessible from *WordStar 2000's* Opening Menu.

MailList is the ultimate *MailMerge* companion. Rivaling *pfs:file* in simplicity, *MailList* gathers all the information a typical data file might contain—first name, last name, middle initial, title, company, and so on—in 21 permanently defined data fields (see Screen 3). Though *MailList* will sort as many as nine fields and perform single-key searches, the program is essentially a glorified and simplified *MailMerge* data file—and therein lies its charm. Any *MailList* file can be effortlessly merged into any *MailMerge* document. Various mailing list permutations and address labels can be generated by the program.

Though *StarIndex* doesn't make the mind-numbing task of creating an index or a table of contents any more pleasant, it does simplify the process. To single out an item for indexing, the user positions the cursor on the line where the word (or phrase) appears in the text. Pressing <Ctrl>-O | I elicits the prompt 'Index entry?'; you must reenter the item as you want it to appear in the index and then press <Enter> to confirm your choice. The resulting index identifies the page number of the entry. You can speed this process up by marking all occurrences of an item using *WordStar 2000*'s search and replace function.

Underground WordStar

Andrew Fluegelman

MicroPro would have us believe that *WordStar 2000* will be the word processor that carries us into the twenty-first century, but I'm not convinced. I predict that the venerable *WordStar*—the program that everyone gripes about and virtually everyone uses—will be in circulation for years to come as the workhorse word processor.

If you're one of those users who's committed to keeping your *WordStar* version 3.3 running along with your trusty VW bug, I'd recommend a survival manual called *UnderGround WordStar*. Officially, this book is authored by two fellows called Ward Starr and Mel Murch, who in real life are regular contributors to a national computer mag (not this one).

The pun-heavy noms de plume set the tone for this 80-page, saddle-stitched handbook reproduced from a letter quality printout. In their hip

straight-from-the-hip style, Mel and Ward breeze through some of the more obscure and useful *WordStar* commands, suggest handy routines that will save you from the jaws of a fatal 'Disk full' alert and other horrors, and point out just about every patch in recorded history for customizing WS.COM to go faster and higher in a panoply of colors.

The book comes with a disk crammed full of BASIC utility programs to help you patch the program file, set screen colors, smooth *MailMerge* operations, and back up data from a RAM disk. You can get this collection of useful and arcane information—disk included—for the bargain price of \$14.95 plus \$2 for first-class postage. *UnderGround WordStar* is available by mail only from Hard/Soft Press, P.O. Box 1277, Riverdale, NY 10471.

MicroPro's Mailer

Art Wilcox

Electronic communications is one area in which the average computer user is still at sea. At every turn the nascent telecommunicator is confronted with terminology that ranges from the suggestive (baud) to the contradictory (half-duplex). Unfortunately, communications software often exacerbates this already confusing situation. Into this breach steps MicroPro's *TelMerge*, a telecommunications program integrated with the company's *WordStar 2000 Plus* package. *TelMerge* is aimed at businesses that want to automate the sending and receiving of electronic mail via on-line services. *TelMerge* plays this role competently, but make no mistake: If you're looking for a general-purpose telecommunications program, search elsewhere.

Instead of choosing telecommunications functions from a menu as with *Smartcom* or issuing direct commands as with *PC-Talk III*, *TelMerge* users must manipulate control files. These files contain the commands, or keywords, that direct every aspect of the program, from passwords to parity. Keywords fall into one of four groups: communications settings (transmission rate, parity, modem type, and duplex), log-on information (host ID, user ID, and ac-

cess phone numbers), general operations (file names, file types, and function keys), and programming keywords. The last category is essentially a scaled-down programming language, complete with GOTO, IF, ELSE, SAY, CLS, and INCLUDE commands.

TelMerge comes installed with command files that access many of today's largest information services, including CompuServe, The Source, EasyLink, MCI, On-Tyme, the Official Airlines Guide, and both RCA's and ITT's Telex services. Using *WordStar 2000 Plus*, all you need do is edit the command files to insert the necessary ID and password information. When a service is selected from the *TelMerge* menu, the appropriate command file is loaded and its instructions executed without further user input.

Of course, *TelMerge* is not pre-installed for every on-line service you might want to use. Adding a service means creating a new command file—not an easy job for the telecommunications novice. You must not only master *TelMerge*'s keyword list and peculiar syntax, but understand logon procedures, terminal types, and other sundry communications concepts. There's an extra surprise too: A new command file (and hence a new service) is not automatically reflected in *TelMerge*'s menu. You must add the name of the service to the program's accompanying

TELMERGE.SYS file. *TelMerge* comes with a "dummy" control file that can be used when adding unsupported services, but it's difficult to use, since the documentation is rather vague on how the whole process is supposed to work. Once connected to a service, *TelMerge* handles file transfer functions adequately. Function keys toggle control of data capture (log on or off), printer functions, and a "get mail" key for Telex services. However, *TelMerge's* scheme for automatically assigning file names to captured data is confusing, cumbersome, and hazardous. Data is saved with the .LOG file extension, then reassigned a .SAV extension during the next session. During succeeding sessions with the same service, the .SAV file is replaced by the incoming .LOG file. If you haven't emptied the .SAV file of its contents or renamed it before that next session, it is written over by the incoming data. You can manually override this scheme, but the *TelMerge* user manual is rather stingy on the details of how to do it.

Although *TelMerge* is successful enough in providing automated access to on-line services, its talent for PC-to-PC communications is limited. All information resides within control files, so you cannot check or change parameters while on line or, for that matter, manually dial another system. If, for example, communications pa-

rameters don't match, you must disconnect, exit *TelMerge*, return to *WordStar 2000 Plus*, open the appropriate command file, and change the erroneous parameter. In addition, you cannot view, rename, or delete a file or change the logged disk drive while in *TelMerge*.

TelMerge's proprietary error-correction protocol provides safe passage for program files, but it operates only between two machines running *TelMerge*. If MicroPro wants to broaden *TelMerge's* appeal and usefulness, it might include a public-domain protocol, such as Xmodem, in the next version of *WordStar 2000 Plus*.

In the final analysis, *TelMerge* will send and receive electronic mail with a fair amount of automated ease. However, given the complexity of *TelMerge's* command files, its incomplete documentation, plus the absence of tutorials and help screens, you might want to have someone on staff with telecommunications experience. Individuals who merely want to discover the world of telecommunications may find that adapting to *TelMerge's* eccentricities and deficiencies is not worth the effort. Perhaps MicroPro will get *TelMerge* right the next time around.

Creating a table of contents from section headings works much the same way, though you must determine a heading's place in the table of contents. (For example, you might specify that a heading should be labeled a "B" subheading under Section II.) *StarIndex* automatically adjusts a table of contents if a heading is added or deleted.

■ The Hardware Squeeze

Though *WordStar 2000* runs on a 256K system with two floppy disk drives, it begs for a hard disk. The main program barely squeezes onto a single disk—with no room left for DOS. As a result, floppy disk users must load DOS, remove the disk, and insert the *WordStar 2000* program disk. Because the program is copy protected, a "key" disk holding special hidden files must be present in drive B:, then removed to make way for a data disk. Still more disk swapping is necessary to run *CorrectStar* or any *WordStar 2000 Plus* module. The program also gobbles up storage space on data disks. For example, in the case of a spelling check, overlay files totaling 90K must be present when the dictionary disk is in drive A:. For lack of space elsewhere, these files must reside on the data disk.

■ Taming the Beast

How should a new user approach this mammoth program? The *WordStar*-proficient can probably turn to "WordStar 2000 for Former WordStar Users" in the Reference Guide and, after a quick read, dive into the program. Those who are new to word processing or unfamiliar with *WordStar* should proceed a bit more cautiously.

Fortunately, MicroPro offers plenty in the way of instruction. Aside from *WordStar 2000*'s on-line help, MicroPro's disk tutorials introduce the uninitiated to program basics. (The tutorial's eight exercises take about 4 hours to complete.) For the user with time and more than a modicum of patience, there are three spiral-bound user manuals (four with *WordStar 2000 Plus*) to delve into as well. Of these, the Training Guide should be the first stop for the new user; its hands-on exercises, keyed to sample files on the install disk, survey the program from top to bottom. Although the new user won't learn *WordStar 2000* in one sitting, the program isn't overwhelming. Those who are serious about word processing and who are willing to invest a little time won't be disappointed by *WordStar 2000*.

By contemporary standards, *WordStar 2000* is not a state-of-the-art creation. The program lacks an outline processor, its on-line help is rather limited, and its menu interface could stand some rethinking. Those who are happy with *WordStar* may want to keep what they have, for *WordStar 2000* does trade some speed for all its features. (See the sidebar "Underground WordStar" for more information.) If you can't live without proportional spacing, automatic paragraph reform, a keyboard glossary—and you have an XT or AT—take the plunge and buy the program. Where else could you get *CorrectStar*, *MailMerge*, *TelMerge*, *MailList*, *StarIndex*, and a revamped *WordStar* for \$595? *WordStar 2000* isn't modern art, but it's a great deal. ●

Terry Datz is a freelance writer specializing in word processing applications. Her latest book, Processing Words with Your PC, PC XT or PC Compatible, was published by the Hayden Book Company.

WordStar 2000, WordStar 2000 Plus

MicroPro Intl.

33 San Pablo Ave.

San Rafael, CA 94903

415/499-1200

List price: *WordStar 2000* \$495;

WordStar 2000 Plus \$595;

WordStar 2000 upgrade for

WordStar owners \$250, for

WordStar 2000 Plus \$350

Requirements: 256K (320K with

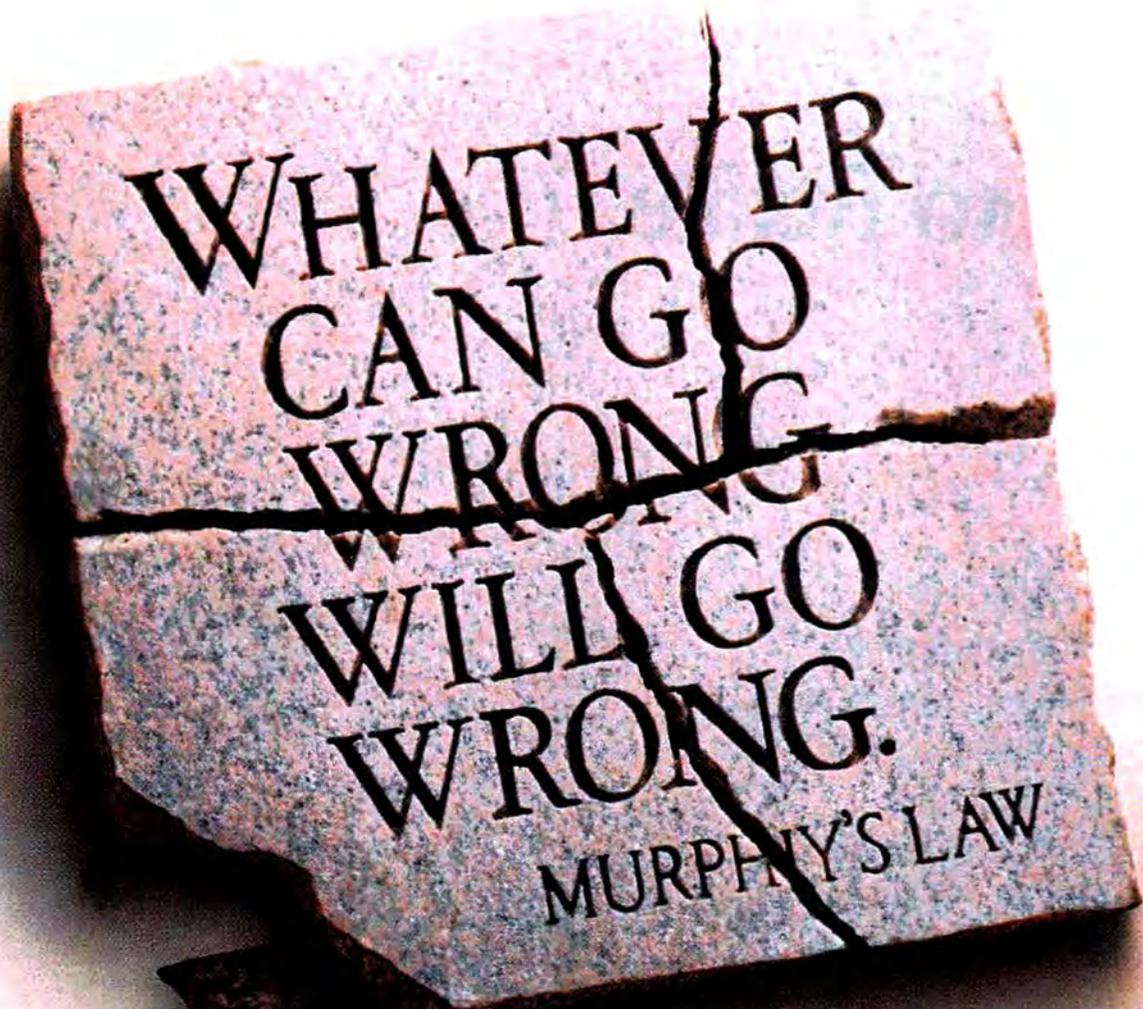
DOS 3.00), two disk drives,

DOS 2.00 or later version (hard

disk recommended)

Editor's note: MicroPro has announced that *WordStar 2000* and *WordStar 2000 Plus* will no longer be copy-protected.

Update kits will be automatically sent to customers who have returned their *WordStar 2000* registration cards.



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Easy to Relate

Two new relational data base management systems—Power-base and Six—appear similar at first glance, but a versatile file design and more powerful features give one the competitive edge.

Manuel Sotomayor

||||| This year a crowd of new relational data base management systems (DBMSs) are challenging the current market leader, *dBASE II*. These challengers are primarily menu-driven and strive to present a friendly user interface. Versatility and speed may suffer due to this user-friendly approach, but most users are willing to pay that price if it means getting a DBMS they can learn to use in a day or two.

Two promising entrants in this mid-range category are *Power-base*, from PowerBase Systems, and *Six*, from ASAP Systems. On a feature-by-feature basis, *Power-*

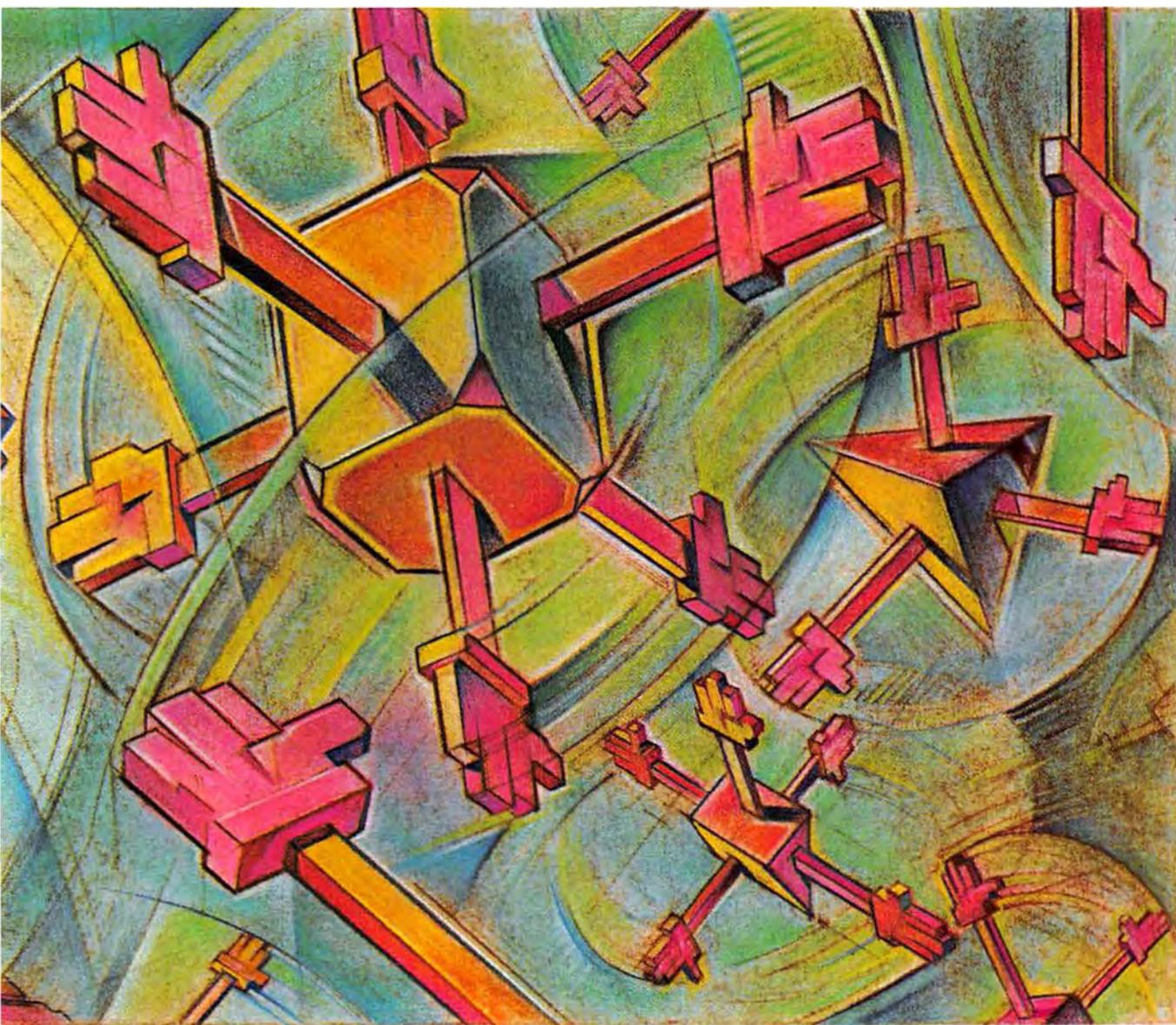
base and *Six* appear to be fairly well matched (see “A DBMS Compendium” on page 145). The prices of the two programs are the same, but *Power-base* provides free customer support, while ASAP charges \$150 a year. The only other major difference is that *Six* is copy protected and *Power-base* is not. However, if you look beyond the vital statistics, differences begin to emerge.

■ Function Key Philosophies

Both *Power-base* and *Six* are menu-driven, and in both programs users make selections with the PC function keys. Both programs display a command line at the bottom of the screen. However, on the issue of how best to use the function keys, the programs follow different philosophies.

Six usually assigns all ten function keys to available menu selections. *Power-base* does the job with only three keys, which retain the same functions throughout the program (see Screen 1). In *Power-*





base, pressing <F9> moves the cursor to the left along the command line, <F10> moves the cursor to the right, and <F8> triggers a selection. Because each screen change in *Six* redefines all the function keys, you must scan the command line to ensure the correct choice (see Screen 2).

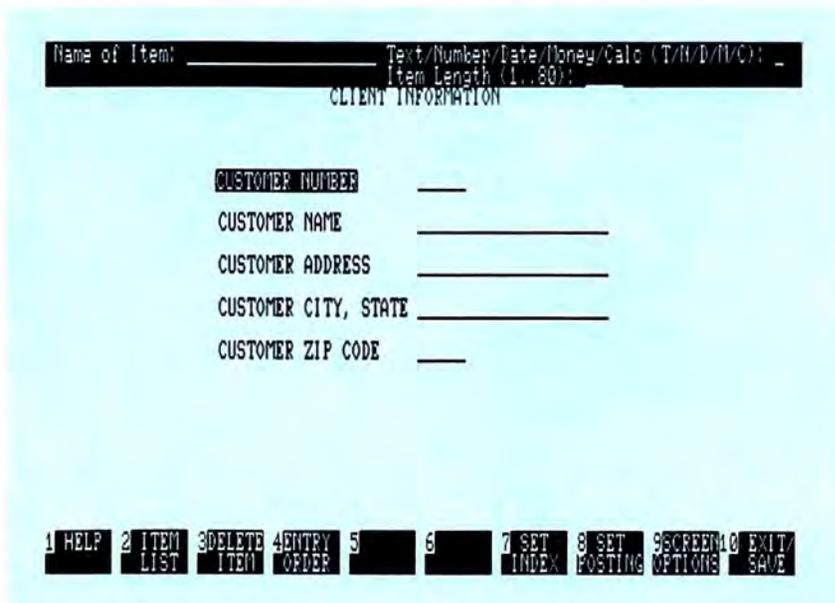
Power-base provides a shortcut called the Command mode (not to be confused with a command language such as dBASE). After pressing <F5>, you need only type in enough characters of a command name to identify it and *Power-base* automatically selects the command. The function keys retain their functions during Command mode so that you can use either method.

Six has a help facility that you can call up at any time by pressing <F1>. The help screen gives a detailed explanation of the current function and points the way to the next logical function. *Power-base* has no similar help feature, forcing the user to rely solely on the documentation. That would be a major flaw were it not for *Power-base's* excellent documentation. The user manual describes all commands and features clearly and in much more detail than the *Six* manual. In addition, *Power-base* comes with a sample applications disk that illustrates a written tutorial. The combination helps cut the learning time to only a few hours. In comparison, the *Six* tutorial lacks sample applications.

Both *Six* and *Power-base* provide standard data entry features such as lookup (which looks in another file to convert CA to Cali-



Screen 1: Data entry screen in *Power-base*. Only three of the function keys are used, but they retain their functions throughout the program.



Screen 2: Screen-design screen in *Six*. All ten function keys are used, but their meanings change throughout the program.

for example), field validation (which imposes limits on data entry, such as numerals or lower-case letters only on a fixed field length), and a ditto function for copying data from one record to another.

Power-base has a Save Next command that reduces two actions—saving the current record and selecting the next record to be updated—to a single keystroke. *Power-base* also has a feature that enables you to substitute date-oriented keywords for actual dates (for example, @TODAY instead of 04/25/85). You can even define your own help messages to supplement field prompts.

File Design: Hierarchy vs. Zoom

Six and *Power-base* both build relational data bases, but the methods used by each to relate, or link, data differ greatly. *Six* has no files—at least not in the usual sense. Instead, the program relies solely on screen definitions for both the layout of each record and the overall structure of the data base. Each screen is given a name by the user and assigned a number by *Six*. The Screen Directory lists each screen by name and number and defines a hierarchy that controls dependencies between screens.

Within a screen *Six* views data in “logical” cells made up of an index followed by a group of logically related data elements. For example, in a typical customer data base for a parts company, a Client cell might contain an indexed field called Custno followed by Custname, Addr, City, State, and Zip. An Invoice screen could

then be defined that would reference the Client cell. The Invoice screen would have to be assigned a higher screen number than the Client screen, which would make it a dependent screen. Data entered on the Client screen would automatically show up in the de-

Power-base comes with a sample applications disk that illustrates a written tutorial. The combination helps cut the learning time to only a few hours.

pendent references on the Invoice screen, and on any other screens lying further along the hierarchy path (see Figure 1).

Conceptually, this approach is easy to understand because it operates strictly at the record level. Files are treated as extensions of a record and are handled internally by *Six*. But the rigid screen hierarchy incorporated in the system makes design changes difficult to implement, especially those involving indexed data elements (key elements that are flagged for speeding up sorting and retrieval). Adding an indexed element requires deleting the original screen and redefining it to include the new indexed element. If data has already been added, the file must also be rebuilt. With this style of file structure, *Six* favors those who have a well-planned design and don't anticipate making changes.

Power-base, on the other hand, is more flexible. Its method of file definition allows you to fashion logical relationships between any two files in a data base. In the customer data base for the parts company, basic customer information would reside in a Client file with

Custno as the index. Invoice information would be stored in another file called Invoice. Linking the two files would require defining a common element in each file. Unlike *Six*, *Power-base* doesn't require the common element to be indexed, but indexing makes the linking process faster.

With the common link in place (say, Custno) you can enter the Client file, select a specific customer, and then jump to the Invoice file to scan all invoices with the same customer number. Since *Power-base* files are separate, you can just as easily begin your search in the Invoice file, jumping to the Client file to select a specific customer. Once you find the information, you can return to the Invoice file to resume your search.

The ability to move quickly from a record in one file to related records in another file is the major feature that makes *Power-base* unique. PowerBase calls this pro-

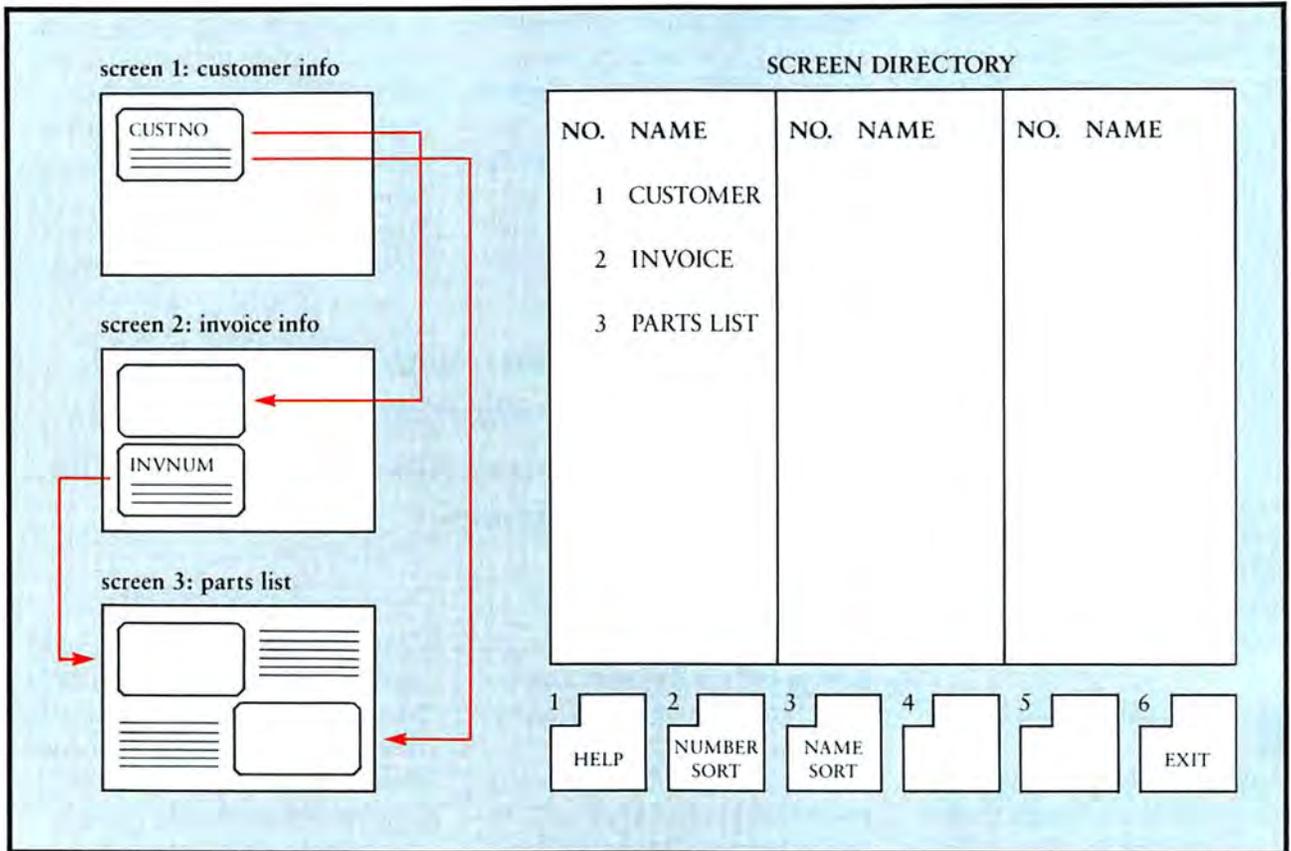


Figure 1: A screen directory in Six that allows you to define a hierarchical relationship between files. Data cells can be accessed only by screens defined at a lower level on the directory. Six's hierarchical structure is a good conceptual tool for novices, but it makes a data base difficult to change.

cess Datazoom, and the common links are called Zoom-Links. *Power-base* accepts up to ten levels of Zoom-Links, allowing even the most complex relationships to be modeled into an application (see Figure 2). Linked files appear and function as one large multi-level file. Yet they can be selected and modified individually. When using Zoom-Links, *Power-base* automatically changes all references to a modified field in all other files. If the field is indexed, *Power-base* updates the proper index file.

Datazooming makes file maintenance easy and, more important, allows a data base design to evolve as the system is used. You can re-define existing files or add new ones, establish or delete Zoom-Links, and update indexed values or define new ones, all without having to duplicate, restore, or rebuild any records. With *Power-base* you have the freedom to alter your design after it's been implemented.

The All-Important Report
 Without the ability to generate customized reports easily, a DBMS is only a limited tool for a limited audience. In the realm of report generation, both *Power-base* and *Six* improve on *dBASE II*. Both programs support all basic report functions, including page breaks, control breaks on sorted fields, subtotals, counts, averages, grand totals, and even labels. Although earlier versions of *Power-base* were criticized because they lacked report features, version 2.00 now surpasses *Six* with features that make it easy to produce professional reports.

With *Six* you define a report in two phases. First you define the physical appearance of the report. An input screen, divided horizon-

tally, is displayed. In the top 17 lines you enter all the free-form text that makes up the page header, such as report titles, column headings, page numbers, and dates. The bottom of the screen is used to select the data items that will appear in each column.

As you type in the name of each data item, *Six* identifies the column on the screen complete with its header and indicates its width

In *Power-base* you define a report by moving through a series of ten screens that enable you to add more detail than is possible with *Six*. First you choose the fields that will appear on the report by pointing the cursor at the field you want to select and pressing <Enter>. Using the Zoom-Link feature, you can select data from other files as if they were part of the current file.

criteria), @Time (the current time), and @Sort (the current sort field in effect). You can also define a footer, with its own set of fields and details. All these values can be positioned and entered in full-screen mode, allowing you to "paint" a report page. To support this function *Power-base* provides a Col-Details command, which displays each column on the report along with the header and footer exactly as they will appear. You can finish the job by selecting the Sort-Field-Details screen and indicating which fields to sort and whether they should be used for subtotals, page breaks, or other control totals.

In the realm of report generation, both Power-base and Six improve on dBASE II. All basic report functions are supported.

in inverse video. You can move data items in the column area to the free-form area and vice versa, calculate values on items found in either area, indicate right or left justification, or truncate any value. You can also define "invisible" items that will be used for sorting and calculation but will not be printed.

Once the format of the report is defined, phase two begins. *Six* displays a table that resembles a large spreadsheet. You enter the parameters that determine which fields will be sorted, when a page break will occur, and which fields will be totaled, counted, or averaged. Upper and lower bounds can be set to filter records that will appear on the report. You enter parameters by responding to prompts with a function key or by modifying the report table directly in the full-screen edit mode.

After you select all the fields, you define the overall report layout, starting with the header. In addition to the layout features available with *Six*, the *Power-base* header can include supplemental details such as @File (the current file), @Select (the current selection

Ad Hoc Reporting

When dealing with data bases it's often convenient to produce spontaneous reports. After a particularly grueling search to select some obscure subset, you might suddenly realize you need a hard-copy listing. In such a situa-

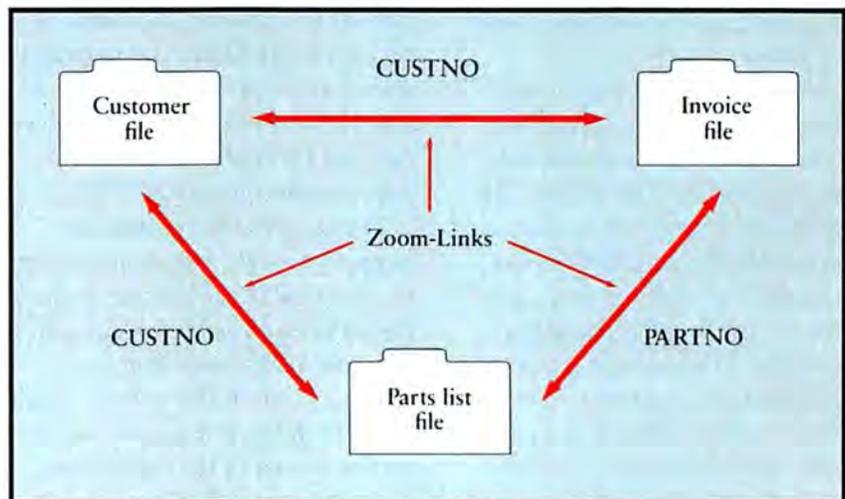


Figure 2: A Power-base data base is structured around the concept of "Datazooming." Using "Zoom-Links" you can access data or view screens of up to ten files. Datazooming enables a more flexible, nonhierarchical design.

tion you don't want to spend a lot of time defining a customized report, nor do you want to make screen dumps of each individual record in your subset. The only solution is some form of ad hoc reporting. Unfortunately, neither *Six* nor *Power-base* addresses this need adequately.

Power-base has a simple report function called List, which can be called from within a file search. It lets you use the cursor to select the data items you wish to include in your list and define the order in which they will appear. When you select Done, *Power-base* begins generating the listing. Unfortunately, it only sends the list to the screen. If you want a hard copy,

perform "what if" calculations using arithmetic and AND/OR operators. Although Query is a handy function for data analysis, it can create lists only from custom reports, not directly from a data base. So much for fulfilling spontaneous needs. It's hardly ad hoc if you have to define the report in advance.

■ File Conversion, Speed, and Security

Both *Six* and *Power-base* read and write files in formats that are compatible with many popular software packages. In addition, they can both create standard ASCII files so data can be transferred to other computer systems.

Power-base is clearly faster. Although both products appear to read the entire file when doing a nonindexed search, *Power-base* is still twice as fast.

File conversion rates while loading external files are respectable in both programs, especially when you consider the field validation and index building required to process each record. Transferring records to an external file seems to be limited only by disk access time. In both cases, using a hard disk would cut all times by at least 50 percent.

One important advantage that *Six* has over *Power-base* is data base security. *Six* has a standard password protection feature that is simple yet effective. After you establish a password using the Utilities module, a password prompt appears in a dialog box on the main menu screen every time you start up *Six*. To keep your password secure, *Six* masks the screen display as you type it in. You get three chances to enter the password correctly before you are returned to DOS. Only after you've entered the correct password will the program allow you to continue and choose from the function menu. In comparison, *Power-base* has no security feature.

■ *Neither Power-base nor Six displays exceptional speed when sorting or searching, but Power-base is clearly faster.*

you must use *Power-base*'s screen print utility to capture one screen at a time.

Six provides two ways to produce ad hoc reports, but neither method is an improvement over the one used by *Power-base*. The first method, Quick Report, produces a nicely formatted report that lists each data item in a columnar format complete with headings. The problem is that this report lists all records; you can't select a subset. The other quick report method is Query, which lists records in a columnar spreadsheet format and enables you to

Power-base comes with predefined formats for seven major products and allows you to define your own formats for both fixed- and variable-length records. These formats are especially useful for telecommunicating ASCII files.

In contrast, *Six*'s conversion support is weak. For example, the user manual describes one of the ASCII formats as being "compatible with many other data base products," but it doesn't say which ones. In the time it takes to look up the format in the target product's user manual (if you have one), the job would be finished using *Power-base*.

Neither *Power-base* nor *Six* displays exceptional speed when sorting or searching (see Table 1), but

■ Lost Without a Language

Although *Six* and *Power-base* are formidable competition for *dBASE*, they lack a command language processor that could be used to build customized interactive applications. To many users its command language is the major feature that contributes to *dBASE II*'s reputation as a "real" DBMS.

Table 1: Six and Power-base compared¹

	Six	Power-base
Sort:		
10-digit indexed field and 3-character nonindexed field	46.13 sec	19.74 sec
40-character nonindexed field	54.20 sec	36.46 sec
Search:		
Indexed search	8.11 sec	2.45 sec
Nonindexed search	3 min, 45.21 sec	1 min, 47.10 sec
File Conversion:		
Inload (including validation, index processing)	15 min, 13 sec	14 min, 45 sec
Outload	8 min, 5 sec	7 min, 53 sec

¹600-record file length, 100 bytes/record

However, if a command language processor is not a requirement for your application, then you should seriously consider both *Six* and *Power-base* as alternatives to *dBASE II*. Both newcomers provide a much friendlier user interface and a more powerful report generator at a lower price.

In almost all review categories, *Power-base* is slightly superior to *Six*. Nowhere was this more apparent than in *Power-base's* flexible file design, which incorporates the powerful Zoom-Link feature. If *Power-base* develops a few important extensions, like a command language processor and a help facility, it could become a potent challenger for the number one middle-range DBMS. ●

Manuel Sotomayor is a manager with the management consulting services group at the San Jose, California, office of Price Waterhouse.

Power-base, version 2.00

*PowerBase Systems
12 W. 37th St.
New York, NY 10018
212/947-3590*

*List price: \$395
Requirements: 256K with DOS 1.10 or 2.00, 320K with DOS 3.00; two disk drives*

*Six, version 6.2
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Tunnel Vision

Microstuf's first venture into the data management field is a slick, quick, and friendly package, but it lacks the relational and quantitative capabilities of a top-notch data manager.

Michael K. Guttman

Microstuf has earned a solid reputation for quality software, largely on the strength of *Crosstalk*, its popular communications program. With the introduction of *Infoscope*, Microstuf adds its name to shelves already populated with data management packages. Does this new offering sustain Microstuf's reputation for reliable, feature-rich software? And what sets *Infoscope* apart from the data management crowd?

Infoscope, like *Crosstalk*, is a single-function product. Data management is the game here, and

no attempt is made to integrate it with word processing, spreadsheets, or any other functions. Unlike most other data management programs, the amount of data that

is managed. The primary liabilities of this reliance on RAM are that *Infoscope* can handle only relatively small files and that it can't adjust to burgeoning data requirements

Infoscope, like a spreadsheet, reads an entire data file into memory at once and does all processing in RAM.

Infoscope can manipulate at one time (the maximum size of a data file) is limited by the amount of available RAM. This is because *Infoscope*, like a spreadsheet, reads an entire data file into memory at once and does all processing in RAM, writing a new or updated file to disk only when you ask it to do so.

Data to Remember

This offbeat approach to data management has advantages and disadvantages. The principal benefit is the speed that results from eliminating extensive disk operations and performing all data base searches and sorts entirely in memory. This method tends to increase the flexibility with which data can be presented or orga-

nized. unless you pop in another memory expansion board.

After I loaded the program on my 256K system, for example, 96K remained for data handling. If I wanted to maintain a mailing list that averaged 100 characters per record, the program could accommodate only about 1000 records. On a 512K system, *Infoscope* could manage more than 3000 records. Although these limitations fall well within the requirements of an ample number of PC applications, such constraints may completely disqualify *Infoscope* as an environment for many others.



Getting Started

Infoscope gets rolling when you invoke an Install routine, which also acts as part of a copy-protection scheme that restricts you to five copies of the program. The *Infoscope* screen consists of a command line at the bottom left and a small map of the working area at the bottom right; the remainder is blank and ready for action. Taking another cue from the spreadsheet model, Microstuf has given *Infoscope* a work area that extends well beyond what's on the screen. The program permits you to scroll around the work area, and the map tracks your location (and monitors available RAM) within that area. The map may

The Infoscope screen consists of a command line at the bottom left and a small map of the working area at the bottom right; the remainder is blank and ready for action.

look like a frill, but it's also quite utilitarian, chiefly because the work area lacks coordinates on the *x*- and the *y*-axis.

Infoscope is command- rather than menu-driven, but commands are in plain English. From the nearly blank opening screen, you will typically either Look at an existing file or Create a new one. If you're unsure about exact procedures, you can simply type **look**, and *Infoscope* will prompt you for an appropriate file name. If you're fairly familiar with the program, typing **look at property** is sufficient

to retrieve a file called Property. If you're a first-time user, typing **help** opens a help window that explains how to enter commands. In general, this kind of prompting is available throughout the program.

Manipulating Scopes

Once you've selected a file, *Infoscope* opens a window to view that file. This window, called a *scope*, lists the contents of the file in tabular form, with headings on top, and data-selected records and the fields that constitute them—conveyed in the body of the scope (see Screen 1). The number of characters per field and per record is open-ended, and multiple-line fields are permitted.

Once you have opened a scope, you select a *focus* that limits the number of records that the scope displays. You might, for example, direct *Infoscope* to **focus on price > 50** as a way of examining only those records in which the value of the field Price is greater than 50. *Infoscope* provides a vocabulary of more than four dozen symbols and keywords that you can use to define a focus. Once a focus is specified, the program enables you to rearrange the records you've selected by invoking a Sort command. Until you do so, the scope has no focus or sort specifications, and records are displayed in the order in which they were entered.

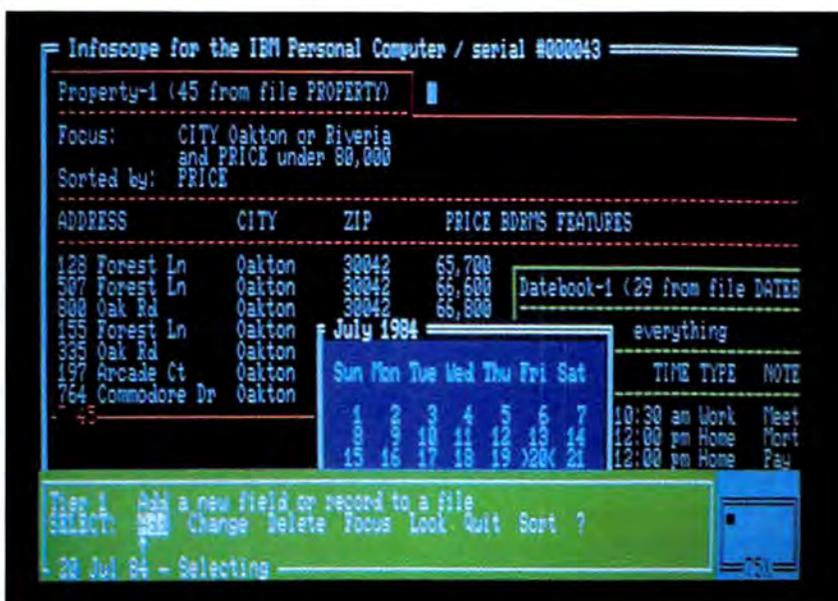
Various other commands enable you to scroll through data and to expand or shrink the size of the scope (see Screen 2). Within the scope you can add or delete records and fields and rearrange the order in which fields are displayed. Modifying fields, however, is a cumbersome process and must be done on a field-by-field basis. Curiously, *Infoscope* won't let you change entries globally.

If you have an affinity for windows, you can use the Look command to generate up to 12 scopes on a single screen. These scopes can be different views of the same file, views of different files, or any mix of the two. Scopes can be rearranged on the screen, expanded or contracted, focused and re-focused, and sorted and resorted to suit your needs. Since these operations take place entirely in memory and are performed by a fast sort algorithm, they are virtually instantaneous. Sort speed is not significantly diminished when operations are performed on a file that hogs RAM.

If multiple scopes of the same file reside on a single screen, *Infoscope* ensures that records added to or altered within one scope are updated in related scopes. In addition, you can link two or more scopes from the same file in various parent-child relationships. In linked scopes, the focus of each additional child is automatically a subset of the focus of its parent. If the focus specifications of a parent scope are changed, the effect ripples down to its children.



Screen 1: Infoscope displays a single scope. Because the Focus is “everything,” all of this scope’s fields and records are shown. The window overlaying the scope specifies function key assignments.



Screen 2: In addition to displaying the “Property-1” and the “Datebook-1” scopes on the screen, Infoscope has created a calendar for the current month; the current date—July 20 in this example—is marked by angle brackets.

■ Marks of Convenience

Besides these data manipulation features, *Infoscope* includes a number of handy shortcuts. You can, for example, create and invoke command files that replace keyboard commands (although these routines will not perform data entry or data manipulation tasks). You can also insert an alias (a synonym) for any word in *Infoscope*'s vocabulary. *Infoscope* can read and create files in 1-2-3 and *dBASE II* formats and can write (but not read) files in Microsoft's SYLK format. The program supports Microsoft and Logitech mice and, more interestingly, works with a number of voice synthesizers—a capability that illustrates Microstuf's emphasis on blending "human factors" into its software. You can use color with *Infoscope*, thereby keeping the various scopes distinct, and the program includes a timer and a calendar.

■ Problems and Limitations

If *Infoscope* shines when creating and manipulating scopes, it's vulnerable in areas that are usually well developed in a data management package. For instance, there appears to be no way to define a field based on the contents of another field (such as making Total Cost equal Price times Quantity). In fact, other than Total and Average commands, *Infoscope* offers no arithmetic, algebraic, or trigonometric operations.

This absence of quantitative functions in turn hampers the program's report-generation facility. Although the Report command does enable you to set page head-

ers and footers and control fonts on dot-matrix printers, you can't do much more. The Report command is limited to reproducing the contents of a scope—sans totaling, subtotaling, page breaks, or other options that are standard with most data management packages. The only realistic way to surmount this hurdle is to rearrange the contents of the scope itself.

In a market flooded with relational data management packages,

help than you might expect from such an ostensibly friendly program. Microstuf gives you the option of creating your own aliases for program commands, but this approach can be as confusing as it is helpful, since you have to document those substitutions on your own. Single-letter aliases won't work, field names cannot be assigned aliases at all, and once applied, an alias is almost impossible to remove.

The capacity to overlay and link scopes, though technically impressive, seems of relatively little value in solving real-world problems.

Infoscope is relational only to a minimal degree. Data consolidation is not this program's forte. Indeed, the product provides no ability to pass data between two *Infoscope* files, even those structured in a like manner; you can link scopes, but only if they share the same file. There simply are no commands that correspond to the Import, Export, Append, or Join functions commonly included in other data management programs. *Infoscope* leaves you only the option of creating a new file based on a focused subset of an existing file.

■ Aliases on the Loose

Although *Infoscope* is quick and fairly flexible—at least where record and field length are concerned—it isn't particularly easy to use. I often had difficulty remembering how to invoke some of the commands, for which *Infoscope* supplies no shorthand and less

It's tough to understand the logic behind some of the program's snazzier features; it makes you wonder whether some are options for options' sake. I had a difficult time conceiving of a project that would need *Infoscope*'s advanced or esoteric capabilities—an undo feature or a Sleep command that shrinks an inactive scope, for example—but wouldn't be stymied by the virtual absence of other, more fundamental ones—such as true relational structures or a serious computational ability.

Indeed, the capacity to overlay and link scopes, though technically impressive, seems of relatively little value in solving real-world problems. Obtaining two different logical views of the same data at the same time might make sense in a spreadsheet that entails extensive calculations, but it's al-

most useless in a data manager that doesn't even support subtraction or multiplication. Perhaps I simply lack imagination, but the documentation was short on examples of how to make music from the program's bells and whistles.

Relinquishing Command
Infoscope's command language, which could have given the program more power, is crippled by an absence of common programming structures; for example, *Infoscope* lacks looping and branching functions such as IF... THEN and DO... WHILE. The few control features that exist are hampered by cryptic and confusing syntax. Serious use of the command language seems to be limited to creating demos, such as the one that accompanies the program disk, but that language is not appropriate for sophisticated applications.

I also doubt the utility and wisdom of *Infoscope's* in-memory approach to data management. With the proliferation of RAM disk products and larger and faster hard disks, the speed advantage of a RAM-based data manager is hardly decisive; in fact it seems a poor trade-off for an arbitrary limitation on file size, particularly when little or no arithmetic processing is occurring.

Tutor or Reference Book?
The *Infoscope* manual is clean and colorful but misses the mark. It reads like a cross between a tutorial and a reference manual, and it doesn't really succeed as either. As a tutorial, the manual fails to offer sufficient examples or to lead the newcomer

through the program's features in a consistent or meaningful way. As a reference tool it lacks consistency of organization, and even though the index is satisfactory, that doesn't solve the problem.

Innovation Gone Astray
Infoscope strikes me as an innovative product, but the program fails in the most important area: it doesn't handle real-life situations in a useful, convenient, and consistent manner. The product is more a data manipulator than a full-blown data manager. *Infoscope* implements its design well and seems generally bug-free; I simply question the design itself. If I misunderstood the point of *Infoscope*, my suspicion is that much of the buying public may do so as well. As it stands now, I see little reason to favor *Infoscope* over the multiplicity of available data management software. ●

Michael K. Guttman is a frequent contributor to PC World, and his consulting company, Professional Computer Technologies, is based in Chico, California.

Infoscope
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404/998-3998
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Graphics Master \$ 479

Call for specifications and help in deciding which board fits your needs.

MISCELLANEOUS

RAM chips 64K Set \$ Best Price
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(Report Generator, dBase II or III) .. \$ 169

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IMSI—4 Point Graphics (Rated #1) .. \$ 59
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Tutorial Set (IBM PC/XT and DOS) .. \$ 69
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Inventory Control \$ 299
Payroll \$ 369
Supercalc III (Version 2) \$ 219

INFOCOM—Zork I, II, III \$ 29
All games available \$ Call

LATTICE

C—Compiler \$ 299
C—Food Smorgasboard (C—Library) .. \$ 110
Lattice Windows (Allows Windowing) .. \$ 225
Float 87 (8087 support) \$ 89
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Volkswriter Deluxe w/TextMerge \$ 169

LOTUS DEVELOPMENT

Lotus 1-2-3 (Version 1A) \$ Call
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Kpaint \$ Best Price
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Flight Simulator \$ 32
Multiplan (New Version) \$ 129
Word \$ 239

Word w/Mouse \$ 299
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Project \$ 159
Chart \$ 159

MICROPRO

Wordstar w/Tutorial on Disk \$ 195
Wordstar 2000 Newest Version \$ 269
Professional Plus \$ 329
Wordstar 2000 Plus \$ 329
Propack \$ 295

MICRORIM

R.base 4000 \$ 279
Clout \$ Call
Extended Report Writer \$ Call

MICROSTUF

Crosstalk XVI (for Hayes
Smartmodem) \$ 99

MORGAN COMPUTING

Trace 86 (Assembly Language Debug) \$ 89
Ted (Program Editor) \$ 69
Professional Basic (640K of workspace) \$ 69
8087 & 80287 Support \$ 39

MULTIMATE INTERNATIONAL

Multimate (See Specials) \$ 269

PETER NORTON

Norton Utilities (Newest Version) \$ 65

ROSESOFT

Prokey (Newest Version) \$ 95

SCARBOROUGH SYSTEM

Master Type \$ 39

SOFTWARE PRODUCTS

Open Access \$ Call

SATELLITE SOFTWARE INTERNATIONAL

Word Perfect (includes Speller) \$ 250

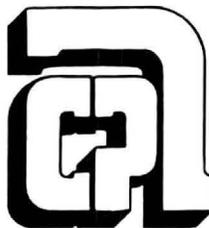
SOFTWARE PUBLISHING

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Circle 205 on reader service card

SIGN-MASTER™

Number 1 in word charts for presentations and reports

Create powerful headlines using SIGN-MASTER's color, size, and font options. Here we chose Bold Roman font.

Highlight a single character, word or an entire line at the touch of a button. Here we focus attention on one number with color and underline.

Indicate source, date, author, etc. with SIGN-MASTER's footnote option. Bold Standard font was used in this example.

THE BOTTOM LINE
PROJECTED EARNINGS
(Millions of \$)

	'78	'79	'80	'81	'82
Sales	86.4	121.0	144.0	163.8	182.0
Net Income	5.9	8.8	11.4	13.4	15.7
ROS(%)	6.9	7.3	7.9	8.2	8.6
Mkt. Share	48%	61%	65%	71%	76%

Capital expenditure required: \$5 Million
Net present value = \$24.25 Million
(opportunity cost of capital = 24%)

(Source: Annual Report)

Develop professional tables quickly and easily. Once data and text is entered, SIGN-MASTER determines the spacing and layout.

Produce SIGN-MASTER word charts on paper, overheads or slides.

With SIGN-MASTER, the possibilities are limitless:

CASUAL USER MARKET
1975 Chain Saw Market
Year Ending March 31, 1982

1981	1980	1979	1978
12,000	11,500	11,000	10,500
11,500	11,000	10,500	10,000
11,000	10,500	10,000	9,500
10,500	10,000	9,500	9,000

Proposals

SUMMARY FINANCIAL DATA

PLAN	ACTION	INTEREST
SALES REVENUE	145,000	120,000
COSTS	110,000	95,000
NET INCOME	35,000	25,000
EXPENSES	110,000	95,000
SALES EXPENSE	25,000	20,000
SALES EXPENSE	110,000	95,000
NET INCOME	35,000	25,000

Summaries

Table 1 - OPERATING DATA

UNIT	1978	1979	1980
Production	100	110	120
Revenue	100	110	120
Expenses	100	110	120
Net Income	100	110	120

Exhibits

EXHIBIT 1
PROFIT FROM INVESTMENT

Initial Investment	100,000
Annual Cash Flow	20,000
Present Value of Cash Flows	150,000
Net Present Value	50,000

Schedules

FINANCIAL SUMMARY

Revenue	100,000
Expenses	80,000
Net Income	20,000
Assets	100,000
Liabilities	80,000
Equity	20,000

Tables

NEW PRODUCT PROPOSAL
For the introduction of the
Bigger
A Backyard Chain Saw for the
Growing Casual User Market

Title Pages



SIGN-MASTER is the first program designed to allow everyone from top management on down to produce colorful, attention-gaining "word charts" and tables for presentations and reports.

Created on a PC with a compatible plotter or printer, SIGN-MASTER word charts are superior in quality to typing and less expensive than typesetting or printing.

Professional Word Charts Made Easy

In just minutes, this unique menu-driven program lets you create impressive, easy-to-read documents using words, numbers, lines and SIGN-MASTER's simple-to-master Table Mode.

Number 1 in Quality Text

SIGN-MASTER offers the greatest variety of text options. In addition to 6 fonts, 16 sizes and 8 colors, you can justify text, underline, italicize, set margins, spacing, and more.

An Important Presentation Tool

With SIGN-MASTER and any one of over 40

plotters, you can produce full color originals on paper and overheads. The program also works with over 10 printers to create the highest quality printer graphics available.

Make Super Slides Quickly and Economically

Presentation-quality 35mm slides can be created in-house and inexpensively using the Polaroid Palette in conjunction with SIGN-MASTER.

For reports and presentations that get noticed, get SIGN-MASTER — Number 1 in word charts.

The retail price is \$245.00. Call or write today for a complete information kit and a demonstration at your nearest dealer. Decision Resources, Inc., 25 Sylvan Road South, Westport, CT 06880 (203) 222-1974

SIGN-MASTER is a trademark of Decision Resources, Inc.

Circle 342 on reader service card

Decision Resources
Software Designed for Decision Makers



A DBMS Compendium

		Six	Power-base	Infoscope
Requirements:	RAM	192K	230K	192K
	Hard disk	No	No	Yes
	Key disk	Yes	Yes	No
Features:	8087 support	No	No	No
	On-line help	Yes	No	Yes
	Menu- or command-driven	Menu	Menu	Command
	DOS 2.00 subdirectories	Yes	Yes	Yes
	Data encryption	Yes	No	No
	Date formatting	Yes	Yes	Yes
	Date operations	No	Yes	Yes
	Calculated fields	Yes	Yes	No
	Customizable data entry screens	Yes	Yes	No
	Text editor	No	No	No
	Command language	No	No	Yes
	Macro capabilities	No	No	No
	Statistical functions	No	No	No
	Graphics capabilities	No	No	No
	Relational structure	Yes	Yes	No
Data entry validation	Yes	Yes	Yes	
Capacity:	Maximum records	65,534	65,534	Memory dependent
	Maximum record length (characters)	1600	1600	255
	Number of digits of precision	13	15	9.5*
	Maximum fields per record	65	64	Memory dependent
	Variable field length	No	No	Yes
	Maximum number of sort keys	18	5	Unlimited
	Global search and replace	Yes	Yes	No
File conversion:	ASCII files	Yes	Yes	Yes
Predefined formats:	1-2-3.wks	No	Yes	Yes
	VisiCalc.DIF	Yes	Yes	No
	Multiplan.SYLK	No	Yes	Yes
	dBASE II	Yes	Yes	Yes
Report generator:	Report from multiple files	Yes	Yes	No
	Customizable formats	Yes	Yes	No
	Multiple levels of subtotalling	Yes	Yes	No
	Save to disk	Yes	Yes	No

*2 decimal place minimum

Live a little.

SOFTWARE

Aptec (for color Prism Printers)	
Rainbow Writer Color Text Formatter	\$119.
Rainbow Writer Screen Grabber	69.
Ashton-Tate	
dBase II	255.
dBase III	355.
Framework	355.
Friday!	169.
Reference Encyclopedia (book)	55.
Best Programs	
Personal Finance Programs	65.
PC/Professional Finance Program II	149.
PC/Fixed Asset System (version 3.0)	329.
PC/Tax Cut	129.
Personnel (Level 1)	279.
Personnel (Level 2)	419.
Personnel (Level 3)	559.
Bible Research	
THE WORD (KJV Bible - 7 disks)	145.
Borland International	
Sidekick	30.
Sidekick (non-protected)	49.
Turbo Pascal	30.
Turbo 8087	59.
Turbo Toolbox	30.
Turbo Tutor	19.
Pascal, Toolbox, & Tutor	59.
Turbo 8087, Toolbox, & Tutor	85.
Broderbund	
Bank Street Writer	49.
Bruce & James	
WordVision	39.
Continental	
Home Accountant Plus	89.
The Tax Advantage	39.
Financier	
Financier II	115.
Financier Tax Series	97.
FriendlySoft	
FriendlyWriter (with FriendlySpeller)	55.
Funk Software	
Sideways	45.
Harvard Software	
Harvard Project Manager	209.
Harvard Total Project Manager	279.
Hayes	
Smartcom II	89.
Lifetree	
Volkswriter Deluxe (with TextMerge)	159.
Volkswriter Scientific	289.
Living Videotext	
ThinkTank	109.
Lotus Development	
1-2-3	call
Symphony	call
Micro Education (MECA)	
Managing Your Money	see special
Running Program (Jim Fixx)	49.

PC Connection Software Special

through April 30, 1985

MECA

Managing Your Money

Fully integrated home/personal finance program

- 7 programs in one: checkbook/budget, net worth, stock portfolio manager, tax estimator, life insurance evaluator, financial calculator, electronic reminder calendar
- Enter data only once: fully integrated "chapters"
- Tutorial on disk; easy to master
- Help screens called up quickly with ESCape key

\$99.

Micropro

WordStar	\$179.
WordStar 2000	259.
WordStar 2000 Plus	299.

Microrim

R:base 4000	259.
Extended Report Writer	85.
Clout II	135.

Microsoft

Multiplan (version 1.2)	125.
Microsoft Spell	35.
Microsoft Word (version 1.15)	239.
Microsoft Word with mouse (ver 1.15)	289.
Microsoft Mouse with software	135.
Microsoft Serial Mouse with software	135.
Microsoft Project	155.
Microsoft Chart	155.

Microstuf

Crosstalk XVI	99.
Infoscope	149.
Transporter (includes Crosstalk)	169.

MultiMate International

MultiMate (version 3.3)	259.
-------------------------	------

PCsoftware

PCcrayon II	39.
Executive Picture Show	139.
CREATABASE	47.

Peter Norton

Norton Utilities (version 3.0)	65.
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Rossoft

Prokey 3.0	89.
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Satellite Software

WordPerfect (version 4.0)	249.
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Software Arts

TK!Solver	249.
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Software Publishing

PFS:Access	59.
PFS:File	85.
PFS:Graph	85.

PFS:Plan	\$85.
PFS:Proof	59.
PFS:Report	77.
PFS:Write	85.
Sorcim	
Supercalc 3	199.
Virtual Combinatics	
Micro Cookbook	29.
Warner Software	
The Desk Organizer	139.

TRAINING

ATI

SKILL BUILDER PROGRAMS

Intro To:

Word Processing	Accounting
Business Software	Data Bases
each 32.	

How to Use:

Compaq	PC-DOS (2.1)
Basic	Home Accountant
IBM-PC	VW Deluxe
MS-DOS (2.0)	TK!Solver
each 32.	

TRAINING POWER PROGRAMS

How to Use:

dBase II	dBase III	Lotus 1-2-3
MS Word	Easywriter II	Multimate
Multiplan	Supercalc 3	Framework
Symphony	Wordstar	
each 49.		

Comprehensive Software

Intro to Personal Computing	39.
Intro to Databases	39.
Intro to Communications	39.
Intro to the Operating System (PC Tutor)	39.

Individual Software

The Instructor	35.
Professor DOS	47.
Tutorial Set (both items above)	75.
Professor Pixel	47.
Typing Instructor	39.

LEARN - PC Video

Introductory to Lotus 1-2-3 (videocassette training) specify VHS or BETA... call

Scarborough Systems

Master Type	35.
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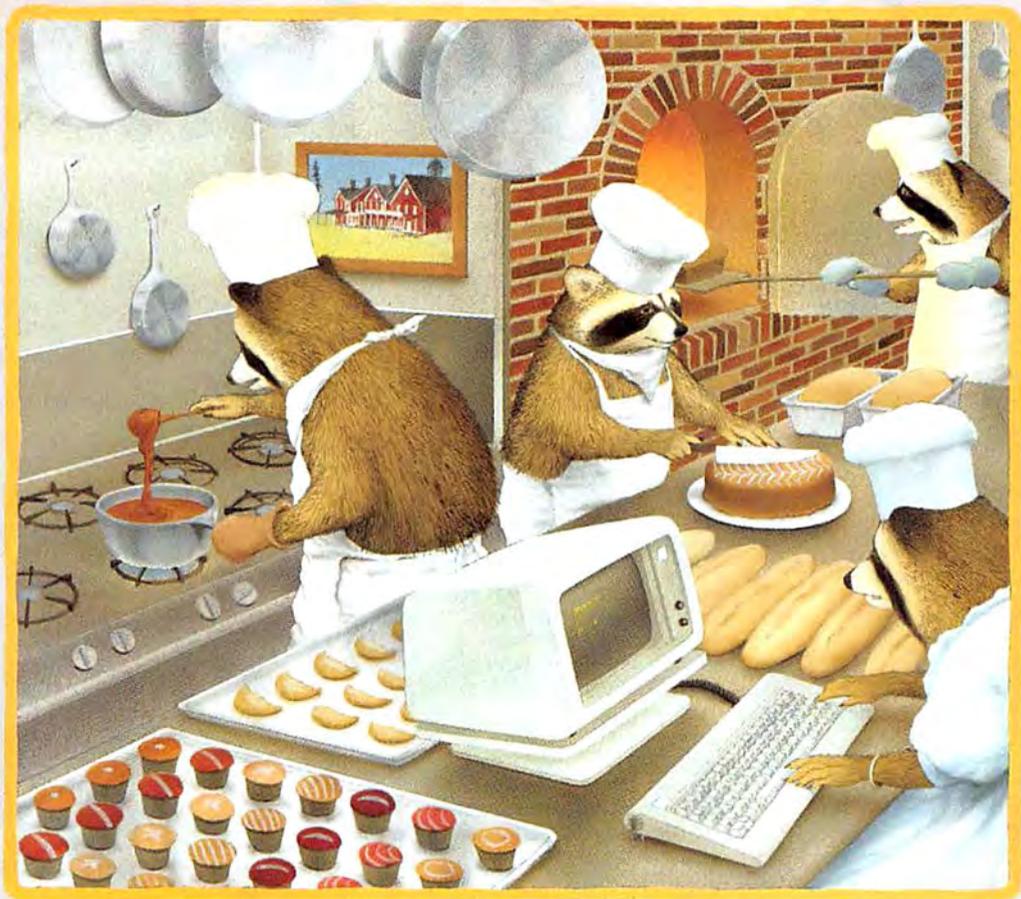
EDUCATIONAL

Davidson

Speed Reader II (high school & college)	49.
Math Blaster (grades 1-6)	35.
Word Attack (grades 4-12)	35.
Spell It (grades 5-adult)	35.
Additional Data Disks for other ages are available for Speed Reader II and Word Attack at \$15. each	

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OwlCat SAT (15 hour)	63.
OwlCat SAT (60 hour)	169.

FriendlySoft

FriendlyWare/PC Introductory Set	35.
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Spinnaker

Educational Games for Young Computer Users. (All require graphics board)	
Delta Drawing (ages 4 to adult)	34.
Snooper Troops I (ages 10 to adult)	30.
Snooper Troops II (ages 10 to adult)	30.
Most Amazing Thing (ages 10 & up)	27.
President's Choice (ages 13 to adult)	27.
Face Maker (ages 3 to 8)	23.
Kids on Keys (ages 3 to 9)	23.
Story Machine (ages 5 to 9)	23.
Fraction Fever (ages 7 to adult)	23.
Kinder Comp (ages 3 to 8)	20.
Rhymes and Riddles (ages 5 to 9)	20.
Hey Diddle Diddle (ages 3 to 10)	20.
Alphabet Zoo (ages 3 to 8)	20.

Stone (requires graphics board)

My Letters, Numbers, Words (ages 1 to 5)	29.
Kids Stuff (ages 3 to 8)	29.
Across the U.S.A. (ages 5 and up)	22.

GAMES

Blue Chip

Millionaire	39.
Tycoon	39.
Baron	39.

Broderbund

Lode Runner	25.
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FriendlySoft

FriendlyWare/PC Arcade	35.
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Hayden Software

Sargon III	35.
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Infocom Difficulty levels shown in italics

Seastalker (junior)	25.
Enchanter (standard)	25.
the Witness (standard)	25.
Planetfall (standard)	25.
Cutthroat (standard)	25.
Hitchhiker's Guide (standard)	25.
Zork I (standard)	25.
Zork II (advanced)	29.
Zork III (advanced)	29.
Infidel (advanced)	29.
Sorcerer (advanced)	29.
Suspect (advanced)	29.
Deadline (expert)	33.
Starcross (expert)	33.
Suspended (expert)	33.

Invisiclus (hint booklets) are available for all Infocom games. Specify game. . .

Microsoft

Flight Simulator	35.
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Origin Systems

Ultima III	39.
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Orion

J-Bird (you'll never sleep)	29.
PC-Man	25.

PC Connection Hardware Special

through April 30, 1985

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603/446-3383

PCSoftware

Armchair Quarterback	\$27.
Chess 2001	27.
Championship Blackjack	23.

Professional Software

Trivia Fever	23.
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Sir-Tech

Wizardry	42.
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Spectrum Holobyte

GATO	27.
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Sublogic

Night Mission Pinball	29.
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HARDWARE

AST Research (For IBM-PC or XT)

All AST Boards come with SuperDrive, SuperSpool, and one year warranty.

SixPakPlus 64k upgradeable to 384k, with clock calendar, serial and parallel ports (game port optional)	249.
MegaPlus II 64k upgradeable to 256k (or more with MegaPak) with clock calendar and serial port (parallel, game, or second serial port optional)	249.
MegaPak 128k (not upgradeable)	239.
MegaPak 256k	339.
I/O Plus II with clock calendar and serial port (parallel, game, or second serial port optional)	129.
Parallel, Game, or second Serial Port for any AST board (specify board)	35.
Connectall connector bracket (PC only)	19.
AST-5251	529.
AST-3780	589.

Amdek

Video 300G monitor (green)	139.
Video 300A monitor (amber)	149.
Video 310A monitor (amber)	179.

Compucable

Plastic Keyboard & Drive Cover Set	17.
IBM Mono Screen Enhancement	17.
Printer to IBM Cable (specify printer)	27.
Smartmodem to IBM Cable	25.

Cuesta Systems

Datasaver (200w power back up)	call
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Curtis

STANDS

PC Pedestal (for IBM Mono or Color)	37.
PGS or Quadchrome Adapter for above	9.
Low Profile Tilt and Swivel Pedestal	37.
AD-2 Adapter for Portables	15.
System Stand	19.

CABLES

Extension Cables for IBM Mono Display	35.
Keyboard Extension Cable (3 to 9 feet)	27.
AC Plug Adapter (any monitor to your PC)	8.

SURGE SUPPRESSORS

Diamond (switched 6 outlets)	33.
Emerald (switched 6 outlets; 6 ft cord)	43.
Sapphire (switched 3 outlets; EMI/RFI filter)	53.
Ruby (switched 6 outlets; EMI/RFI filter; 6 ft cord)	63.

For the IBM-PC Exclusively.

PC CONNECTION®

Save a lot.

Epson

Many of the RX, FX, and JX dot matrix printers are now being shipped as the "Plus" version. "Plus" printers can print in near letter quality (NLQ) with the addition of the NLQ option.

RX-80 with GRAFTRAX-Plus	call
RX-80 F/T with GRAFTRAX-Plus	call
FX-80 with GRAFTRAX-Plus	call
RX-100 with GRAFTRAX-Plus	call
FX-100 with GRAFTRAX-Plus	call
JX-80 with GRAFTRAX-Plus	call
LQ-1500 (letter quality dot matrix)	call
Printer to IBM Cable (specify printer)	27.

FTG Data

Light Pen (Push Tip)	195.
Demo Disk Set for Light Pen	39.

Hayes

Smartmodem 300	199.
Smartmodem 1200	459.
Smartmodem 1200B (w/Smartcom II)	389.
Smartmodem 2400	597.
Smartcom II	89.

CompuCable's

Smartmodem-to-IBM Cable	25.
-------------------------	-----

Hercules Computer

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

IOMEGA

Bernoulli Box 20 Meg	2695.
10 Meg cartridge	56.

key tronic

Deluxe keyboard (KB 5151)	169.
---------------------------	------

Koala

Koala Touch Tablet with software (connects to game port)	89.
Speed Key System	115.

Kraft

Joystick	35.
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Maynard Electronics

Floppy Drive Controller	119.
Internal Hard Disk (10 Meg) with WS-1 Controller	859.
Internal Hard Disk (10 Meg) with WS-2 Controller	1049.

Mouse Systems

PC Mouse (w/software & desk pad)	129.
PC Mouse (w/software, pad, & PC Paint)	139.
PC Paint (software)	69.

NEC

Pinwriter P2-3 (IBM, 80 column)	679.
Pinwriter P3-3 (IBM, 132 column)	897.
Spinwriter 2050 (3550's little brother)	699.
Spinwriter 3550 (IBM-PC compatible)	1369.
Spinwriter 8550 (IBM-PC compatible)	1789.

Orchid Technologies

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

Blossom 64k upgradeable to 384k, with clock calendar, serial and parallel ports	229.
---	------

PCnet Daughter Board (piggybacks to Blossom) with version 2.4 networking software	call
PCnet Blossom 64k Blossom Board with the Daughter Board installed	call
PC Turbo 128k	call

Paradise Systems

Modular Graphics Card	275.
Multidisplay Card	289.

Princeton Graphics

HX-12 RGB monitor (690 x 240)	call
MAX-12 Amber monochrome monitor	call

Quadram

New Expanded Quacboard 64k
expandable to 384k, with clock calendar, parallel, serial & game port, I/O bracket, and Quadmaster software 249.

Microfazer Printer Buffer (parallel) w/copy MP 64 (64k upgradeable to 512k) 169.

Quadcolor I 197.

Quadlink 369.

Quadchrome RGB Monitor 469.

Quadchrome II 469.

SMA (Systems Management)

PC-Documate Keyboard Templates available for:

DOS/Basic 1.1	Supercalc 3
DOS/Basic 2.0-2.1	Wordstar
Lotus 1-2-3	Turbo Pascal
Symphony	WordPerfect
Multiplan (IBM)	dBase II
Multiplan (Microsoft)	dBase III
Peachtext 5000	Framework
Easywriter II	Multimate
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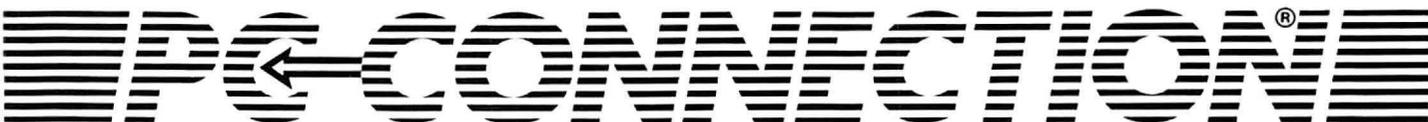
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From the Software Shelf

PC World editors offer first impressions of recent software releases

In this special edition of From the Software Shelf, PC World's editors share the spotlight with our regular contributors, who look at updated versions of some of 1984's most important programs.

Edited by Robert Luhn

Framework's Mite

Some software companies promise to revise their software but never deliver. Ashton-Tate took a different tack: although the company never promised a revision of *Framework*, it revised the program before release and then revamped *Framework* again just four months after it hit the market.

The first revision came, no doubt, in response to Lotus Development's *Symphony*, which included a telecommunications module—a feature that *Framework* initially lacked. With both integrated products on the verge of release, Ashton-Tate quickly sutured an existing telecommunications program called *Mite* onto *Framework* with the aid of a *FRED* program. As I noted briefly in my initial review of the package (see "Framework: Simplicity and Synergy," *PCW*, Vol. 2, No. 12), the operation was rather slapdash. *Mite* boosts *Framework*'s memory requirements from 256K to 384K, effectively denying the majority of PC users access to the package—or so I thought. With the final version of *Framework* in hand, I can pass along some good news: *Framework* works fine on a 256K machine, though, of course, the telecommunications module will not load.

But *Mite* is by no means an intimate part of the *Framework* environment. In fact, *Mite* can work as a stand-alone program, and this independence precludes the seamless integration shared by *Framework*'s word processor, spreadsheet, data base, and graphics modules. *Mite* does not behave in a *Framework*-like manner: its menus are decidedly different, and the function keys trigger entirely different types of actions. At best,

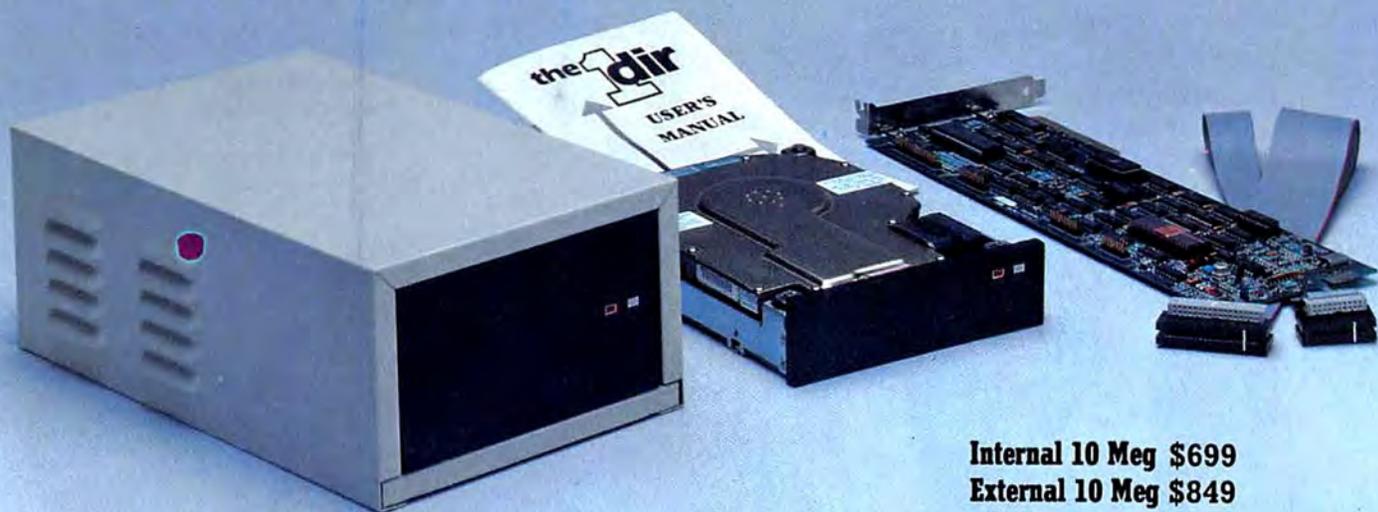
Framework simply makes *Mite* friendlier. You can use *Mite* to capture files into frames, and you can run *Mite* from the *Framework* desk top. Nonetheless, it is sad to see Ashton-Tate set a new integration standard and then immediately lower it.

As a telecommunications program, *Mite* has a number of redeeming features. It supports most



modems available for the IBM PC, features an auto-answer mode with password protection, and can cope with 9600-bps transmission rates. *Mite* even comes with a FORTRAN utility that makes possible PC communications with larger computers. Like other sophisticated telecommunications programs, *Mite* can load as many as ten macros to automate logon sequences with passwords, set parameters, and give other commands. However, *Mite* macros function only within a telecommunications session. DOS commands such as DIR, REN, TYPE, and ERASE can also be used within *Mite*.

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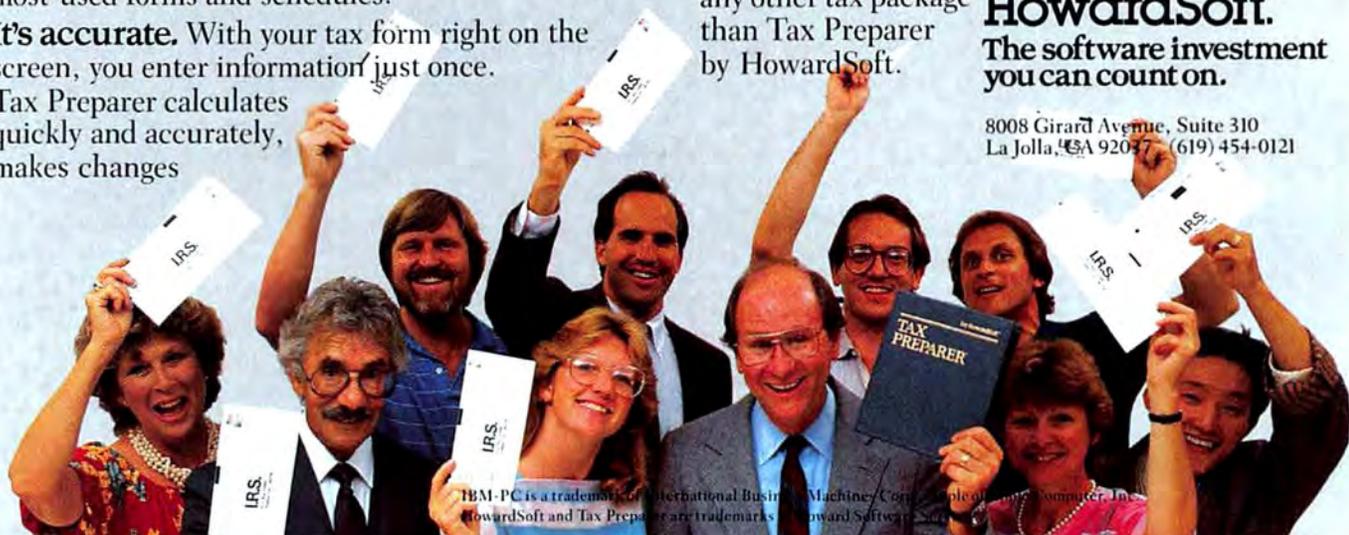
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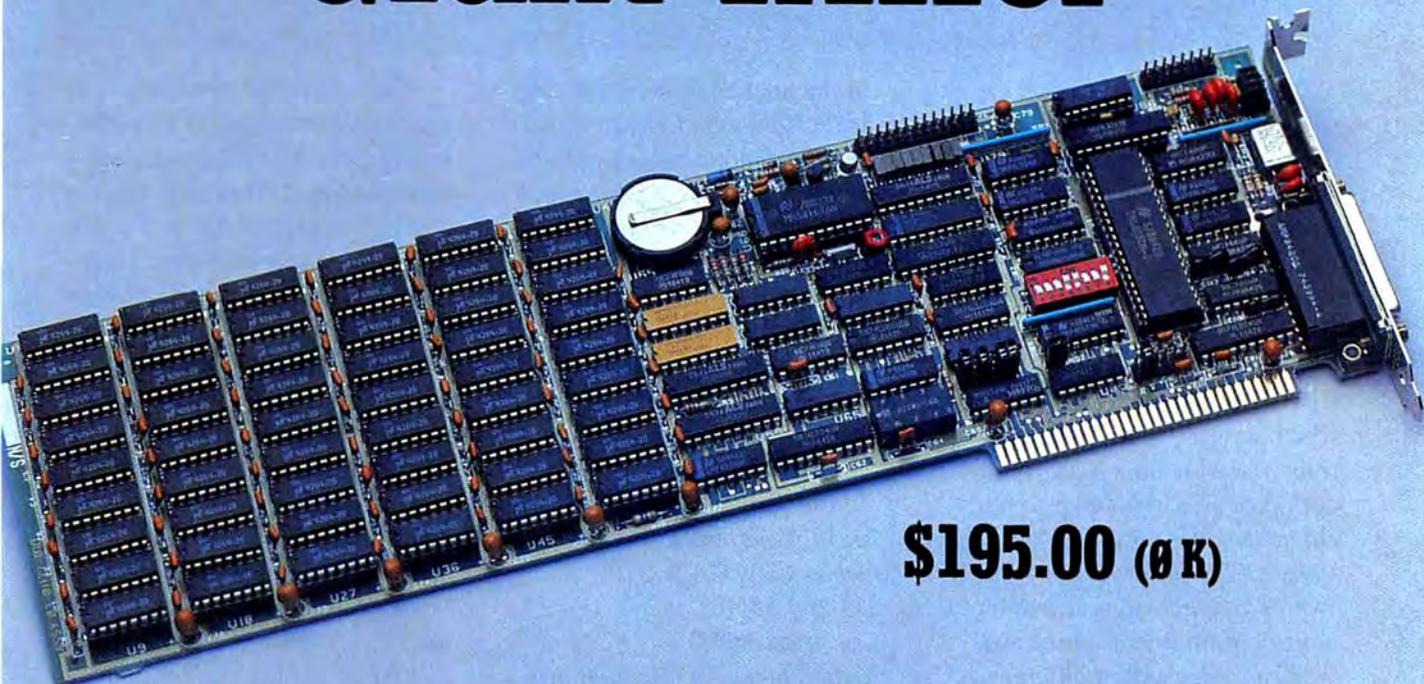
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Perhaps *Mite*'s biggest plus is its support of a plenitude of communications protocols. Besides straight ASCII transfers, *Mite* is conversant in Xmodem, Xmodem batch, *Crosstalk*'s CLINK, *Smartcom*'s Verification Protocol, IBM Async, and *Mite*'s Multifile; the program can also utilize the CRC error-checking method, which ensures nearly error-free file transfers. *Mite* also gives you the option of filtering out up to ten characters of your choice during a session. The program will ignore *WordStar*'s notorious eighth bit—a useful option if you want to use *WordStar* files with a different word processor.

In spite of these powerful features, *Mite* has some annoying traits. Telecommunications parameters for frequently called systems and on-line services must be stored in separate, external files. Anyone who has used a setting sheet for specifying parameters will find *Mite*'s approach irksome: It requires that you remember the name of the appropriate parameter file or find it in the disk directory. If you regularly communicate with a number of services and computer systems, you'll soon find your disk cluttered with files. Were *Mite* better integrated with *Framework*, the external files could easily be stored and retrieved from a data base frame. However, *Framework* does have a menu frame that holds the names of remote systems. When a system is selected from the menu, the name is passed to *Mite* and the parameter file loads automatically. Exiting *Mite* returns you to this menu.

In the final analysis, what's significant is how *FRED* can be used to tie stand-alone programs to *Framework*. As an experiment, I altered the *FRED*-to-*Mite* program so I could use *PC-Talk III*; the program worked perfectly. So maybe *Framework* users can have their cake—and more or less eat it, too. —Bill Crider

Framework
Ashton-Tate
10150 W. Jefferson Blvd.
Culver City, CA 90230
213/204-5570
List price: \$695
Requirements: 384K, two disk drives, DOS 2.00 or later version

Samna Word II and III, Versions 2.0

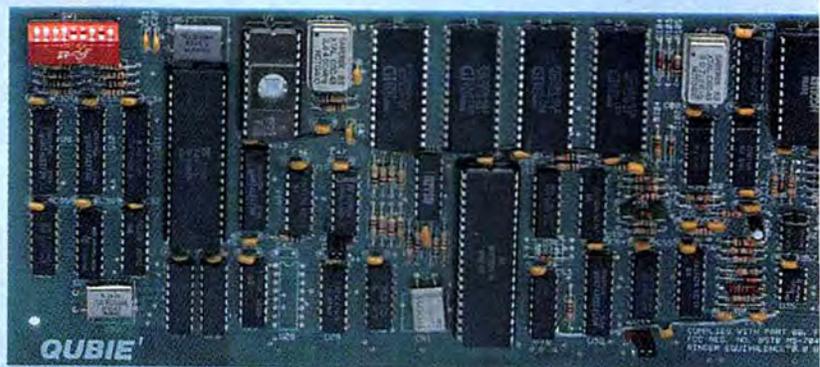
It's obvious that the people at Atlanta-based Samna Corporation have been doing more than sipping mint juleps out on the veranda this past year. In an ambitious effort to simultaneously beat out dedicated word processors and best its competitors in the PC arena, the company has released a significantly enhanced *Samna Word II* and introduced *Samna Word III*. In the true spirit of the South and marketing bravado, Samna is trotting out these new versions and pitting them in public "docuthons" against the established dedicated word processors sold by Wang, NBI, and IBM.

While powerful, the original release of *Samna Word II* conspicuously lacked a mail merge feature. Version 2.0 corrects this oversight and, perhaps as a consolation, adds sort and select capabilities to the program. With these features, for example, a customer mailing list could be sorted by zip code and merged with a form letter, with printed results properly presorted for mass mailing.

Part of keeping up with the competition is offering goodies everyone can appreciate. So it's not surprising that in addition to a mail merge feature, *Samna Word II 2.0* also includes an 80,000-word spelling checker. As with most spelling checkers, you can replace a flagged word, ignore it, or add it to the main dictionary or one you create. The checker will go the extra step and display a list of alternate spellings, then insert your choice in the place of a suspect word.

While it's a crowd pleaser, *Samna Word II 2.0* also meets the needs of special users. For the serious word processor, the program will now move, copy, insert, and delete columns. For the indecisive, it will restore impulsively deleted text. For those with special printing requirements, the program supports proportional spacing. And in a move seldom seen in the software industry, Samna has purposely dropped its copy protection scheme to accommodate hard disk users. Not surprisingly, *Samna Word II* can now take advantage of DOS 2.00's tree-structured file system.

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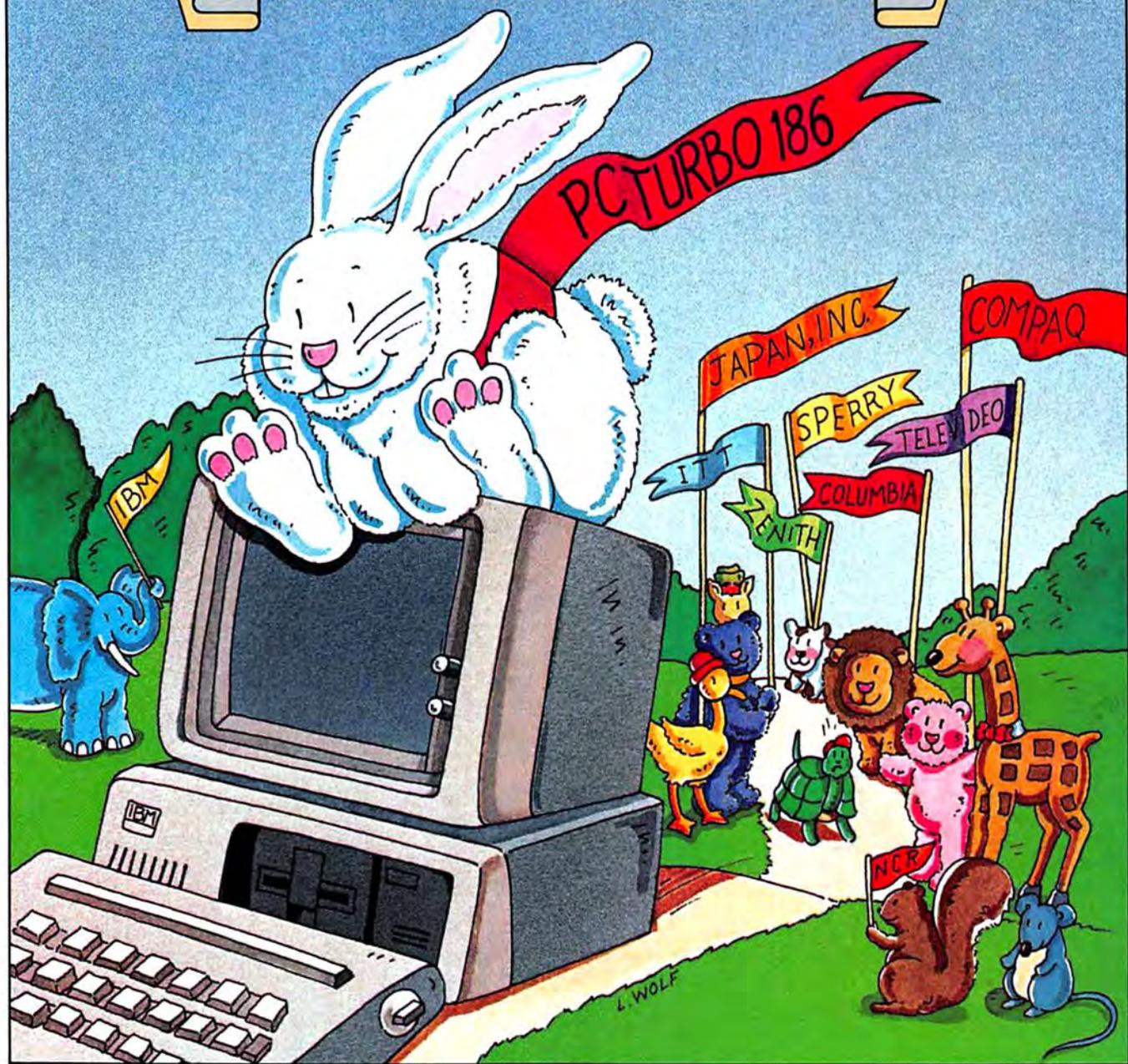
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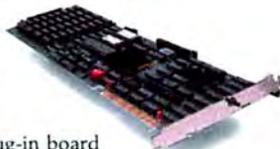
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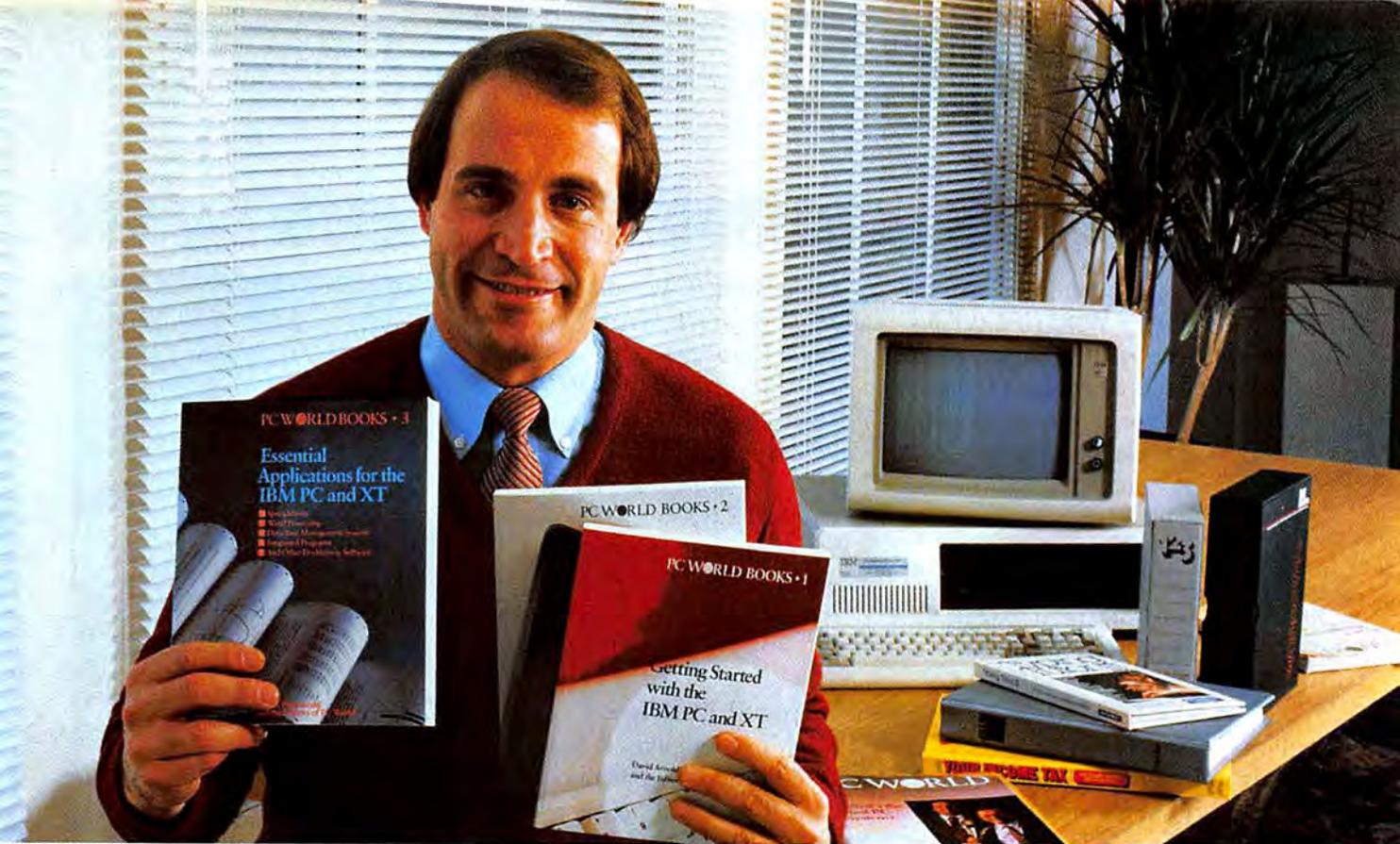
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The company, in keeping with its generous nature, gives owners who bought *Samna Word II* after April 1984 an upgrade to version 2.0 at no charge; those who bought version 1.0 prior to April must pay \$50. All *Samna Word III* owners receive free *Samna Word III 2.0* upgrades automatically.

While many software companies boast that their word processors are a match for a Wang or an IBM DisplayWriter, few make good on their claims. Samna does. Given the company's street-smart aggressiveness and *Samna Word*'s success in various "docuthons," it's clear that these folks ain't just whistling Dixie. —*Merrily Shinyeda*

Samna Word II, Version 2.0
Samna Word III, Version 2.0
Samna Corp.

2700 N.E. Expwy. #C-700
Atlanta, GA 30345
800/241-2065

List price: *Word II 2.0* \$450,
Word III 2.0 \$550

Requirements: 256K, two disk
drives, DOS 2.00 or later
version

Smartcom II, Version 2.0

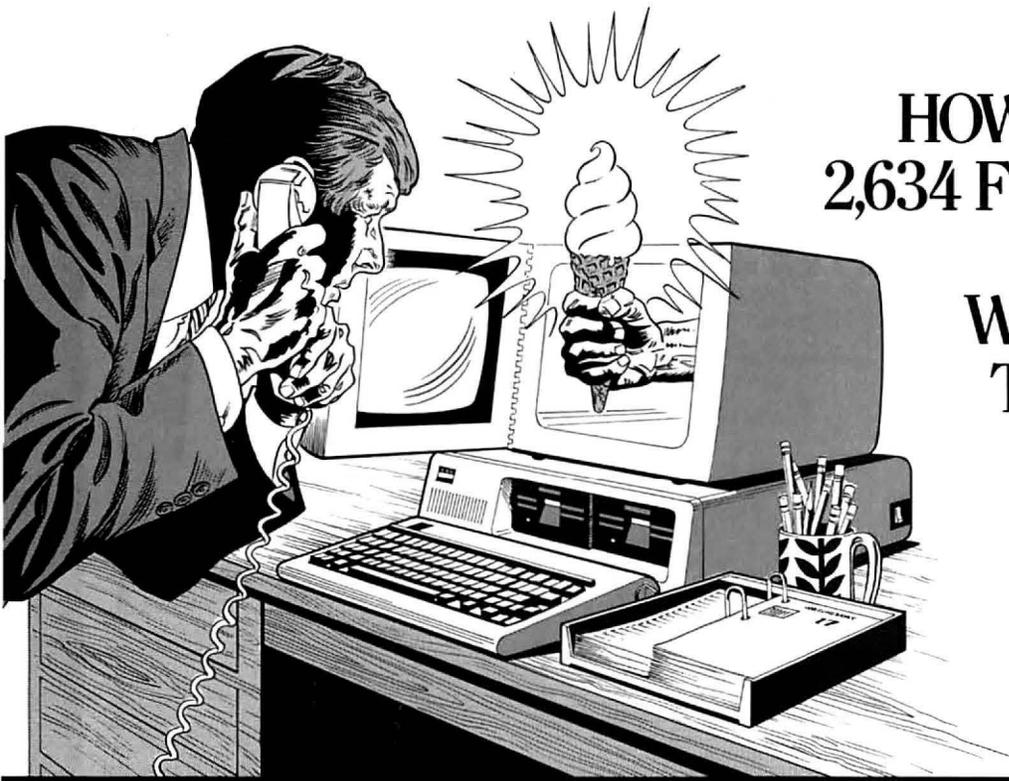
Hayes Microcomputer Products has a well-earned reputation for making some of the best personal computer modems around. When Hayes introduced *Smartcom II*, its first PC communications program, it set a standard for elegance and ease of use. This trouble-free program integrates a number of powerful features with a simple menu system and doesn't bother with any copy protection schemes. It's no surprise that *Smartcom II* has become one of the most popular communications programs on the market. With the introduction of version 2.0, Hayes retains the program's virtues, remedies a few niggling flaws, and adds some very potent features.

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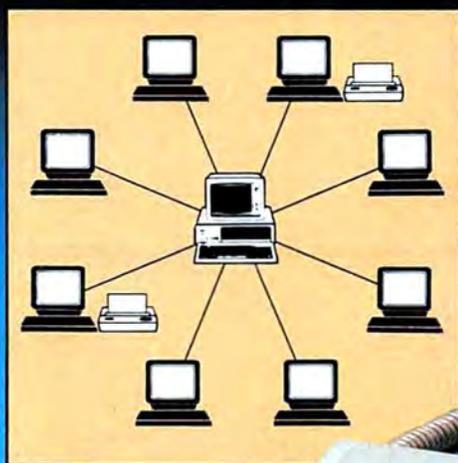
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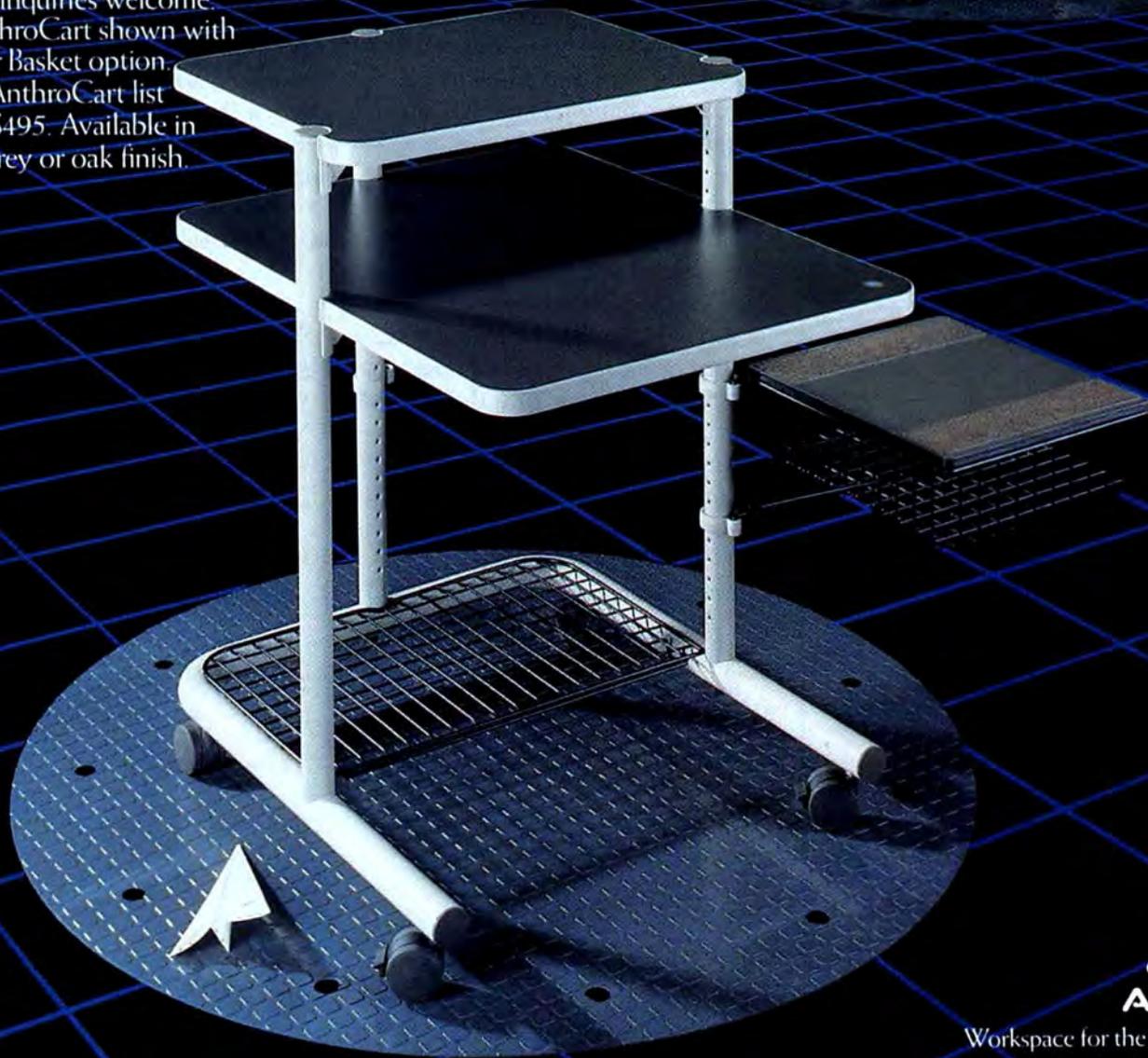
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From the Software Shelf

directories, erase files, and transfer files from one machine to another. You can also automate logon sequences for as many as 25 systems by using the program's built-in macro processor. Thus, with a few keystrokes you can, for example, trigger all the command sequences necessary to log on to The Source or CompuServe, retrieve any mail, and store your messages to disk.

So what could Hayes add to this package? As it turns out, quite a bit. The most significant new asset is freedom; previously *Smartcom II* users were confined to Hayes' proprietary protocol, but now the popular Xmodem protocol is a program option. Hayes has also extended batch processing to embrace operations that occur outside of a telecommunications session. For example, you could link a series of macros that instruct a PC to call The Source at 1:30 a.m., summon the IBM bulletin board, turn on a printer, print all the bulletin board items, turn the printer off, and then log off the service. This feature is particularly important to those who want to take advantage of the lower phone rates and on-line service connection fees available during off-hours.

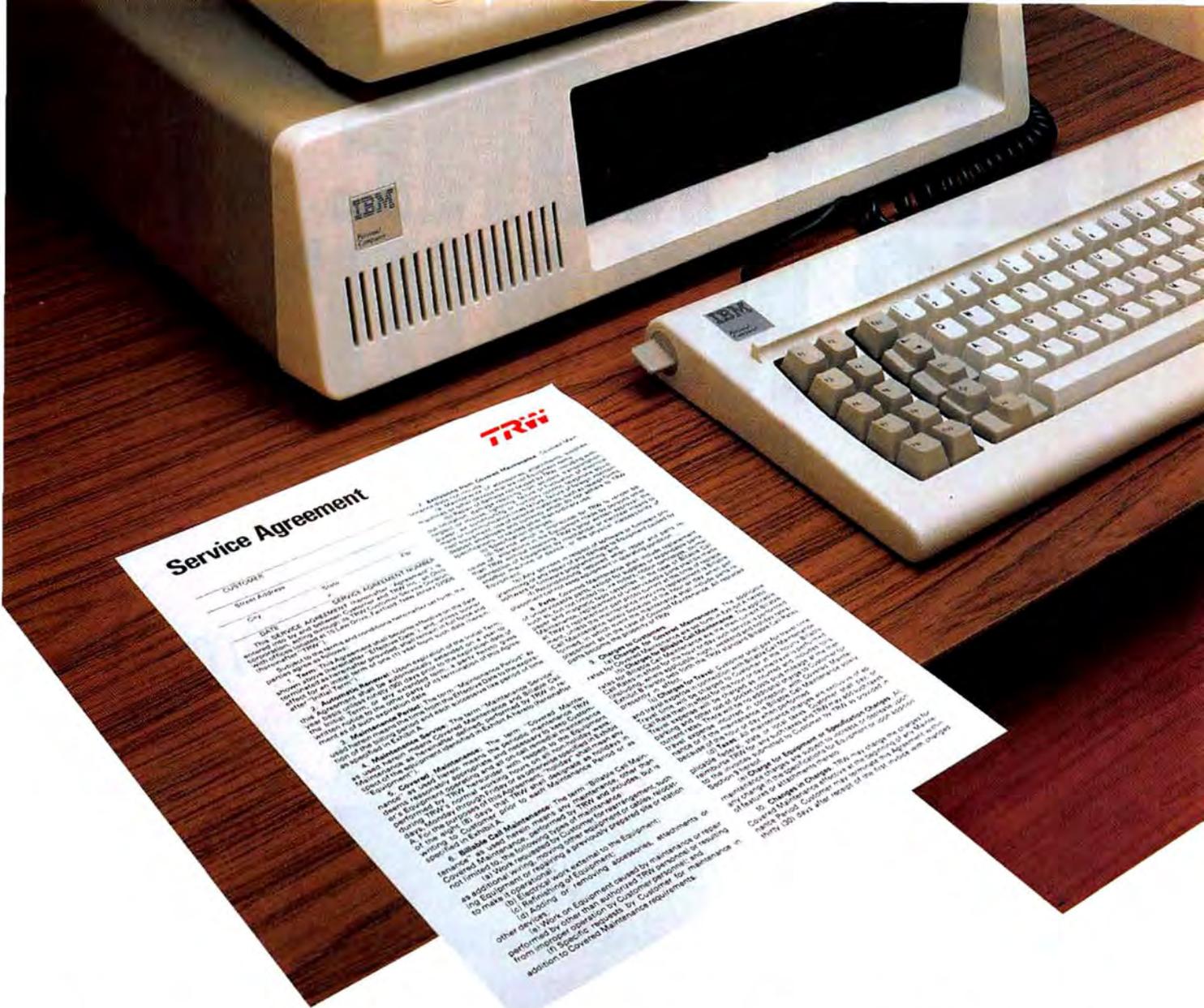
Switching back and forth from data to voice on a single phone line is now less likely to terminate

a connection abruptly. The user initiating the switch merely enters a 0 from the main menu, and a D (for data) or a V (for voice); the other party is then notified and confirms the change with the <F1> key. *Smartcom II* also emulates VT 102, VT 100, VT 52, and Televideo terminals in addition to its standard TTY mode.

One flaw remains: *Smartcom II* still cannot use DOS 2.00's tree-structured directories. As a result, only the default directory of any given drive is available for file operations. While this limitation will have little or no impact on floppy disk users, XT and other hard disk users will rightly find it a problem. Given DOS 2.00's presence in the market, this oversight is puzzling. It is the only blemish in an otherwise solid piece of work. —Burton L. Alperson

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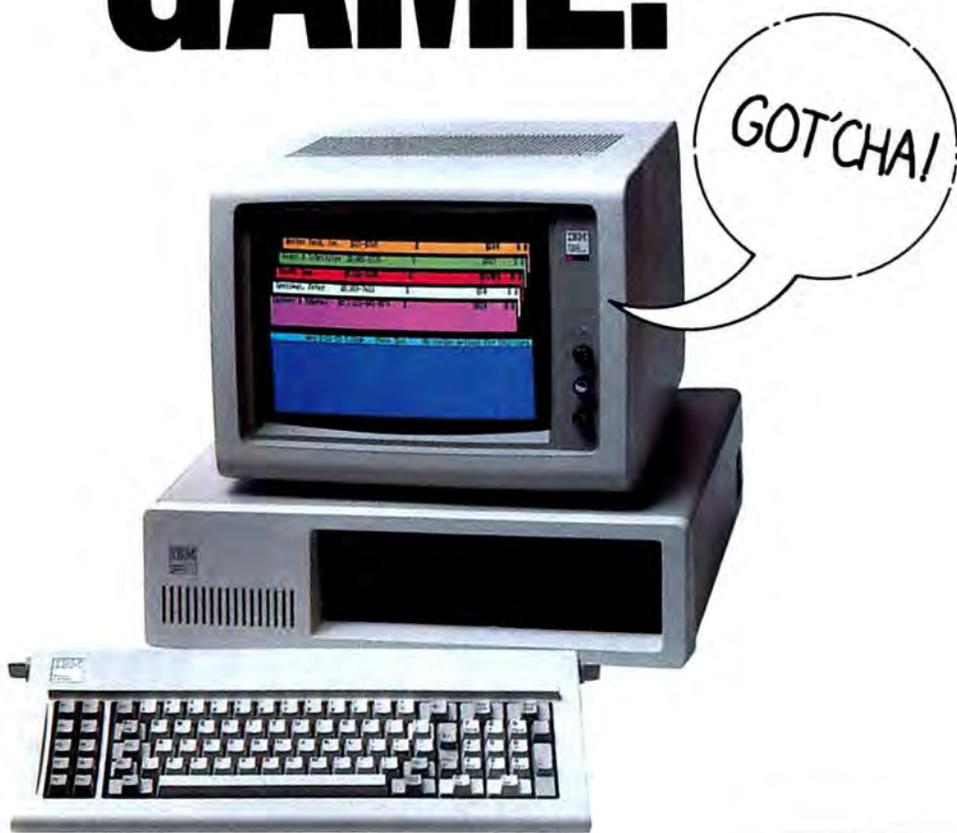
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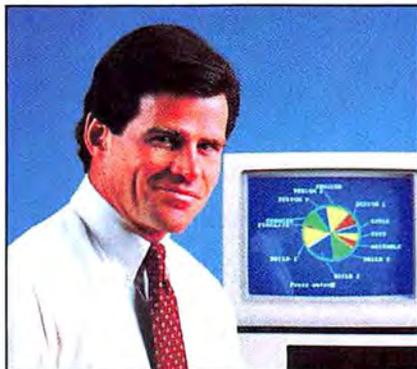
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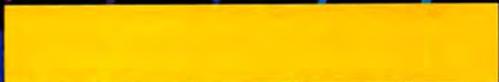
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PCjr WORLD

April 1985

The PCjr Magazine

**Jr Gets
WordStar**



WordStar for Jr

To help the Jr owner ease into WordStar, MicroPro has given its time-honored program a little flash.

Rick Altman

For the past five years *WordStar* has been the Rock of Gibraltar among word processors. As one of the first full-featured word processors for the PC it did its job well, but with no frills or fancy graphics. Over the years MicroPro has made few fundamental changes to the program, adopting a take-it-or-leave-it attitude. Despite this indifference, *WordStar* has thrived on its reputation for aloof dependability and has become one of the industry's success stories.

MicroPro's release of *WordStar for PCjr* and the new, comprehensive *WordStar 2000* for the PC (see "A Brighter Star?" in this issue) marks the company's first major attempt to put on a new face. The PCjr version doesn't include the new functions introduced in *WordStar 2000*, but MicroPro has added a few new ornaments to the original *WordStar* user interface. These include color-coded menus, increased use of the function keys, and improved documentation.

First Impressions

Through all its past CP/M and IBM incarnations *WordStar*'s documentation has ranged from disorganized to downright user-abusive. But the documentation for the PCjr version presents a shocking contrast. It is well organized, distinguishes clearly between computer messages and user responses, and in-

cludes pleasant reminders of details. The manual also includes a superior index and fun cartoons. I found myself browsing through it for my reading enjoyment—unthinkable with previous versions.

While the manual was a pleasant surprise, sadly the installation procedure was not. The program offers customization of 18 format settings, via the WINSTALL program. The installation, as usual with WINSTALL, is tedious, and if you want to change any of your chosen settings, you have to start over and install the program again. If you want to choose a printer other than the IBM Graphics printer, WINSTALL informs you that it is 'loading data base of printers'. Eighty seconds later it presents you with a meager list of ten choices.

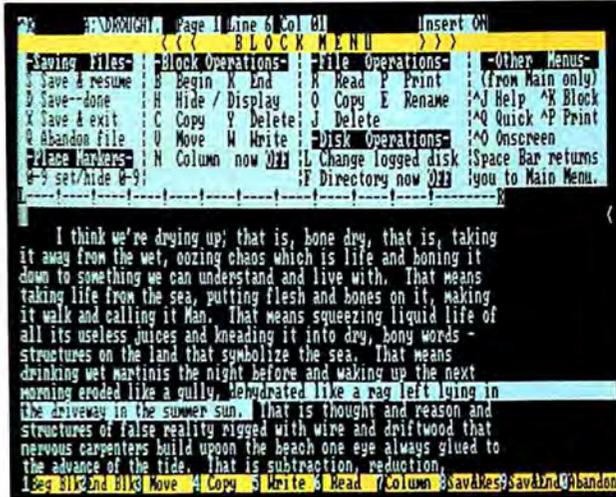
A Chip Off the Old Block

The program operates in tried-and-true *WordStar* fashion with only minor changes. One of the nicest alterations is that MicroPro now offers the program as one complete executable file. It takes about 7 extra seconds to boot up, but once the program is running, the user is spared the incessant delays formerly suffered while the program accessed its overlay files. The wait is as long as before when you call up a submenu with commands like <Ctrl>-O or <Ctrl>-Q, but all three-key commands (<Ctrl>-O R, <Ctrl>-Q F, <Ctrl>-K O) are performed immediately, and the old 5-second wait for <Ctrl>-Y to delete a line is just a bad memory.

One curious addition is a message that appears during creation of a new file: 'disk directory updated'. Sure enough, a directory check shows that the new file is present even before the first save. The update takes 5 extra seconds and slows down the process of abandoning a file. Its real use is unclear.

WordStar for PCjr does not run *SpellStar*, *Mail-Merge*, or any of the other *WordStar* options. In fact, MicroPro has removed the R option (run a program)





Screen 1: To enhance its appearance on TVs and color monitors, the program uses inverse video to highlight marked blocks and menus.

from the opening menu. To format a disk or run a disk check, you must exit *WordStar*, run the program from DOS, and then reenter *WordStar*, thus losing whatever changes you might have made to default format settings during the session.

MicroPro's designers have given the overall personality of *WordStar for PCjr* a rather flamboyant cast. A MicroPro spokesperson says the company made the changes to enhance the program's appearance on color monitors and televisions. The new cursor is a blinking block of white that completely covers the letter space. Menus and marked blocks are highlighted with inverse video (see Screen 1). Unfortunately, the inverse video in the menus is slow to execute, so any new line first comes up dark and then flips. If you call up a menu and then change your mind, you could get dizzy.

Function Key Follies

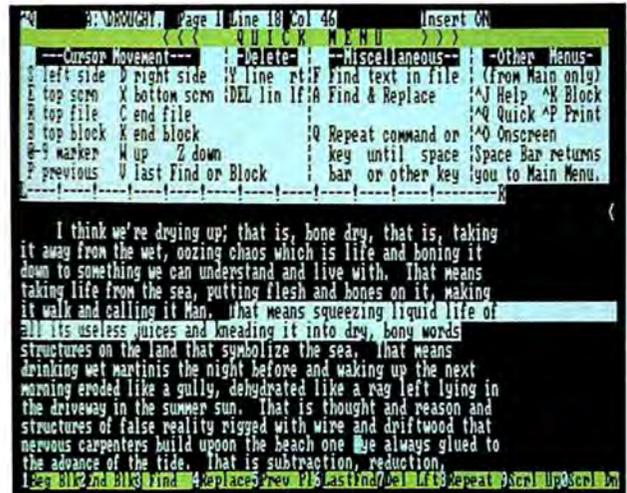
"Our thinking is that Jr owners may be new to computers. We wanted to do some things that would make it easier for them," says Tom Hacker, MicroPro's manager of public relations. One method the company used

to help the novice was to assign a unique color to each of the menus. The function key assignments change in each menu, and the color used to mark the function key definitions at the bottom of the screen changes accordingly (see Screens 1 and 2).

Color-coded or not, the implementation of the function keys is the program's biggest blunder. The purpose of function keys is to abbreviate commands and save keystrokes, but in this case using the function keys requires more keystrokes than the standard commands.

In the opening menu, the function keys perform the same actions as the standard *WordStar* options. Performed conventionally, these are all simple, one-finger commands; with the function keys they require two strokes and, depending on the keyboard, maybe both hands. Why type <Fn> 2 to open a file when a simple D will suffice? MicroPro would have done better to have given the function keys some real value—for instance, by making <Fn> 2 carry out D <Ctrl>-R <Enter> (return to file just closed).

Once you're in a file, the function keys are just as useless, mirroring the options in the main menu and submenus. In the quick submenu (<Ctrl>-Q), for example, the keys offer ten common options, such as moving to the top of a block, moving to the end of a block, and finding a string. Again, these keys could



Screen 2: Compare the function key options in the quick menu with those in the block menu in Screen 1. The function key assignments are color coded to the unique menu colors to aid the user's memory.

have been used to combine several commands (like <Ctrl>-O I <Esc> to set a tab at the current cursor position).

There is no provision for changing the function key assignments, only the choice of displaying them or not. In other words, MicroPro is once again saying take it or leave it.

Meet Startutor

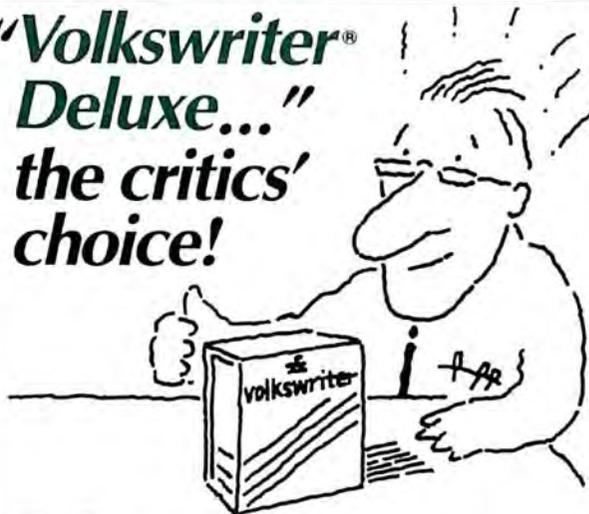
WordStar for PCjr comes with two tutorial disks that contain just about everything you need to know for normal use of the program. The tutorials are corny, cute, and instructive and are introduced by the friendly Startutor. But while the tutorials effectively lead novices by the hand, they also mislead them at some critical junctures.

All the tutorials display the menus used on WordStar, version 3.3, without the inverse video MicroPro specially added for the Jr. The tutorial menus also erroneously show the presence of the R option and do not acknowledge the presence of the function keys. Ironically, I'd rather have the WordStar for PCjr that is portrayed in the tutorial than the real one.

MicroPro's designers have given the overall personality of WordStar for PCjr a rather flamboyant cast.

Another problem is the absence of any provision for easily reviewing information from the tutorials. If you want to go back over a lesson, you must start from the beginning. You have to meet Startutor again, tell him your name, watch him dance on the screen for about 2 minutes, and then endure the slow prompts through the mock WordStar. Startutor is a friendly introduction the first time, but there should be an easier method for accessing needed information once you've overcome your fears.

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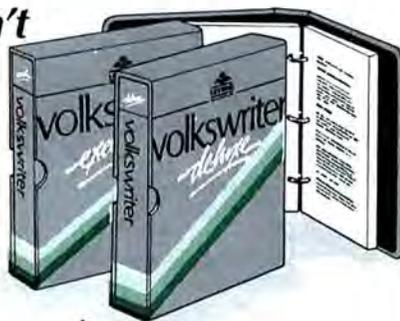
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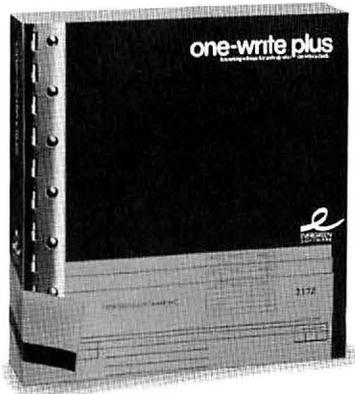
MicroPro has made no changes to the fundamental program structure or to the method of operation that has been *WordStar's* successful trademark. If you like *WordStar*, or if you are looking for a powerful word processor to run on your PCjr, you will be very happy with this program. *WordStar for PCjr* reads *WordStar* files created on a PC, making it a handy program to use at home if you use *WordStar* at the office.

Nonetheless, it would have been nice if MicroPro had made changes in a conscientious effort to address *WordStar's* shortcomings, as it has done in its new PC release, *WordStar 2000*. It would be helpful, for instance, to finally have an Undo command, a block write capability in column mode, or a simple message that tells you the default drive. Except for the new manual and the faster execution, the changes in this version are cosmetic.

Catering to the novice is a good idea, as long as a program also answers users' needs as they grow. Although MicroPro's intentions are admirable, the company seems to have given its full attention to the complete novice and forgotten the experienced user the novice will become.

Rick Altman is the managing editor of a San Francisco Bay Area sports magazine. His articles have appeared in several general-interest magazines.

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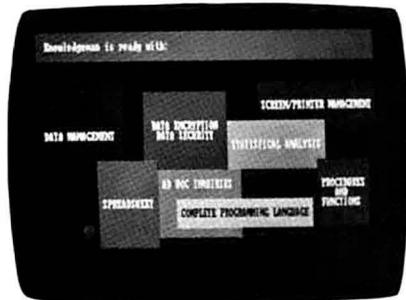
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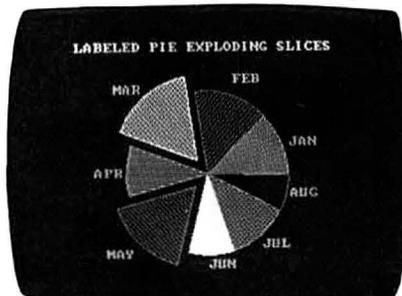
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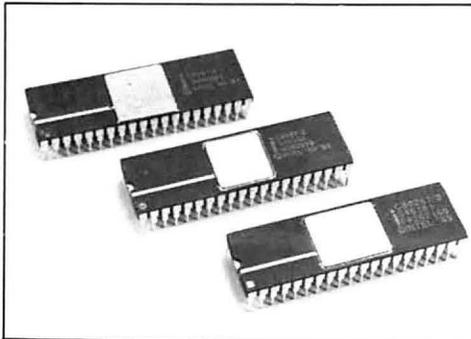
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The Myth of the Virtual Device

IBM recently endorsed GSS-Drivers, a virtual device interface that promises to convert graphics commands into the language of any graphics output device. This latest standard may trigger a boom in graphics software—if programmers and users are satisfied with the output.

David McCune

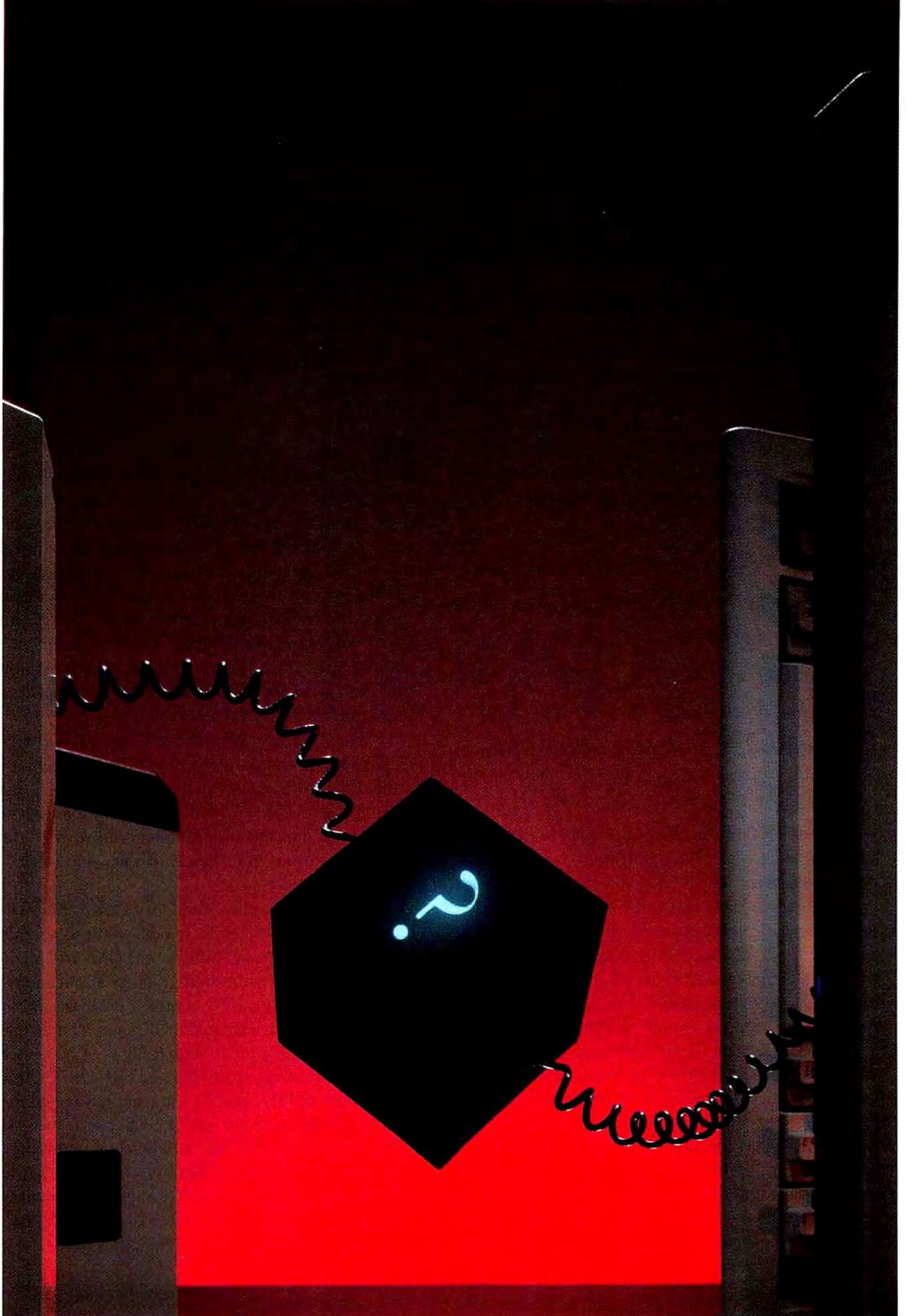
||||| The past year has seen an explosion of inexpensive, high-performance graphics peripherals in the PC marketplace, but the graphics software to drive them has come slowly. One serious impediment has been the lack of a standard way for programmers to interact with the wide variety of printers, plotters, monitors, and other graphics output devices now on the market. The commands that draw a green square on one plotter are likely to produce nonsense on another. Application programmers must write custom device drivers (specific hardware control programs) for each printer, plotter, or graphics board they want to support. As a result, most graphics software works with only a few of the many available graphics peripherals.

It would be in everyone's interest—programmers, peripheral manufacturers, computer vendors, and end users—to formulate a standard way for graphics programs to send commands to different devices. A number of graphics standards have been vying for recognition in the past several years. One standard, the North American Presentation Level Protocol Syntax (NAPLPS), defines a compact scheme for storing graphics information for telecommunications and display (see "Toward a Graphics Standard," *PCW*, Vol. 2, No. 12). NAPLPS is widely used by videotex systems to transmit graphics between computers, but that standard is intended primarily for use with graphics monitors, not printers, plotters, or input devices.

Another popular standard for the IBM PC is the *Halo* library of graphics subroutines and device drivers. *Halo* allows programmers to develop graphics software for many of the video boards, printers, and plotters available for the PC (see "Halo," *PCW*, Vol. 2, No. 6).

■ The Graphical Kernel System

Perhaps the most popular graphics standard is the Graphical Kernel System (GKS). GKS evolved in Europe in the 1970s and is now gaining wide acceptance in the United States. Like *Halo*, GKS is a programmer's interface that encompasses a large set of subroutines that can be called from various high-level programming languages to draw graphics. For exam-



ple, the GKS function **Polyline**(*N*, *X_Coords*, *Y_Coords*) draws a set of joined lines between the *N* points specified in the *x* and *y* coordinate arrays. Using GKS, a graphics program activating the Polyline function will always draw a set of joined lines, regardless of whether the computer is a PC, an Apple, or a mainframe.

A GKS implementation consists of two major parts—a graphics library and drivers for the most popular graphics peripherals. The GKS library's standard set of subroutine calls, known as a language binding, ensures that source code can easily be moved from one computer to another. The GKS drivers translate the GKS subroutines into commands that can be understood by individual peripherals. With GKS, the programmer does not have to worry about

The Graphical Kernel System planted the first step toward realizing the programmer's dream of writing graphics software without having to deal with the specifics of output.

whether the Polyline is being sent to a Houston Instrument plotter, an Okidata printer, or any other output device for which GKS provides a driver.

Thus, programmers call GKS subroutines, which in turn call the device drivers. GKS is never aware of the hardware details of the specific graphics peripheral being used but instead sends its data to an imaginary, or virtual, device. The drivers provide the interface between the virtual and physical devices.

The Graphical Kernel System planted the first step toward the programmer's dream of writing graphics software without having to deal with the specifics of output. However, GKS routines tend to be slow and take up considerable program space, and some programmers prefer more immediate control over the output drivers. In theory, any graphics program—even those using non-GKS subroutines—can call peripheral drivers individually. This is similar to a programmer circumventing MS-DOS and calling

IBM PC BIOS subroutines directly. Since the programmer's path to the hardware device is more direct, the result is usually increased program speed.

However, direct programming access to specific drivers presents some problems. The more devices you want to support, the more programming is required, resulting in product delays and higher costs. Also, since computer peripheral technology is advancing at an accelerated rate, last year's printers may not be selling next year, making a program's list of drivers obsolete.

■ The Virtual Device Interface

Undaunted in the quest for the virtual device, software developers have searched for an alternative—a separate programming interface that would allow programmers to send some graphics information directly to a standard set of drivers without incurring the cost in speed and program size that comes from using GKS. In other words, programmers would have a subset of GKS that they could use to interact with the drivers (see Figure 1). This set of subroutine calls, known as the virtual device interface (VDI), appears to have become a reality.

The American National Standards Institute (ANSI), which standardized NAPLPS and is about to standardize GKS, is now preparing a draft VDI specification. Like GKS, VDI will include standard sets of language bindings so programmers can write portable VDI programs in C, Pascal, BASIC, and other high-level languages.

ANSI's attempt to standardize GKS and VDI doesn't amount to an endorsement of these systems. However, recently IBM did endorse GKS and VDI, and it now recommends that graphics applications communicate with the PC via these standard interfaces. That in itself may make GKS and VDI de facto standards. At the same time that Big Blue announced its new PC graphics hardware (see the sidebar "IBM's New Graphics Hardware"), the company stated that it would distribute a version of GKS, called the *GSS-Toolkit Kernel System*, and an implementation of VDI, called *GSS-Drivers*. Both versions were written by Graphic Software Systems (GSS) of Wilsonville, Oregon.

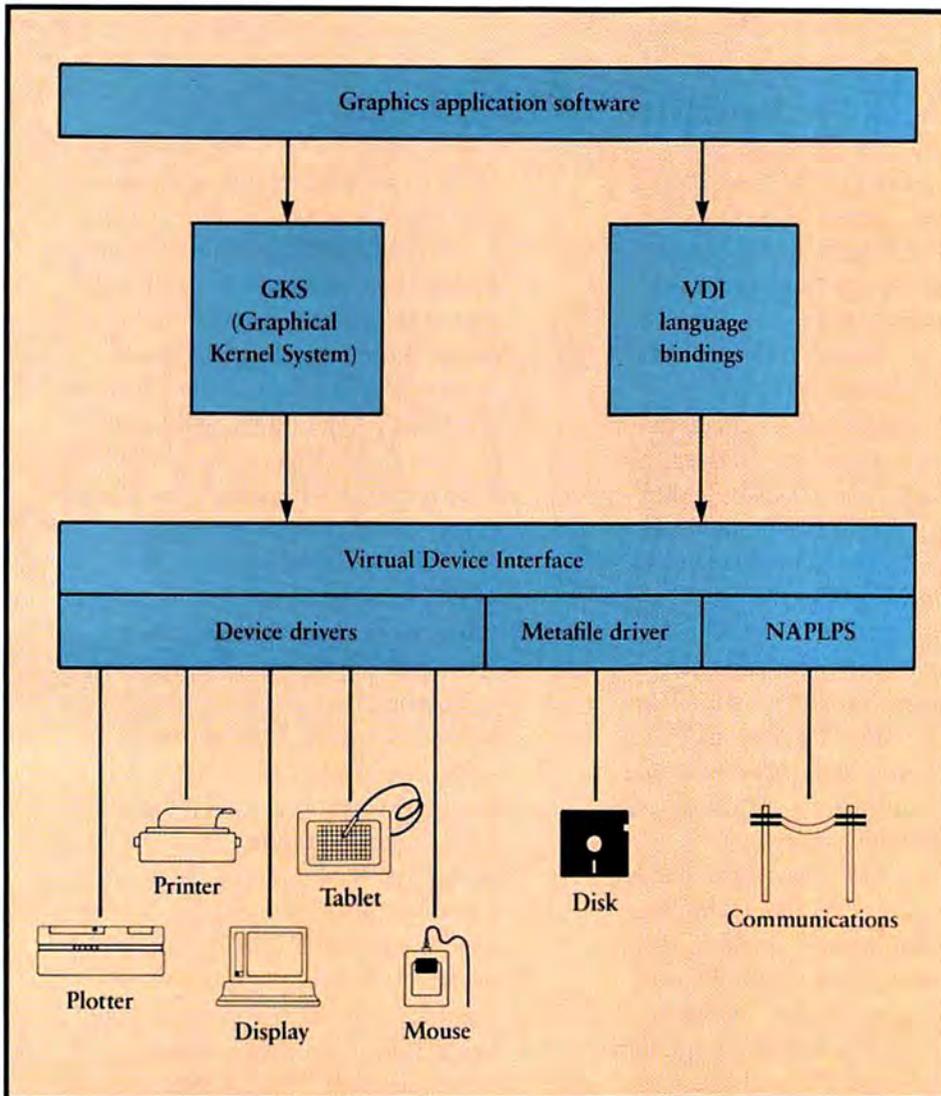


Figure 1: Programmers have several options for using the virtual device interface provided by GSS-Drivers. They can use the full GKS system or the VDI subset. Although GKS is richer in features, VDI is faster and more compact.

GSS is in a good position to influence the ANSI standardization process. Currently, the software company offers the only VDI implementation for the PC, and IBM, which endorses the GSS version of VDI, has far more influence over microcomputer standards than ANSI. GSS is represented on the ANSI committee now developing the VDI draft standard, and last July GSS hired Peter Bono, the chairman of the ANSI committee that standardized GKS.

How VDI Works

GKS and its subset, VDI, can be thought of as graphics operating systems. Just as DOS has a command interpreter that lets the PC understand English-like commands, GKS and VDI have language bindings that enable programmers to enter English-like calls to graphics subroutines. The graphics system

translates the high-level commands into data, fetches the appropriate device driver, and passes data to it.

GSS divides its VDI functions into six categories: control, output, attribute, input, inquiry, and I/O. The object of most VDI functions is a virtual device that GSS calls a workstation. The first VDI function must be Open Workstation, which opens an I/O channel to a particular device. The programmer specifies what kind of workstation device should be opened by referring to the generic labels Display, Plotter, or Printer. Once a workstation is open, the programmer sends graphics information in the form of VDI function calls, which pass parameters to specify variables such as line type, line color, marker type, fill style, and text color and font.

IBM's New Graphics Hardware

IBM's two new graphics boards and monitors are neither technological nor price breakthroughs. But they may have just as large an impact on the confused microcomputer graphics market as the PC had on microcomputer hardware and software.

IBM is targeting two markets. The Enhanced Graphics Adapter and the Enhanced Color Display should attract business users who now feel constrained by the limited color and poor resolution of the PC Color/Graphics Adapter, or those who desire high-resolution text and color graphics using a single monitor. The far more expensive Professional Graphics Controller and Professional Graphics Display are aimed at graphics-intensive applications.

Graphics has always been one of the PC's weak spots. Users who have wanted to display high-quality graphics have had to buy graphics boards from third-party vendors. However, only a few of those enhanced graphics boards are compatible with each other or with common software. Programmers have had to write new versions of their applications for each board. The result has been a plethora of boards and a paucity of programs that make good use of them.

IBM has finally made its move and will almost certainly impose some order on the graphics chaos. In so doing, it will probably sweep away much of the competition, which is

likely to be incompatible with the new Big Blue products. On the other hand, IBM may save some of its competitors by embracing the VDI and GKS standards described in these pages. If the other graphics board vendors produce VDI drivers for their products, programmers will be able to move their programs from IBM's boards to other graphics boards more easily than is now possible.

The new products were not available for hands-on testing at press time, but the technical spec sheets show that Big Blue has learned from its competitors. The IBM PC Enhanced Graphics Adapter provides 16-color graphics in both 320-by-200 medium-resolution and 640-by-200 high-resolution modes. With the addition of the IBM Graphics Memory Expansion Card, which adds an extra 64K, the new color board can display 640-by-350 extra-high-resolution graphics in 16 colors on the Enhanced Color Display. Graphics memory can be increased to 256K. The extra memory can be used for smooth scrolling, panning, animation, storage of customized character sets, and additional "pages" of video images.

IBM can now legitimately claim to display high-resolution text in color. The Enhanced Graphics Adapter provides an 8- by 14-character cell, compared to the current color graphics board's 8-by-8 cell. When used with the Enhanced Color Display, the board supplies a palette of 64 colors from which you can select the 16 display colors. A light pen can also be used with the new board.

The Enhanced Graphics Adapter was designed to be used with the Enhanced Color Display, but you also can display standard high- and low-resolution graphics on the old Color Display and 640-by-350 bit-mapped graphics on a standard IBM monochrome monitor. IBM's spec sheet boasts that the Enhanced Graphics Adapter is compatible with programs written for the old color graphics board. But an IBM spokesperson listed 18 educational and entertainment programs that will not run on the new board. Make sure you test your current graphics software on the new board before you buy it.

The Enhanced Color Display is a major improvement over the current IBM color monitor. IBM has improved resolution dramatically by reducing the size of the dots that make up screen images to .31mm. To handle the extra high resolution, the Enhanced Graphics Adapter drives this display at a scan rate of 22 kHz.

At the high end of the market, IBM offers the IBM PC Professional Graphics Controller and the IBM PC Professional Graphics Display. The controller provides a high-resolution, 640-by-480, color-mapped display. You can display 256 colors simultaneously, choosing from a palette of 4096 shades. In order to speed graphics processing, the board contains its own 8088 (the same microprocessor that powers the PC) and quite a bit of drawing intelligence in firmware. Built-in features include two- and

three-dimensional graphics manipulation, line and polygon drawing, polygon filling, programmable character sets, and the ability to rotate and scale graphics.

The Professional Graphics Controller provides 300K RAM for display data and 20K for display lists (picture descriptions) and internal program work space. Other features include a 16- by 8-pixel character cell in color graphics emulation mode.

IBM says it knows of no popular PC graphics programs that do not run on the Professional Controller, but unlike the Enhanced Adapter, the high-end board requires an expensive analog RGB monitor and will not run with the old PC color monitor.

The new Professional Graphics Display is an analog RGB monitor, which means that the red, green, and blue video signals can vary smoothly from weak to strong. When combined, these signals can produce an almost infinite variety of colors, unlike the limited range provided by cheaper, so-called "TTL" or "direct-drive" RGB monitors. The Professional Graphics Display provides the same .31mm dot pitch as the Enhanced Display.

Considering the high price of the Professional Controller and Display, they should be considered only by those who do intensive graphics work—particularly anyone who does CAD/CAM projects in which speed is a major consideration. However, the Enhanced Graphics Adapter and Display should provide strong competition for the majority of graphics boards on the market today.

At that point, VDI must choose the correct device driver for the virtual workstation. When the end user boots up a graphics program with *GSS-Drivers*, the virtual device interface and one or more of the drivers chosen by the user are loaded into memory. VDI then assigns each of the drivers to one of the generic device types. When a program tries to send data to a Display workstation, VDI uses its internal logic to figure out whether any of the drivers that are loaded with the graphics program is of the Display type. If so, the program sends its output to that particular driver.

If the end user wants to send Display output to a printer, he or she can use DOS's SET command to override the default type assigned to a driver. For example, the commands

SET DISPLAY = DIAB150.SYS

SET DIAB150.SYS = LPT1:

instruct VDI to redirect all output destined for Display workstations to the parallel port instead and to use the Diablo 150 ink jet color printer driver. All of this can happen without changing the application program. The end user can instruct a VDI application to switch its output to any of the devices for which GSS supplies a driver—and the programmer had to write the output logic only once.

Once a software package starts using GSS implementations of VDI or GKS, it is limited to using only graphics devices for which GSS provides drivers.

The true virtual device remains more myth than reality. The programmer must still be aware of differences between peripherals.

In the VDI C-language binding manual, GSS lists 29 device drivers; almost all of those are printers or plotters. One mouse and two tablets are also included. However, the only GSS-supported video controllers are the IBM Color/Graphics Adapter and the two new IBM color boards: the Enhanced Graphics Adapter and the Professional Graphics Controller. This limitation is one of GSS's major weaknesses.

None of the popular high-resolution controllers, such as Number Nine, Scion, or Conographics, is supported. However, now that IBM has endorsed the VDI concept, many video controller vendors may take the plunge and pay GSS the fee for writing a driver for their graphics boards.

GSS also supplies a driver for "metafiles." Somewhat like the NAPLPS code used in videotex, a metafile provides a scheme for storing and telecommunicating graphics information. Once a graphic has been encoded and stored as a metafile, it can be transmitted to other computers that use the same procedure. (A Virtual Device Metafile standard is also under ANSI review.) To cover all the bases, GSS also plans to come out with a VDI driver for NAPLPS.

If the VDI standard catches on and remains stable, hardware vendors may take the gamble of burning VDI into the chips that run their products. VDI in firmware would eliminate the need for device drivers, resulting in lower costs and faster execution.

■ The Problem With Output

For the most part, the GSS implementation of VDI provides a pleasant and efficient graphics programming environment. The level of peripheral independence provided by VDI should vastly reduce the amount of time graphics programmers spend on developing applications. VDI is superior to GKS in several areas. Since VDI uses only integer arithmetic for its coordinate calculations, it tends to draw objects much faster than GKS, and the code is more compact.

Even more important is VDI's Rubberbanding feature. When you begin to draw a line with VDI, you establish the beginning point. As you move the cursor, you can stretch the line between the first point and the cursor until you find and set the final endpoint. This is an extremely valuable feature for developing interactive graphics.

Yet the true virtual device remains more myth than reality. The programmer must still be aware of differences between peripherals. A graph that depends on color for clarity might display correctly on

Graphics Products

The following graphics products are discussed in this story and in the sidebar "IBM's New Graphics Hardware." GSS-Drivers and the Graphical Kernel System are available from both IBM and Lattice, Inc. However, with GSS-Drivers, IBM sells drivers only for IBM products. Lattice, Inc., provides the full line of drivers.

IBM

Entry Systems Division

P.O. Box 1328

Boca Raton, FL 33432

*800/447-4700, 800/447-0890 Alaska
and Hawaii, 800/322-4400 Illinois*

*IBM Personal Computer Graphics
Development Toolkit (GSS-Drivers)
List price: with one language binding
\$350, each additional binding \$150
Requirements: 128K, DOS 2.00,
graphics board, graphics monitor*

*IBM Personal Computer Graphical
Kernel System
List price: \$295
Requirements: 256K (384K
recommended), DOS 2.10, graphics
board, graphics monitor, 8087 math
chip recommended*

*IBM Personal Computer Enhanced
Graphics Adapter
List price: \$524, Graphics Memory
Expansion Card \$199, Graphics
Memory Module Kit \$259
Requirements: IBM PC Color
Display or IBM PC Enhanced Color
Display (old PCs may require ROM
BIOS update)*

*IBM Personal Computer Enhanced
Color Display
List price: \$849
Requirements: IBM PC Color/
Graphics Adapter or IBM PC
Enhanced Graphics Adapter*

*IBM Personal Computer Professional
Graphics Controller
List price: \$2995
Requirements: PC XT, PC AT, or PC
with expansion unit; IBM PC
Professional Graphics Display*

*IBM Personal Computer Professional
Graphics Display
List price: \$1295
Requirements: IBM PC Professional
Graphics Controller*

*Lattice, Inc.
346 Paft St.
Glen Ellyn, IL 60137
312/858-7950*

*GSS-Drivers
List price: with one language binding
\$225, each additional binding \$225
Requirements: 128K, DOS 2.00,
graphics board, graphics monitor*

*Graphical Kernel System
List price: \$225
Requirements: 256K (384K
recommended), DOS 2.10, graphics
board, graphics monitor, 8087 math
chip recommended*

a number of different four-color plotters but appear nonsensical on a black-and-white printer. VDI's internal logic does its best to translate graphics commands destined for one device into the language of another, but the output often misses the mark.

For example, when Open Workstation is called, VDI returns a large amount of information about the device that was just opened, including the number of available colors. The application program has to read that data and adjust its output accordingly—for in-

While the virtual device interface gains much of its stature from being standardized by ANSI, the standards bureaucracy could also inhibit its future evolution.

stance, by drawing a black-and-white dotted line instead of a red one. However, the greater the differences between peripherals, the more the translation becomes guesswork.

GKS, on the other hand, has a provision for defining "attribute bundles" for various workstations. A system manager can define all the attributes that will define *polyline, type 1*, for example, on each hardware device in an office. An attribute bundle created for one plotter might define *polyline, type 1* to mean a solid red line, but the bundle for another plotter could define it as a dotted black-and-white line. VDI lacks this advanced feature.

Another major GKS feature missing from VDI is the "segment" concept. A segment is an in-memory storage area where graphics can be temporarily stored. Segments can be written to one or more workstations and then moved, rotated, scaled, and erased with a single command.

Furthermore, the VDI coordinate system is less sophisticated than that of GKS. VDI assigns all graphics coordinates to an imaginary display area 32,767 units square. The device driver then maps the square onto the physical display. GKS has a similar, yet far more complex, concept. GKS users can define their own imaginary "world coordinate" system instead of accepting the established grid. The GKS device drivers then convert the world coordinates to the physical device.

Even more important, the imaginary world coordinate system can be mapped onto another imaginary "unit screen" that measures 1.0 units on each side. With this normalized device coordinate (NDC) system, GKS lets you map the world coordinate system to a portion of the NDC screen. A 1000-by-1000 world coordinate system could appear in an area measuring .25 NDC units on each side, or one-quarter of the screen. This is called an NDC viewport. You can also map a portion of the world coordinate screen onto the NDC display area, so you can "zoom" in and make one-fourth of the original graphic occupy the full NDC display area.

Although GKS may seem awkward and slow to some programmers, features such as attribute bundles, segments, world coordinates, and NDC viewports may keep them from switching to the scaled-down VDI. As with any software program, speed and ease of use often exact compromises in functionality.

Trapped in the Past

While the virtual device interface gains much of its stature from the fact that it is being standardized by ANSI, the standards bureaucracy could also inhibit its future evolution. Drafting, reviewing, and officially adopting the standard will take years. Meanwhile, technical progress in graphics hardware and software could make much of the standard obsolete.

As an example of this problem, neither GKS nor VDI provides any facilities for working with three-dimensional objects. As faster and more powerful micros make 3-D graphics work more feasible, this weakness will become more pronounced. ANSI is

now reviewing possible 3-D extensions to GKS, but there is no firm date when these extensions will be available.

Furthermore, it is likely that many of the functions now offered by GSS will not be supported by ANSI, and vice versa. Even the name VDI is about to change to CGI (for Computer Graphics Interface). In addition, the specific language bindings will likely differ from those now available. Thus, programs written for today's VDI will probably have to be modified significantly during the coming two years.

If the companies that sell implementations of standards do not offer extensions to their products until the standards are officially modified, programmers will be tempted to leave the standards behind. Despite IBM's endorsement of VDI, other graphics environments for the PC, such as *Halo*, still have a future. *Halo* remains attractive to programmers for many reasons, one of which is the large selection of graphics boards that it supports. In the long run, the graphics system that can evolve the fastest may be the one that prevails.

Somewhat prematurely, the VDI and GKS standards are being touted as the salvation of computer graphics. Many claim that these standards will liberate graphics programs from hardware dependence and so make graphics programming truly efficient and lucrative. VDI and GKS are important milestones, to be sure, but they are not the end of the journey. While there are many good reasons to use either GKS or VDI for graphics programming, there are also many good reasons to avoid them—at least for now. ●

David McCune is president of the Proteus Group, a consulting firm in Brooklyn, New York.

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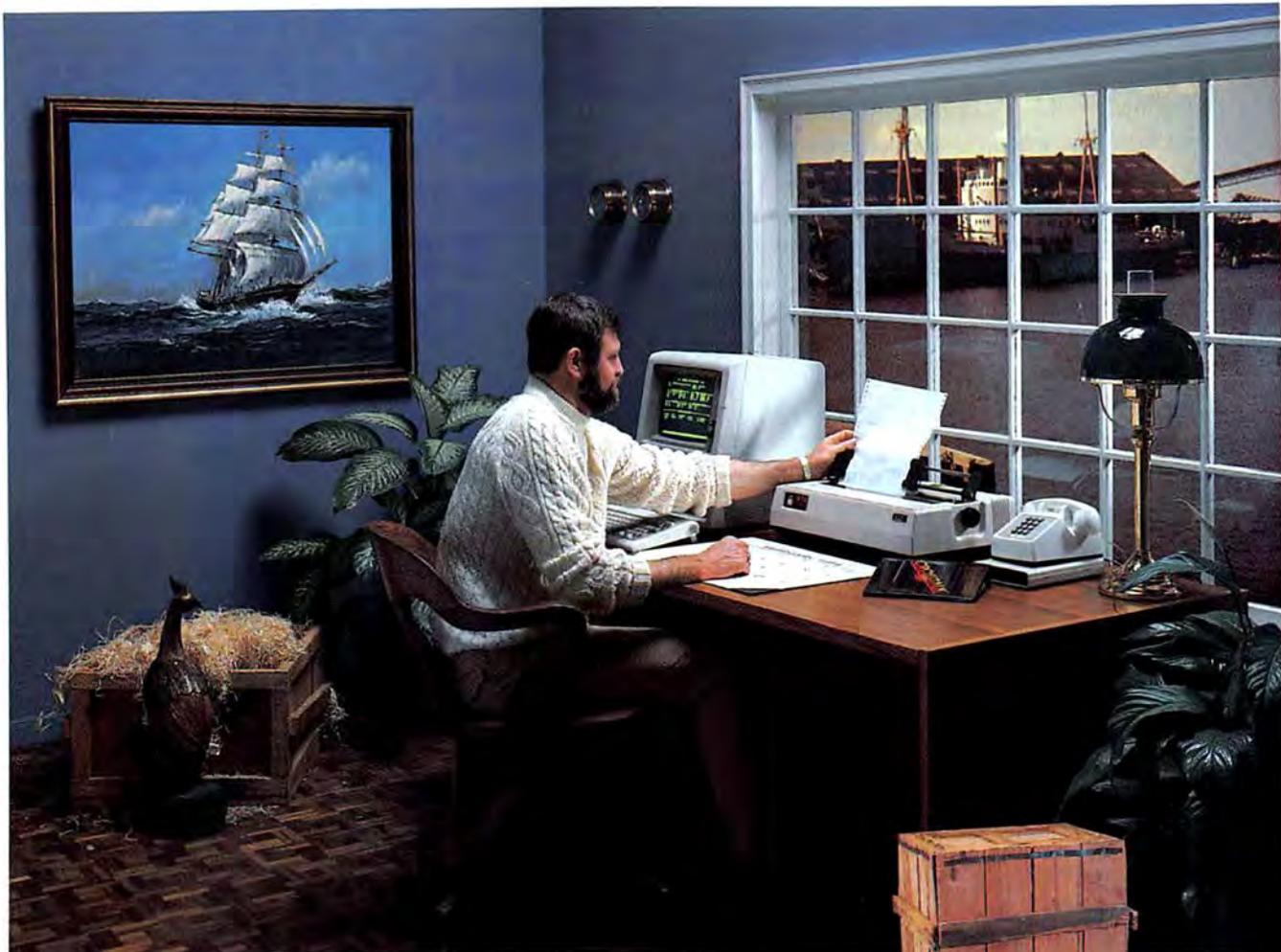
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Hi-Fi Floppy

The integration of the personal computer with the home entertainment system has been anticipated and ballyhooed for more than a decade. The first audio component to capitalize on that promise, the CompuSonics DSP-1000, is now reaching the market.

Keith Yates

■■■■ The marriage of home audio and home computers was almost inevitable. Audiophiles and hackers—not necessarily two separate groups—have much in common. They share an enthusiasm for the newest electronics and the slickest peripherals, and both pounce on each new tasty gadget almost before it hits the market.

The two technologies came within nodding distance with the introduction of digital sound mastering in the 1970s; now they finally meet in the first computer-stereo component, the CompuSonics DSP-1000.

The DSP-1000 is a prototype digital recording-and-playback stereo component that records music on 6.6MB 5¼-inch floppies. Unlike turntables and compact disc (CD) players, the DSP-1000 reads *and* writes musical data. Unlike conventional tape decks, it can be used to modify music to suit your personal tastes.

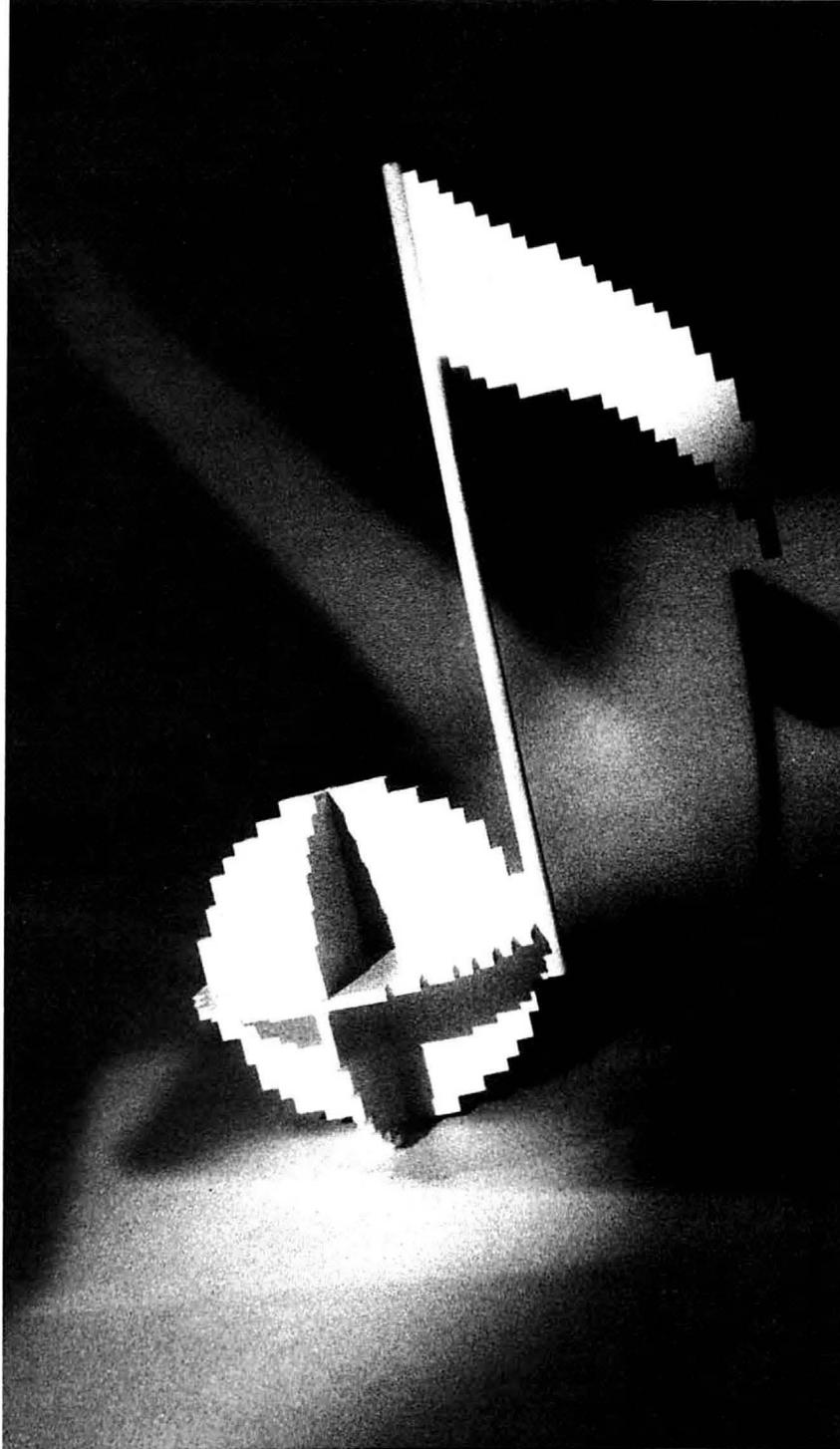
■ The PC Connection

The DSP-1000 doesn't require a PC for basic recording and playback, but without it the unit is just another recording device. When connected to the PC, however, the DSP-1000 takes on new functions. Possible operations include Editing the Playlist, which allows the user to examine the contents of a disk and reorganize

or delete selections as desired; Equalization, which is used to tonally touch up existing recordings; and Enhancement, which permits "de-noising" of music documents (enhancing recordings that originated from scratchy LPs or hissing tapes) and any other signal processing the user might want to perform.

The unit is also set up to "tele-record" from remote data bases via modem. This capability yields a glimpse of CompuSonics' assumptions about the musical future—no such data bases exist at present. David Schwartz, CompuSonics' president and inventor of the DSP-1000, says the firm also plans to release a music synthesis program module once production of the DSP-1000 is under way.

When it is connected to a PC, all the DSP-1000's functions are controlled by the PC's function keys. During every operation, the PC screen displays a menu in the form of a function key map that covers the left half of the screen (see Screen 1). Each menu includes exit, undo, and help options.



Using the Equalization feature, a music enthusiast can reconfigure a recording's spectral content to suit room acoustics or personal tastes. The PC's monitor displays color bars that represent the bass, midrange, and treble components of the music. To make changes,

the user manipulates the cursor to redraw the bars. Changes can be played back, compared, and either saved, further modified, or abandoned. Because this Equalization feature operates in the purely digital domain, noise, phase shift, and other side effects that plague analog equalizers and tone control circuits are eliminated (see the sidebar "The Digitization of Music").

In Enhancement mode, the screen yields a two-dimensional display of the analog waveform, much like that on an oscilloscope (see Screen 2). Working with the cursor, the user can alter the waveform's attack-decay-sustain-release (ADSR) envelope—the guts of the music itself. Says Schwartz, "If you think Ringo should have hit the cymbal harder or the cymbal's sound should have lasted longer, you can change [the waveform] to suit yourself."

■ A Musical Background

The CompuSonics player-recorder is the latest breakthrough in the ongoing high-stakes scramble to bring high technology to the living room stereo system. About two years ago Sony introduced the first commercially available CD player, which utilizes a low-power laser to read a digital code etched in a shiny 4¾-inch disk that holds about 80 minutes of music. Soon after, video cassette recorders (VCRs), first with Beta hi-fi and then with VHS hi-fi, entered the audio sweepstakes with specifications rivaling good cassette and reel-to-reel tape decks. But by virtue of its compatibility with the personal computer and its revolutionary encoding system, the CompuSonics technology holds more immediate promise and power than do CD players or hi-fi VCRs.

CompuSonics' recording technology is based on the notion—unsettling to many audiophiles—that much of the information in an audio waveform can be discarded with sonic impunity. This calculated discarding of information

The Digitization of Music

Sound starts with the percussion of the air—by a voice, a musical instrument, a tree falling in the woods. The impact of the blow causes a disturbance in the airwaves with a shape determined by the character of the percussion. The wave caused by air blown through a clarinet, for example, has a different shape than a wave caused by the striking of a snare drum.

The shape of a sonic wave is *analog* information, data that is represented by variable physical quantities—the height of the wave signal at any moment. This data can be received by an ear or a microphone connected to a tape recorder. It can also be read by a digital mastering device like the CompuSonics DSP-1000. The purpose of any recording device is to save and reproduce the analog waveform in as close to its original form as possible.

To record the shape of the waveform, analog sound systems translate it into its electrical equivalent—which can be observed as a squiggle on an oscilloscope—and send it to loudspeakers for reproduction. Unfortunately, as long as the data is represented by a waveform, distortion is added at each step of the translating, recording, and copying processes.

The digitization of music, first developed by Bell Labs half a century ago, records sound by “freezing,” or *sampling* the electrical wave at a high, fixed rate—usually 40,000-50,000 times per second. In each sample, the height of the squiggle is noted and *quantized*—given its closest available numerical value, expressed in binary code as a string of 16 0s and 1s. This information results in a constant stream of data describing the changing position of the wave over time. The effect is something like the dot grid used to reproduce a photo in a

newspaper. The finer the dot grid—the higher the sampling rate—the crisper and more detailed the sound reproduction. This data can then be stored on a compact disc, a hard disk, magnetic tape, or—for the CompuSonics DSP-1000—a superfloppy. Once the signal is quantized, unlike an analog signal, the data will not be distorted by any amount of copying.

In reconstructing the analog waveform for playback, the reverse of digitizing occurs: The data is sent to a digital-to-analog converter at the sampling rate, and the converter develops the corresponding electrical value for each sample. The converter holds each value until the next sample is received and converted. Provided the sampling rate is fast enough and the quantization is precise enough, the resulting wave is an almost exact duplicate of the original signal.

makes it possible to store an immense amount of data on a low-capacity medium such as a floppy disk—and thus to use a PC for recording music. The machine's proprietary data-reduction system discards redundant and perceptually unretrievable information to reduce the data rate from the CD's 1.4 million bps to as low as 160,000 bps or even lower. The processing, based on sophisticated psychoacoustic models, is handled by one Motorola 68000 microprocessor and four specially programmed Texas Instruments TMS32010 digital signal processors.

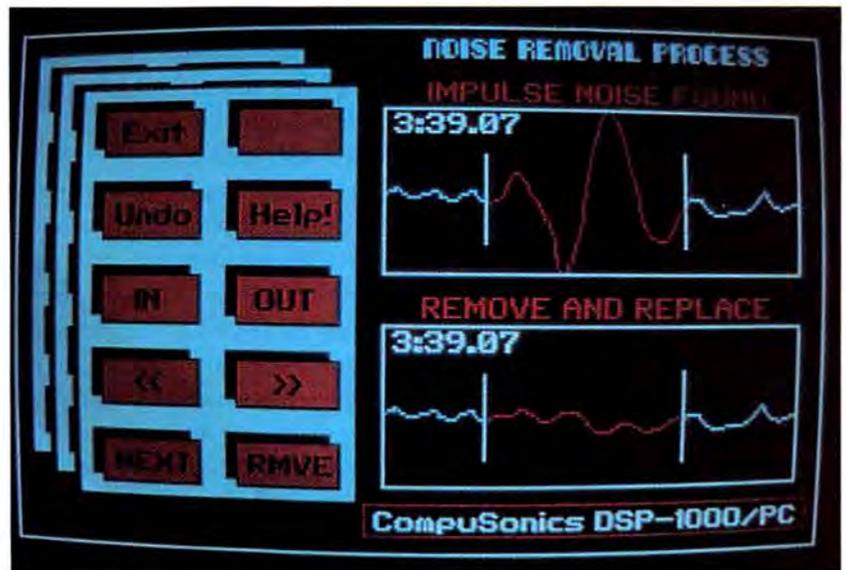
The DSP-1000's signal-crunching methods are illustrated by its handling of the 4- or 5-second silence between selections on a disk. On a CD, this pause is read as a series of 16 zeros more than 44,000 times every second. In the CompuSonics system, this redundant data is replaced by a single command to continue silence for the appropriate length of time. Also, the system divides the incoming signal into 128 spectral bands (from deep bass to the highest treble) to memorize a general tonal "signature," and then analyzes subsequent departures from it, a method that requires less data handling than would processing the entire waveform afresh every 1/50,000 of a second.

Sound Judgment

The nature of a signal controls the encoding behavior of the CompuSonics system. Complex and perceptually important signals, such as onset transients (the attack, or leading edge of sounds), are encoded with great resolution,



Screen 1: The Opening Menu. The left side of the screen displays the function key assignments. The right side of the screen shows the playlist—the selections available on the disk. Pressing <F2> (Menu) takes you to the secondary menu, from which you can edit the playlist.



Screen 2: The Audio Processing menu, which is used to enhance old recordings. The top graph shows the impulse noise (pop). The lower graph shows the corrected waveform.

while simpler, repetitive signals are condensed. The system also takes into account a psycho-acoustic effect known as masking—the ear’s insensitivity under certain conditions to otherwise audible sounds. Those elements of the waveform that would be

number of data rates to be offered in the finalized DSP-1000 had not yet been decided.

The sampling rate of the analog-to-digital (A/D) and digital-to-analog (D/A) converters could also be made user-selectable. Raising the sampling rate from its current

To be fair, the latest generation of CD players sounds significantly better than the early versions. Likewise, CD software is steadily improving as recording engineers adapt to the professional digital gear turning up in more and more sound studios. In fact, CompuSonics also makes what many recording engineers consider the state-of-the-art studio mixer/recorder. Using 140MB hard disk drives, the DSP-2000 supermicro multiprocessor computer is the first studio unit to operate digitally from microphone to master recording.

Schwartz, himself a violinist, is sensitive to the digital-versus-analog sonic battle. He insists that CompuSonics won’t release the DSP-1000 until all involved are convinced that it sounds right (see Table 1 for a rundown on the DSP-1000’s current sound specs).



The CompuSonics DSP-1000, the first PC-stereo component

masked are simply not recorded. Because of signal-dependent data storage requirements, some musical selections call for far greater data capacity than others that have the same duration. Several hours of, say, classical guitar music might be accommodated on a single disk, while Mahler’s Eighth Symphony might fill several disks.

Another space-saving feature of the CompuSonics technology: it allows the user to select data rates, somewhat analogous to the low and high tape speeds on existing tape decks. For important recordings, a high data-encoding rate could be used for high resolution, while material that tolerates lower resolution or requires longer running times—like background music—could be handled with lower data rates. As of press time, the

50 kHz would theoretically increase the precision of waveform replication and extend frequency response, but this stratagem would also gobble up more disk space. Lowering the rate would reduce demand on disk space but limit high-frequency response.

Which brings us to The Sound. For all the hype and hoopla, CDs and even digitally mastered LPs have been criticized by many keen-of-ear for imparting a coarse, blaring quality to music’s textures and hues. To date, digital audio has offered immense dynamic range and a welcome reduction of background noise. But if a Steinway sounds like a synthesizer, can that really be called progress?

■ The Future of PC Stereo
Schwartz says that initially the DSP-1000 will be sold only by select quality-oriented audio retailers, beginning in mid-1985. The unit is targeted to retail for about \$1200. Schwartz plans to use the high-end dealer network as a springboard into the larger and more lucrative “mid-fi” stereo and computer retail markets. Will the technology catch on? As of this writing, McIntosh Laboratory, a Binghamton, New York, firm that many call the Cadillac of stereo manufacturers, had confirmed plans to bring a CompuSonics technology unit to market around September 1985. NAD, Carver, and other quality-oriented audio manufacturers have also shown interest in picking up licenses to the technology.

A Sonic Glossary

ADSR envelope. The shape of an analog music wave, showing the attack, decay, sustain, and release of the sound as its loudness varies over time—a sonic “fingerprint.” A sound’s ADSR envelope combined with its *spectrum* determines the sound’s identity and character. A drum beat, for example, has a more explosive attack and a more rapid decay, sustain, and release than a flute tone.

Analog. Pertaining to the representation of data by variable physical quantities. In music, data is represented by the wave of air or electrical pressure associated with a sound.

Beta hi-fi. A high-fidelity recording-and-playback system developed by Sony Corporation for video cassette recorders using the Beta format.

Compact discs. An audio storage format developed by Philips in cooperation with Sony, using optical (laser) pickup of

digitized musical information in the form of microscopic bumps on an otherwise smooth 4¼-inch metalized disk.

Digital. Pertaining to the representation of data by numerical digits. In music the data represented in the analog wave is reduced to a stream of numerical values in binary form (0s and 1s), suitable for computer processing.

Enhancement. The changing of musical parameters such as loudness or duration.

Equalization. The alteration of tone quality.

High-resolution recording. A recording highly faithful to the sonic nuances of the original. Digital recording accomplishes this by using a high sampling rate and accurate quantization.

Masking. The drowning out of weak sounds by louder sounds.

Phase shift. The shift in time of one acoustical event relative to another. For instance, in the equalization of analog recordings, the entry of one instrument may be thrown out of sync with the supposedly simultaneous entry of another.

Psychoacoustic. Pertaining to the study of the brain’s perception of sound.

Sampling rate. The rate at which an analog wave is “viewed,” or sampled, akin to the number of frames per second used in motion pictures. The higher the sampling rate, the faster an action must occur “between frames” to go undetected.

Spectrum. The array of frequencies, from the lowest-pitched (bass) tones to the highest-pitched (treble) tones. Every instrument has a characteristic spectrum (mix of frequencies) and ADSR envelope that identify it.

Rounder Records, a Boston-based company, plans to release some new recordings—mostly folk—on the floppy format. Other labels have also expressed interest, although none had made a formal commitment as of this writing.

Prerecorded floppies will probably retail for \$8 to \$10—roughly half the current CD price. Blank disks should debut at about \$6 and eventually decline to about \$3, once large-scale production of such high-density media is under way. CompuSonics' 6.6MB super-floppies are currently supplied by Drivetec, SpinPhysics, and others. This spring, CompuSonics expects to take advantage of the introduction of 25MB floppies, and Schwartz is quick to point out that the data-reduction technology covered under his recently approved patent is equally applicable to hard disk, bubble memory, or any other storage medium. This compatibility allows him to incorporate other storage technologies into CompuSonics components as those technologies become practical and affordable.

If the CompuSonics technology filters down to the major mid-fi mass producers—Sony, Pioneer, Yamaha, Fisher, and the like—it could have enormous market impact. But will the majors invest in manufacturing and promoting yet another hi-fi gadget so soon after

Table 1: CompuSonics specs

Sampling rate	50 kHz
Number of channels	2
A/D and D/A conversion	16-bit linear
Spindle speed	300 to 600 rpm
Scan velocity	7.5 ft./sec.
Head	Microgap ferrite core
Harmonic distortion	< 0.007% at 1 kHz
Dynamic range	> 91 dB
Signal-to-noise ratio	> 91 dB
Wow and flutter	Below measurable limits
Channel separation	> 91 dB

the introduction of the CD player? Certainly, the recent history of new format introductions—like quadrophonic in the 1970s—does not fill manufacturers, retailers, or consumers with burning optimism. With 1980s technologies proliferating and prices sliding, the market has already become so confusing that many consumers have adopted a wait-and-see attitude. Meanwhile, sales of premium-quality turntables are brisk and getting stronger.

It is likely that at least five years of what might be called format pluralism lie ahead, in which CDs, Beta/VHS hi-fi, digital cassettes, and CompuSonics floppies all vie for a piece of the pie, with none of them dominating the market the way the phonograph record has for decades. It will take a strong blow to knock the long-lived LP from its throne, but Schwartz and McIntosh president Gordon Gow are betting that a fair number of consumers will embrace the

DSP-1000 as the way to enjoy the technical advantages of digital and the control of the computer without abandoning the sonic “rightness” of analog. And the CompuSonics DSP-1000 has a powerful ally in the PC. ●

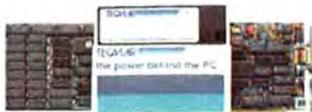
Certified audio consultant Keith Yates is a high-end audio retailer in Sacramento, California, and an audio writer for several magazines.

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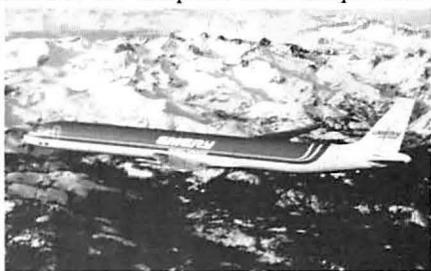
BY MICHAEL CHRISTOPHER

GARDEN CITY, N.Y.—Mr. David W. Pasternack, President of Logisoft, a major IBM PC software and hardware distributor, has announced the inception of a unique new customer service policy. . . free overnight courier delivery on their entire product line.

In a recent interview, Mr. Pasternack stated that "We feel our new free overnight

delivery service will set a new standard in the computer software mail order industry. In a study we conducted, we found that in addition to competitive pricing, experience was a factor utmost in our customer's minds. Whether their order was \$300 or \$3000, the need to get their package as soon as possible was the same. Under our old procedures, between processing and shipping time, it could take up to a week and a half to two weeks for an order to arrive. With our new courier service, an order can be processed, shipped, and arrive in our customer's hands in only 3 working days. . . at no additional charge!"

The company is using Emery Worldwide to handle the large number of packages being shipped each evening for next day delivery. "We chose Emery for their competitive pricing structure and excellent delivery record", said Mr. Pasternack. Emery was quoted as saying, "This makes Logisoft the largest single Emery account in the New York Metro area.



LOGIC TIP OF THE MONTH

Choosing software can be mind-boggling. With the proliferation of publishers, how do you choose. Analyze your needs. . . what specific tasks do you want to perform. Read the software reviews; an excellent way to evaluate a package. Ask around. . . you'd be surprised how many associates may be using a package similar to your application. Finally, choose the best package (not always the most expensive). Upgrading will end up costing you more. Remember the key word is research.

TOLL-FREE SUPPORT A Smashing Success

GARDEN CITY, N.Y.—A survey of Logisoft's toll-free technical support policy was done to see if it warranted the continued costs of the 800 toll-free number, personnel costs, etc. After careful monitoring of these calls (both pre-sale and after sale) it was found that 92% of the calls were for legitimate technical support questions rather than for answers already contained in the softwares' operations manual. As a result of the survey, the decision has been made to continue toll-free support as an important part of their customer service.

This service consists of assisting with:

- Hardware requirements
- Initial boot-up procedures
- Initial software configuration (printers, disc drive, etc.)
- Back-up procedures
- Defective program determination
- Alternative program recommendation
- Return policy

Logisoft's Lowest Price Guarantee Still Effective

GARDEN CITY, N.Y.—Logisoft, Inc. has indicated that their long time policy of guaranteeing the lowest prices in the mail order market is still being offered and will not be affected by their new free overnight delivery service. "We will continue to beat any price by \$10" a company spokesman said. "We'd be crazy to fool with success", he stated; "since the inception of our lowest price guarantee, sales have skyrocketed."

When asked how Logisoft could afford to give their customers free overnight delivery plus beat any price by \$10, they replied "Buying Power". "Very simply", they said, we buy at the best possible prices and pass those savings along to our customers".

CONTINUOUS STATIONERY: BIG BUSINESS, But "Where's The Class?"

NEW YORK—The growth of Logicforms, Inc., a member of the Logic Group, has been phenomenal. Mr. Ralph Corso, President of Logicforms explains why. "Up until now, buying continuous stationery through the mail has been a take what's available situation". "First off", he said, "almost all mail order firms offer only stock letterheads & envelopes with limited typestyles, colors and stock logos from which to choose, but, 'where's the class?'"

"The individual style and design of a letterhead", said Mr. Corso, "reflects the professionalism and personality of a company and should not have to change because they now have a printer and the need for continuous stationery. While other mail order firms are limited in the variety they can offer, Logicforms specializes in custom stationery. Logicforms offers a large selection of quality paper, ink colors and special effects such as thermography, blind embossing, foil stamping and multi-color printing." Mr. Corso went on to say that

"whether a customer chooses to supply his own artwork or printed letterhead, or wishes to select from our vast array of stock designs. . . We are the Logical Choice".

For a free sample/pricing kit and a handy re-usable shipping envelope for artwork, simply call toll-free 1-800-645-3491 or send a sample of your current stationery for a free firm price quote. Mail to Logicforms, Inc., 300 Garden City Plaza, Garden City, N.Y. 11530

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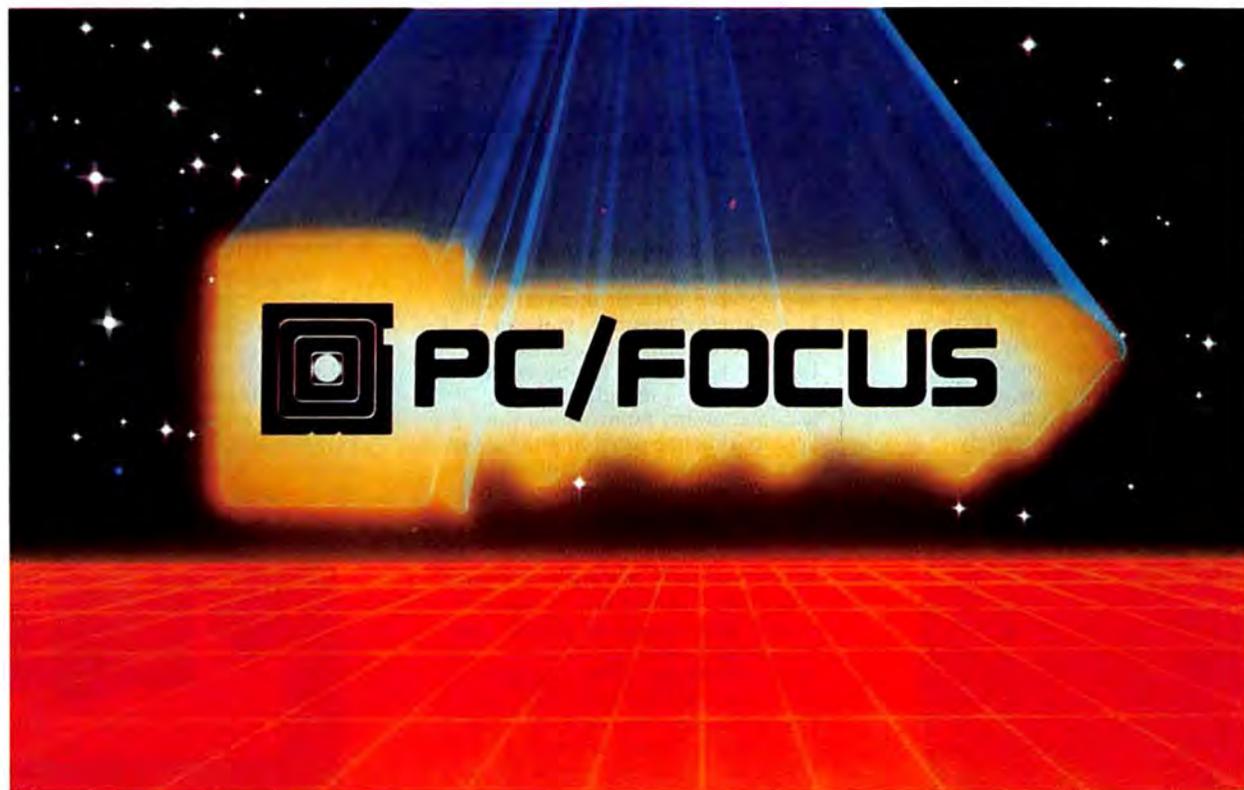
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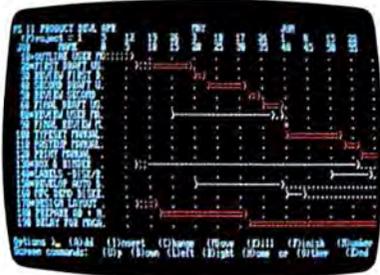
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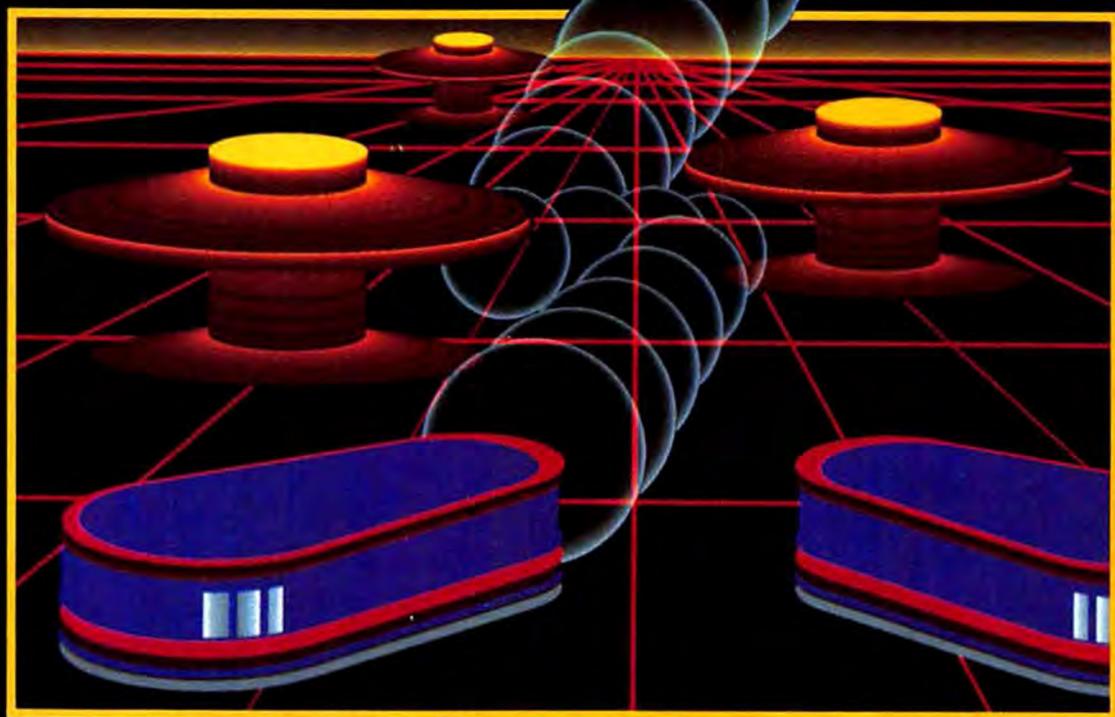
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Upwardly Mobile dBASE



dBASE II aficionados don't have to start from scratch with dBASE III. Here are some tips for using the dCONVERT utility to transform your dBASE II files to dBASE III.

David Jenkins

||||| If you're like most *dBASE II* users, you've come to rely on that data base management system like a trusty old car—even the rust spots have become lovable. But lately you may have felt the urge to trade in the old buggy, climb behind *dBASE III*'s sparkling dashboard, and push the pedal to the floor. First, however, you will have to convert your *dBASE II* data and programs. The conversion process is not difficult; in fact, it's an excellent way to familiarize yourself with *dBASE III*.

The *dBASE III* package provides help, including a useful booklet by Adam Green, "dBASE Bridge," and a disk of sample programs and utilities, one of which is a utility called dCONVERT. This article will guide you through the process of converting a *dBASE II* file to *dBASE III*'s format. *dBASE II* has a variety of file types. In most cases the process consists of only one step, running the file through dCONVERT. For example, dCONVERT automatically converts data base (.DBF) files. With other files, in particular program (.PRG) files, you may need to perform two additional steps after using dCONVERT: manually editing the resulting *dBASE III* files to make any

necessary changes that dCONVERT failed to make, and then testing the output produced by the new *dBASE III* files against the output of the original *dBASE II* versions.

Using dCONVERT

Many of the apparent differences between *dBASE II* and *dBASE III* are simply new names for familiar functions and commands (see Table 1). dCONVERT translates old *dBASE* language automatically. Naturally, before you do anything else, make backup copies of dCONVERT and all your *dBASE II* files.

To display the dCONVERT menu, boot DOS and type

dconvert *source drive: destination drive:*

If you do not specify any drives, dCONVERT will use the drive it was called from as the default for both the source of the *dBASE II* files and the destination of their converted *dBASE III* counterparts. If you use a hard disk and your files reside in a subdirectory, Ashton-Tate suggests that you copy dCONVERT into that subdirectory, then type **dconvert** without specifying a source or a destination. The utility will place the converted files into the same subdirectory. If your *dBASE II* files are on a floppy disk, place the disk in the source drive before making a selection from the dCONVERT menu (see Figure 1).

The conversion process is an excellent way to familiarize yourself with dBASE III.

Now choose a file type such as .DBF or .PRG from the menu. dCONVERT displays a list of all files on the source disk that have that extension. Enter the name of the file that you wish to convert. dCONVERT transforms the file into *dBASE III*'s format and also saves the original *dBASE II* file. dCONVERT distinguishes between converted and unconverted files by changing the last letter of the original *dBASE II* file name extension to *B*. For example, if you convert a file named Record.DBF, the *dBASE II* version will be renamed Record.DBB, while the converted *dBASE III* version will inherit the name Record.DBF.

Table 1: *dBASE II* and *dBASE III* functions

Function	<i>dBASE II</i>	<i>dBASE III</i>
Upper case	!()	UPPER()
Record number	#	RECNO()
Substring	S()	SUBSTR()
Primary data base	SELECT PRIMARY	SELECT A
Secondary data base	SELECT SECONDARY	SELECT B
Special character in variable names	:	—
Substring search	(a())	AT()
End of file	EOF	EOF()
True, false	T, F	.T., .F.

In some cases, simply passing *dBASE II* files through dCONVERT results in a fully working *dBASE III* system. Converted .DBF files, for example, work perfectly with *dBASE III*. Most files, however, require further adjustments, ranging from a minor tune-up to a complete overhaul.

Report Format Files

dBASE II and *dBASE III* differ considerably in the way they create report format (.FRM) files. Consequently, after you run .FRM files through dCONVERT, two types of adjustments may be needed.

dCONVERT cannot convert *dBASE II*'s SET HEADING command (the SET HEADING command in *dBASE III* has a different function). To set headings in *dBASE III* with the REPORT FORM command, you would, for example, write:

REPORT FORM Test HEADING "This is a test"

Note that the heading must be in quotation marks. With the REPORT FORM command you cannot, as you might expect, store "This is a test" to a memory variable, as in the following statement:

REPORT FORM Test HEADING &Testhead

The second adjustment you may need to make in .FRM files results from the different methods that *dBASE II* and *dBASE III* use to position headings. *dBASE II* uses the symbol < and the symbol > to position column headings in a report. For example typing > year causes the word "year" to appear right-

justified in its column. Converted .FRM files will retain these symbols, which you must strip out manually. To do so, load *dBASE III*, type **MODIFY REPORT filename**, and select the appropriate menu options to remove the unwanted symbols and reposition the headings.

Index Files

The error messages associated with REPORT FORM aren't very helpful. If you, or dCONVERT, have a problem, you may be better off retyping the entire form into a new file.

dCONVERT cannot convert a *dBASE II* index (.NDX) file directly to the *dBASE III* format. Instead, dCONVERT looks in the *dBASE II* index file, finds the key expression, and generates a special, one-line command file with the extension .RX. For example, if the *dBASE II* index file is Metro.NDX, and the key expression is city + state, dCONVERT creates a one-line *dBASE III* command file, Metro.RX, that reads: INDEX ON city + state TO Metro

Now you can use the Metro.RX file to create a new Metro.NDX file in the *dBASE III* format. First run the *dBASE II* .DBF file associated with your index through dCONVERT. Then load *dBASE III* and type:

SET DEFAULT TO *drive*

USE *filename*

DO Metro.RX

dBASE III will create a new index file; you can then erase Metro.RX.

```

dBASE II --> dBASE III

1 - Database File      <.DBF>
2 - Memory Variable File <.MEM>
3 - Report Format File <.FRM>
4 - Command File      <.PRG>
5 - Screen Format File <.FMT>
6 - Index File Help   <.NDX>
7 - Un-dCONVERT III->II <.DBF>

9 -      Instructions
0 -      EXIT
```

Figure 1: The menu of the dCONVERT utility. Options 1-6 let you select the type of *dBASE II* file you wish to convert to *dBASE III*. Option 7 lets you convert *dBASE III* data files back to *dBASE II* format.

Screen Format Files

Screen format (.FMT) files are program files that generate data entry screen designs; the only commands these files hold are @ ... SAY ... GET commands. dCONVERT has no difficulty converting most .FMT files to *dBASE III*. If a *dBASE II* .FMT file uses relative screen addressing or macros, however, the converted version may generate an error. If you encounter such a problem, you will have to correct the .FMT file manually, a process discussed later in this article.

Command Files

Amazingly, dCONVERT has problems with command files that use four-letter abbreviations. In my test cases, it would slip out of gear and back to the neutral DOS prompt. If you encounter this problem, you may have to rename your files before converting them.

After converting a command file, dCONVERT displays a message noting how much of the program was successfully converted. Occasionally the message will report that a line or two could not be converted, but usually it will state that the conversion was 100 percent successful. Beware! At best this means that what dCONVERT could convert, it did. But dCONVERT does not address various conversion issues, including logical tests based on the record number, relative addressing, and the use of memory variables. Let's consider each of these in turn.

The Record Number A common *dBASE II* programming technique is testing the record number after a FIND to see if the FIND was successful. If the FIND command fails to turn up any records, *dBASE II* positions the record number at zero. *dBASE III* operates differently. If the *dBASE III* FIND command doesn't turn up any records, the program sets the end of file marker, EOF(), to true.

dCONVERT successfully translates some, but not all, logical tests that are based on the FIND command. For example, dCONVERT correctly converts IF # = 0, a *dBASE II* test for "no record found," to the equivalent *dBASE III* statement IF EOF() .OR. BOF().

dBASE II	ROW
Answer=" "	
@ 10,20 SAY "What is your answer?" GET Answer	10
READ	10
@ \$+2,20 SAY "Everything OK?"	12
dBASE III	ROW
@ 10,20 SAY "What is your answer?" GET Answer	10
READ	24
@ ROW()+2,20 SAY "Everything OK?"	error

Figure 2: A comparison of how dBASE II and dBASE III position the cursor with the READ statement. The numbers in the columns at the right show the location of the cursor after each statement.

BOF() is the *dBASE III* beginning-of-file function. dCONVERT also correctly converts the statement IF # <> 0 into IF .NOT. (EOF() .OR. BOF()) But IF # > 0, which signifies "if there was a FIND," is not correctly converted. Instead it is translated literally to IF RECNO() > 0 whereas what is required is IF .NOT. EOF ().

This sort of erroneous conversion is especially dangerous because, when the program runs, no error message is generated; rather, the program produces incorrect results. The only way to get rid of such mis-translations is to check command files for their occurrence and correct them manually.

Relative Addressing *dBASE II* does not return an error message in response to statements that ask it to write outside the screen limits, but *dBASE III* does. The statement @26,84 SAY "Hello" is perfectly acceptable in *dBASE II*; in *dBASE III* it elicits an error message and causes the program to

halt, because *dBASE III* recognizes only a 25-row by 80-column screen. You must rewrite such statements manually.

dBASE II and *dBASE III* also differ in their handling of the READ command, a discrepancy that matters only if you are using relative screen addressing. In *dBASE II* after a READ operation, the cursor positions itself after the previous SAY or GET. But in *dBASE III* the cursor moves to the last row of the screen, row 24. This makes it difficult to convert *dBASE II* screen routines that are written like this:

```
@ 10,20 SAY "What is your answer?" GET Answer
READ
@ $ + 2,20 SAY "Everything OK?"
```

Because the cursor is at row 10 after the READ, \$ + 2 means row 12. But when the same code appears in *dBASE III* with \$ converted to ROW(), as in Figure 2, *dBASE III* announces an error, since ROW() is now 24 and ROW() + 2 is off the screen.

The simplest solution is inserting two new *dBASE III* lines into the converted program to reposition the cursor to the same row as in *dBASE II*. With the two new lines, the previous routine becomes

```
@ 10,20 SAY "What is your answer?" GET Answer
STORE ROW() TO Row
READ
@ Row,79
@ ROW() + 2,20 SAY "Everything OK?"
```

```

Printmsg = " "
@ 10,20 SAY "Send report to the screen (S)";
+"or the printer (P) ?";
GET Printmsg PICT "!"
READ
IF Printmsg = "P"
    STORE "EJECT" TO Newpage
ELSE
    STORE "ERASE" TO Newpage
ENDIF

```

Listing 1: dBASE II and dBASE III allow commands to be stored in memory variables.

Memory Variables In both *dBASE II* and *dBASE III* a memory variable can contain a command. For example, in Listing 1 the variable *Newpage* can store a printer command, *EJECT*, or a screen command, *ERASE*. Because of this powerful feature, other command files can simply use the macro substitution function, *&*, and call *&Newpage*. Both *dBASE II* and *dBASE III* will respond by executing the *EJECT* or the *ERASE* command.

Unfortunately, *dCONVERT* will not convert the contents of memory variables. Thus it does not convert the *dBASE II* command *ERASE*, when stored in a memory variable, to the equivalent *dBASE III* command, *CLEAR*. If you use memory variables frequently in your command files, you will be spending plenty of time manually correcting your programs. Fortunately, as you scan your program files for instances of commands stored to memory variables, you'll find they often occur in predictable places.

Sometimes a variable rather than a command is stored in a memory variable. For example, the *dBASE II* statement
 STORE "Emp:name" TO Key
 will probably be used later to perform a find, as in
 FIND &Key
 Since *dCONVERT* does not act on the contents of memory variables, it will not convert "Emp:name" to the equivalent *dBASE III* form, "Emp_name." When the *dBASE III* program encounters *&Key* you will get an error message. You must then work back to the command that created the variable *Key* and manually change it.

The Public/Private Problem In order to conserve memory and operate more efficiently, *dBASE III* divides memory variables into public and private types. A public variable is available to any command file. A private variable is available within the command file in which it is created and to all command files that are called by that command file. In *dBASE III* all private variables are automatically released, or lost, when a *RETURN* is performed. *dBASE II* makes no distinction between public and private variables; in effect, all *dBASE II* variables are public. If your

In order to conserve memory and operate more efficiently, dBASE III divides memory variables into public and private types.

dBASE II command files are called by other command files, you will need to examine them after conversion and decide which variables should be private.

To temporarily avoid the public/private dilemma while you test a program, simply declare all variables at the dot prompt; doing so makes them public. For a more permanent remedy you have two possible courses of action. One is to declare the variable in the highest-level command file in which it is used. The other is to locate the command file where the variable is created and declare it public before it is first used. The first remedy requires more effort, but it is preferable in the long run because it preserves the program's structure.

```

* This is the high-level command file
PUBLIC Program,Data
STORE "A:" TO Program
STORE "B:" TO Data
STORE DATE() TO Today
DO Savemem
DO Lowlevel
? Program,Data,Today

* This is Savemem.PRG
SAVE TO Saveinfo
RETURN

* This is Lowlevel.PRG
RESTORE FROM Saveinfo
RETURN
    
```

Listing 2: SAVE and RESTORE are not appropriate in dBASE III.

Memory Files The problem of public and private variables complicates the conversion of memory files. In *dBASE III* when you use the RESTORE command, which reactivates stored variables, the variables become private in the file where they are restored, not in the file where they were created. This can create havoc for a *dBASE III* program. In Listing 2, for example, the memory variables Program, Data, and Today become private variables when they are restored in Lowlevel.PRG. When you leave Lowlevel.PRG, these variables are lost.

No amount of tinkering can correct this problem. In most cases the best solution is simply to run your programs through dCONVERT, review the new *dBASE III* listings, and remove all references to SAVE and RESTORE. Fortunately, *dBASE III* permits up to 256 variables and can provide 31K of space for them, compared to 64 variables and 1000 bytes in *dBASE II*. Thus, the reason for using memory variables—which were originally designed to let you work around *dBASE II*'s stingy RAM capacity—no longer exists.

Testing Converted Files

Even if your converted *dBASE III* program appears to function correctly, subtle errors may have crept in during the conversion process. For example, the TRIM function now produces a different result when used with blank character strings. For large data bases with multiple command files, you will

need some strategies for testing the newly converted *dBASE III* files. To test command files that create menus for the user, first see if you can move back and forth between all the menus. Any memory variables in the command files that need to be set public will cause *dBASE III* to generate error messages. Next, display the data entry screens, enter some test data, and generate a report. Watch for recurring problems that result from your particular programming style. If you can learn to predict where problems are likely to occur, you'll be able to make the necessary changes more quickly as you inspect your command files.

To guarantee a correct conversion, however, you must test all parts of the software using an appropriate set of data. Be prepared for the possibility that the *dBASE III* incarnation of your application will produce results subtly different from the original *dBASE II* version. And don't be surprised if bugs that were ignored by *dBASE II* are suddenly flagged by *dBASE III*.

Once you've converted and tested your files and programs, reach around and pat yourself on the back. Now that you've made the transition to *dBASE III* you can start looking at all its new features... but that's another article. ●

David Jenkins is the president of Midway Software, a consulting and programming company based in Berkeley, California, that specializes in dBASE applications. He is currently writing a book on dBASE III for Hayden Book Company.

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Setting the Data Table

1-2-3 is best known as a spreadsheet, but it also works well as a data base manager. Learn to use 1-2-3's Data Table command to fine-tune your "what if" analyses and automate data extraction.

Eric Weiss

Every day in offices around the world, managers make decisions based on correlated data. Financial analysts may need to scrutinize sales variations by region. Operations managers may monitor quality-control failures. Other managers may need to measure the productivity of company machines as a function of the time of day.

If you have faced tasks like these—making decisions based on known relationships—you'll appreciate the complexities of cross-tabulation. But don't rush out and buy a statistical package or a data base management system to solve these problems—you may need to look no further than that old workhorse, Lotus Development's 1-2-3.

The tutorial presented here illustrates the use of the Data commands to extract meaningful information from a report of raw data. The example combines the use of data base statistical functions with 1-2-3's Data Table feature to automate cross-tabulation and analysis tasks. A data table allows you to specify a list of values to be substituted for a variable in a formula. When you issue a Data Table command, 1-2-3 reports the result of those substitutions in a table on the screen (see Figure 1). This combination makes 1-2-3 a reasonably powerful data management tool.

The article assumes that you know how to move around a 1-2-3 worksheet, but requires no other data management expertise. The

terms listed in *italics* represent 1-2-3 commands. Text or values to be entered into cells and responses to prompts are shown in **monofont**.

Creating the Data Base

The matrix of a 1-2-3 spreadsheet provides a good visual framework for data management applications. In this context each row of data is a record, and each column entry represents a field within that record. Figure 2 shows a monthly sales transaction report for a company that sells machine parts. Using 1-2-3's data commands you can extract information such as who is buying what parts, how many, and for what price.

To create the sales transaction data base shown in Figure 2, set the global column width to 10 with `/Worksheet Global Column-Width 10 <Enter>`, and set the width of column A to 25 with `/Worksheet Column-Width Set 25 <Enter>` to accommodate the customer names. Using the same method, set the widths of columns B, C, and D to 3.

Start typing in the worksheet from Figure 2 at cell A7. The field (column) labels can serve as range names for the data; this will simplify formula references later. To create those range labels, position the cursor at *CNAME* (the column A label). Select */Range Name Labels Down*; then press <End> <CursorRight> to highlight the whole row, and press <Enter>.

The transaction date is recorded in columns B, C, and D. This three-column date format is relatively easy to enter and facilitates quick sorting of data records by day. Column J converts the three-column date to the storage format that 1-2-3 uses for date arithmetic. Date arithmetic allows selection of transactions that occur when you are working with more than one month's worth of data (during a 45-day sales promotion, for example). In cell J9, enter **@DATE(YR,MO,DA)**. Then copy that formula down column J with the command */Copy <Enter> J9..J36*. Finally, format the column to display the date in readable form with the command */Range Format Date 1 <Enter> J9..J36 <Enter>*.

Columns E (part number), F (unit price), and G (quantity) are values. Format column F to display two decimal places (*/Range Format Fixed 2 <Enter> F9..F36 <Enter>*). For column H (total sale), simply enter the formula **+UPRC*QTY** and copy it into the remaining cells of column H using */Copy*. Column H should also be formatted for two decimal places (*/Range Format Fixed 2 <Enter> H9..H36 <Enter>*).

Save this worksheet with the name *Dbsample*. You may want to add a keyboard macro (<Alt>-S)



DATA TABLE						
	A	B	C	D	E	F
1						
2						
3						
4	formula -->	X+Y				
5		1	2	3	4	5
6		2	3	4	5	6
7		3	4	5	6	7
8		4	5	6	7	8

Figure 1: A simple data table. Column C contains the values that will be substituted for the first variable (X), and the values in row 4 will be used for the second variable (Y). The results of substituting each combination are displayed at the point on the table where the corresponding row and column intersect.

1*CRITERIA*	A	B	C	D	E	F	G	H	I	J
2 CNAME		MO	DA	YR	PNUM	UPRC	QTY	TOTSAL		
3										
4										
5										
6										
7*DATA INPUT*										
8 CNAME		MO	DA	YR	PNUM	UPRC	QTY	TOTSAL		
9 FLEXCON CO.		1	2	85	78289	7.40	334	2471.60		02-Jan-85
10 CONLIFT INC.		1	2	85	74870	9.50	296	2812.00		02-Jan-85
11 LARIMORE ENTERPRISES		1	2	85	24542	12.20	139	1695.80		02-Jan-85
12 NORDICO		1	2	85	58550	8.75	290	2537.50		02-Jan-85
13 NDE INDUSTRIES		1	3	85	74870	9.50	430	4085.00		03-Jan-85
14 CONLIFT INC.		1	4	85	19143	22.00	297	6534.00		04-Jan-85
15 REISCHEL PARTS CO.		1	4	85	87321	17.25	428	7383.00		04-Jan-85
16 SHETLER MACHINES		1	6	85	50622	9.65	876	8453.40		06-Jan-85
17 MACHCO INC.		1	8	85	34953	14.70	143	2102.10		08-Jan-85
18 OLDHAM PARTS INC.		1	9	85	19143	22.00	510	11220.00		09-Jan-85
19 CONLIFT INC.		1	9	85	58550	8.75	892	7805.00		09-Jan-85
20 NORDICO		1	12	85	87321	17.25	724	12489.00		12-Jan-85
21 AUTOMACH CO.		1	12	85	74870	9.50	695	6602.50		12-Jan-85
22 BISCOA INC.		1	14	85	24542	12.20	806	9833.20		14-Jan-85
23 CLEVELAND MACHINE CO.		1	15	85	74870	9.50	523	4968.50		15-Jan-85
24 FLEXCON CO.		1	15	85	57557	15.90	840	13356.00		15-Jan-85
25 REISCHEL PARTS CO.		1	17	85	57557	15.90	108	1717.20		17-Jan-85
26 DEWITT EQUIPMENT CO.		1	18	85	34953	14.70	914	13435.80		18-Jan-85
27 SUMMIT INDUSTRIAL PARTS		1	18	85	78289	7.40	829	6134.60		18-Jan-85
28 LARIMORE ENTERPRISES		1	18	85	34953	14.70	94	1381.80		18-Jan-85
29 FLEXCON CO.		1	22	85	19143	22.00	794	17468.00		22-Jan-85
30 WEISS CORPORATION		1	27	85	24542	12.20	925	11285.00		27-Jan-85
31 AUTOMACH CO.		1	28	85	78289	7.40	887	6563.80		28-Jan-85
32 ARMSTRONG INDUSTRIES		1	28	85	87321	17.25	77	1328.25		28-Jan-85
33 DEWITT EQUIPMENT CO.		1	29	85	74870	9.50	678	6441.00		29-Jan-85
34 B.C. CAMDEN CO.		1	29	85	67189	13.20	609	8038.80		29-Jan-85
35 NDE INDUSTRIES		1	31	85	87321	17.25	615	10608.75		31-Jan-85
36 REYNOLDS CO.		1	31	85	58550	8.75	13	113.75		31-Jan-85

Figure 2: Raw data from a sales transaction report. To analyze the data, you must organize it by customer and by part number.

```

4           L           M           N
5
6           **OUTPUT2--PARTS LIST**
7 **OUTPUT1--CUSTOMER LIST*PNUM
8 CNAME           78289
9 ARMSTRONG INDUSTRIES           74870
10 AUTOMACH CO.           24542
11 B.C. CAMDEN CO.           58550
12 BISCOA INC.           19143
13 CLEVELAND MACHINE CO.           87321
14 CONLIFT INC.           50622
15 DEWITT EQUIPMENT CO.           34953
16 FLEXCON CO.           57557
17 LARIMORE ENTERPRISES           67189
18 MACHCO INC.
19 NDE INDUSTRIES
20 NORDICO
21 OLDHAM PARTS INC.
22 REISCHEL PARTS CO.
23 REYNOLDS CO.
24 SHETLER MACHINES
25 SUMMIT INDUSTRIAL PARTS
26 WEISS CORPORATION

```

Figure 3: Output 1 is the list of unique customers sorted alphabetically so that it can be used in a table later in the example. Output 2 is the part numbers list, also cleared of duplications.

to save the worksheet automatically. To do so, move the cursor to cell AA1, away from the active work space; type `\s`; and in the same row in column AB enter `/fsdbsample~r`. Next position the cursor on the `\s`, select `/Range Name Labels Right`, and press `<Enter>`. Now use `<Alt>-S` to save the file, including the macro.

Setting the Criteria

The sales transaction data base lists all customers for January; many are listed more than once, as they made several purchases. There are two ways to find out how many customers you have and who they are. The first is to have *1-2-3* sort the records by customer name with a Data Sort command. You could then count the groups of names to find out how many customers you have.

There is, however, an easier way. You can use a Data Query command to extract a customer list or a parts list from the data base. Data Query commands

come in three flavors: Find, which highlights each matching record; Extract, which copies each matching record to a specified output range; and Unique, which also copies matching records to an output range, but doesn't copy duplicates.

Thus, the first step in distilling the data is to use the Data Query Unique command to develop a customer list without duplications. However, before you can use any of the Data Query commands, you must tell *1-2-3* where to look for certain variable data.

First, you must specify the input range, which is all of the data to be searched or sorted—in short, the data base. In this case, the transaction report is the data base, so position the cursor at *CNAME* (A8), select `/Range Name Create`, and type `input <Enter> A8..J36 <Enter>`. You have just created a named range called Input. Now

you must tell *1-2-3*'s Data Query command that the Data Input range is the range called Input; give the command `/Data Query Input input <Enter> Quit`. It is important to notice that the data input range includes the column titles.

Next, *1-2-3* needs to know the criterion range. The criterion range will hold the criteria—either examples or formulas—that each data record will be tested against to find those records that match. The *1-2-3* manual compares a criterion range to a gateway through which data is allowed to pass if it meets a certain specified condition.

The criterion range in Figure 2 can be created by simply copying the row of column titles to the first row of the criterion range and naming the range. With the cursor on *CNAME* (cell A8), type `/Copy <End> <CursorRight> <Enter> A2 <Enter>`; name the range with the command `/Range Name`

Create criteria < Enter > A2..H3

< Enter > . Row 3 is included in the range because selection rules (examples—character strings—or formulas) are entered here. Thus, if you enter a name in cell A3, the Data Query command will compare it to the CNAME fields in each of the data records to see if it matches. Issue the command /Data Query Criterion criteria < Enter > Quit to establish the range you just named Criteria as the Data Query command's criterion range. As a reminder, enter the label *CRITERIA* in cell A1.

Finally, if you want to extract the matching records (with the Extract or Unique commands), you must specify the area of the worksheet to which those records will be copied—the output range. The output range must be large enough to contain all of the selected records. The first row of the output range must contain the names of the fields that you want extracted—you need not extract all of them, nor need they be placed in the same sequence as in the data base. If you are unsure of the size of the output, you can avoid guesswork by specifying an output range of a single row (only the row of field names). 1-2-3 will automatically set the bottom of the output range at the bottom of the worksheet. Be sure that the output range is empty before starting, for the Extract or Unique operations erase any existing cell contents in the output range, even if they write nothing in their place.

To establish the output range for the unique customer list, move the cursor to cell L7 and enter the label *OUTPUT1-CUSTOMER LIST*. Plan ahead and make room for the customer names with the com-

	L	M	N	O	P
7	*TABLE 1--UNIT SALES VOLUME ANALYSIS BY CUSTOMER*				
8	@DSUM(\$INPUT,6,\$CRITERIA	19143	24542	34953	50622
9	ARMSTRONG INDUSTRIES	0	0	0	0
10	AUTOMACH CO.	0	0	0	0
11	B.C. CAMDEN CO.	0	0	0	0
12	BISCOA INC.	0	806	0	0
13	CLEVELAND MACHINE CO.	0	0	0	0
14	CONLIFT INC.	297	0	0	0
15	DEWITT EQUIPMENT CO.	0	0	914	0
16	FLEXCON CO.	794	0	0	0
17	LARIMORE ENTERPRISES	0	139	94	0
18	MACHCO INC.	0	0	143	0
19	NDE INDUSTRIES	0	0	0	0
20	NORDICO	0	0	0	0
21	OLDHAM PARTS INC.	510	0	0	0
22	REISCHEL PARTS CO.	0	0	0	0
23	REYNOLDS CO.	0	0	0	0
24	SHETLER MACHINES	0	0	0	876
25	SUMMIT INDUSTRIAL PARTS	0	0	0	0
26	WEISS CORPORATION	0	925	0	0
27					
28	PARTS TOTALS	1601	1870	1151	876

	L	M	N	O	P
31					
32					
33					
34	*TABLE 2--SALES DOLLAR VOLUME ANALYSIS BY CUSTOMER*				
35	@DSUM(\$INPUT,7,\$CRITERIA	19143	24542	34953	50622
36	ARMSTRONG INDUSTRIES	0.00	0.00	0.00	0.00
37	AUTOMACH CO.	0.00	0.00	0.00	0.00
38	B.C. CAMDEN CO.	0.00	0.00	0.00	0.00
39	BISCOA INC.	0.00	9833.20	0.00	0.00
40	CLEVELAND MACHINE CO.	0.00	0.00	0.00	0.00
41	CONLIFT INC.	6534.00	0.00	0.00	0.00
42	DEWITT EQUIPMENT CO.	0.00	0.00	13435.80	0.00
43	FLEXCON CO.	17468.00	0.00	0.00	0.00
44	LARIMORE ENTERPRISES	0.00	1695.80	1381.80	0.00
45	MACHCO INC.	0.00	0.00	2102.10	0.00
46	NDE INDUSTRIES	0.00	0.00	0.00	0.00
47	NORDICO	0.00	0.00	0.00	0.00
48	OLDHAM PARTS INC.	11220.00	0.00	0.00	0.00
49	REISCHEL PARTS CO.	0.00	0.00	0.00	0.00
50	REYNOLDS CO.	0.00	0.00	0.00	0.00
51	SHETLER MACHINES	0.00	0.00	0.00	8453.40
52	SUMMIT INDUSTRIAL PARTS	0.00	0.00	0.00	0.00
53	WEISS CORPORATION	0.00	11285.00	0.00	0.00
54					
55	PARTS TOTALS	35222.00	22814.00	16919.70	8453.40

mand /Worksheet Column-Width Set 25 < Enter > . Move the cursor down to cell L8 and enter the label CNAME. Name the range with /Range Name Create OUTPUT1 < Enter > L8..L30. The command /Data Query Output OUTPUT1 < Enter > Quit specifies Output1 as the output range.

From the Ready mode, enter an asterisk (*) in cell A3 just below the CNAME label in the criterion range. You are now ready to ex-

tract the customer list. Move the cursor to cell L7 and give the command /Data Query Unique to view the list. It would be more convenient to have the customer list in alphabetical order, so with the cursor on cell L9, issue the command /Data Sort Data-Range L9..L26 < Enter > Primary-Key L9 < Enter > A < Enter > Go. The customer list should now look like

Q	R	S	T	U	V	W	X
57557	58550	67189	74870	78289	87321	CUSTOMER TOTALS	
0	0	0	0	0	77	77	
0	0	0	695	887	0	1582	
0	0	609	0	0	0	609	
0	0	0	0	0	0	806	
0	0	0	523	0	0	523	
0	892	0	296	0	0	1485	
0	0	0	678	0	0	1592	
840	0	0	0	334	0	1968	
0	0	0	0	0	0	233	
0	0	0	0	0	0	143	
0	0	0	430	0	615	1045	
0	290	0	0	0	724	1014	
0	0	0	0	0	0	510	
108	0	0	0	0	428	536	
0	13	0	0	0	0	13	
0	0	0	0	0	0	876	
0	0	0	0	829	0	829	
0	0	0	0	0	0	925	

948	1195	609	2622	2050	1844	14766	

Figure 4: The results of the data table operation indicate the best-selling parts and the customers who buy the most parts.

Q	R	S	T	U	V	W	X
57557	58550	67189	74870	78289	87321	CUSTOMER TOTALS	
0.00	0.00	0.00	0.00	0.00	1328.25	1328.25	
0.00	0.00	0.00	6602.50	6563.80	0.00	13166.30	
0.00	0.00	8038.80	0.00	0.00	0.00	8038.80	
0.00	0.00	0.00	0.00	0.00	0.00	9833.20	
0.00	0.00	0.00	4968.50	0.00	0.00	4968.50	
0.00	7805.00	0.00	2812.00	0.00	0.00	17151.00	
0.00	0.00	0.00	6441.00	0.00	0.00	19876.80	
13356.00	0.00	0.00	0.00	2471.60	0.00	33295.60	
0.00	0.00	0.00	0.00	0.00	0.00	3077.60	
0.00	0.00	0.00	0.00	0.00	0.00	2102.10	
0.00	0.00	0.00	4085.00	0.00	10608.75	14693.75	
0.00	2537.50	0.00	0.00	0.00	12489.00	15026.50	
0.00	0.00	0.00	0.00	0.00	0.00	11220.00	
1717.20	0.00	0.00	0.00	0.00	7383.00	9100.20	
0.00	113.75	0.00	0.00	0.00	0.00	113.75	
0.00	0.00	0.00	0.00	0.00	0.00	8453.40	
0.00	0.00	0.00	0.00	6134.60	0.00	6134.60	
0.00	0.00	0.00	0.00	0.00	0.00	11285.00	

15073.20	10456.25	8038.80	24909.00	15170.00	31809.00	188865.35	

Figure 5: The results of the second data table operation help classify customers by dollar volume and determine which parts produce the most revenue.

Column L in Figure 3. If you haven't already done so, save the worksheet using the <Alt>-S macro you created earlier.

Numeric Selection

You can also use the Data Unique command to generate a similar list of part numbers without duplications. However, selection rules for numeric fields differ from those for nonnumeric characters.

With letters you can match records based on character sequences as well as specific characters. With numbers, you usually look for relationships expressed as algebraic expressions such as more than, less than, or equal to. Since the part numbers in the transaction report are all 5 digits long, they

fall into a range of values between 0 and 100,000.

To set up the criterion range, move the cursor to cell E3. Enter the formula `+pnum > 0#and#pnum < 100000`. Next, go to cell M7 to establish and name a new output range with the command `/Range Name Create OUTPUT2 <Enter> M7.M36 <Enter>`. Place the field label **PNUM** in cell M7.

Then, change the Data Query output range with the command */Data Query Output OUTPUT2* <Enter>, select *Unique*, and save the worksheet, including the parts list, with <Alt>-S. The results should look like Column M of Figure 3.

Setting the Table

Now that you have a customer list and a parts list, you are almost ready to find out which customers have bought which parts, in what quantities, and for how much. The Data Table command, coupled with 1-2-3's data base statistical functions, will help disclose the answers.

The Data Table command extracts and presents data from a data base according to given sets of selection criteria. Since this function performs calculations, a table may generate information not originally in the data base.

To organize the sales by total parts sold per customer during the month of January, you will use a data table to display the results of a single formula that uses two independent variables. 1-2-3 will find all records in which both customer name and part number (the independent variables) match the combination indicated in the margins of the table and substitute the associated data into the formula. But first you must understand the formula used in this example.

Data Base Statistical Functions

The formula cells in a data table can use any of 1-2-3's built-in @ functions. Particularly useful are the data base statistical functions. The form of those functions in

1-2-3 is always *@functionname(input,offset,criterion)*.

Input refers to the data base, and *criterion* refers to the criterion range, just as in the Data Query Input and Criterion commands.

Offset is a number that identifies the field of the data base on which the function should operate. This number is relative to the first column of the input range. That is, the first column of the input range is counted as 0, the second column is 1, and so on. In this

The Data Table command extracts and presents data from a data base according to given sets of selection criteria.

example, therefore, column A is 0, column B is 1, through column J, which represents an offset of 9.

To understand the operation of offsets and the data base statistical functions, move the cursor to cell E3 and enter **78289**. Only a data base statistical function can find the total quantity of number 78289 parts sold in January. Move to cell J3 and enter the formula **@DSUM(input,6,criteria)**. This formula tells 1-2-3 to use the data base that resides in the range called Input, operate on the field that is offset 6 from the beginning of the data base (in other words, the QTY field), and use the criteria found in the range called Criteria. @DSUM adds the values of the QTY field for every record that matches the criteria (PNUM = 78289). The formula finds

three matches: Flexcon bought 334 on the 2nd, Summit bought 829 on the 18th, and Automach bought 887 on the 28th, for a total of 2050 parts.

Back to the Table

The next step in the cross-tabulation analysis is to build the data table. The customer list in column L can form the vertical margin of the table. You can now sort and move the parts list to form the horizontal axis of the table. Go to cell M8 and give the

command */Data Sort Data-Range M8..M17* <Enter> *Primary-Key M8* <Enter> **A** <Enter> Go. Then move down to cell M9 and move part number 24542 to cell N8. Move part number 34953 to cell O8, and so on, until you have all of the part numbers forming the horizontal axis.

Move the cursor to cell L8 on the table. Replace the label CNAME that is currently held in that cell with the formula: **@DSUM(\$ <UN > INPUT,6,\$ <UN > CRITERIA)**. To see the formula in the spreadsheet, convert it to text with the */Range Format Text* <Enter> command. If you look back at the data base, you can see that the offset number for the QTY field is 6. Thus, this formula will fill the table with the sums of the quantity of each part number purchased by each customer during

the month of January. The dollar signs make the range references absolute so that they can be copied later.

Name the table range with the command */Range Name Create table1* <Enter> L8..V26 <Enter> . Erase the label PNUM from cell M7 (*/Range Erase M7..M7* <Enter>) and change the label in cell L7 to read ***TABLE 1-UNIT SALES VOLUME ANALYSIS BY CUSTOMER***. At this time, it is advisable to save the worksheet (<Alt>-S).

You are now ready to execute the table. When you invoke the */Data Table 2* command, the first prompt asks for the table range. Press <F3> (the Name Key), highlight the range name Table1, and press <Enter>. The next prompt asks for the location of the first input cell. In some simple data tables, the input cell could be any cell in the worksheet that is treated as an independent variable. However, when you use the Data Table 2 command with a data base statistical function, the input cells must be located in the appropriate place in the criterion range.

In this kind of operation, 1-2-3 must "pair up" data records according to the contents of the fields used as selection criteria. For example, Armstrong and 19143 are a pair, as are Biscoa and 34953, or Biscoa and 19143. In answer to the prompt 'Input cell 1', enter **A3**. Input cell 2 is **E3**.

The two independent variables for this formula are the customer name and the part number as

specified in the Criteria range. The data table substitutes the values listed in the vertical column of the table for the variable specified as input cell 1. At the same time, each part number is substituted sequentially for input cell 2.

To form the table, 1-2-3 begins by looking at the first row of the table and makes the CNAME in that row the criterion for cell A3. It then looks at the first column of the table and makes the PNUM in that column the criterion for cell E3. 1-2-3 then searches the data base for all records whose CNAME and PNUM match the criteria in A3 and E3. Next it adds the entries in the QTY field for all these records, and it places the result in the first cell of the table. It does the same for each row-column pair of the table.

All that's left to do is to calculate the total quantities for each part number and customer. At cell M27, type \- to create a repeating label—a line of hyphens. Copy this label across the row with the command */Copy M27* <Enter> **N27..W27** <Enter> . Enter the label **PARTS TOTALS** in cell L28. Enter the formula **@SUM(M9..M26)** in cell M28, and copy it across the row with the command *Copy M28* <Enter> **N28..W28** <Enter> . In cell W8 enter the label **CUSTOMER TOTALS**. In cell W9 use the formula **@SUM(M9..V9)**, and copy that formula down the column with *Copy W9* <Enter> **W10..W26** <Enter> . The result is shown in Figure 4.

From this table you can now determine which customers are buying which parts, and in what

quantities. To analyze the dollar amounts, make a copy of the table with the command *Copy L7..W28* <Enter> **L34** <Enter> . Give this copy a new range name with */Range Name Create TABLE2* <Enter> **L35..V53**. Change the label in cell L34 to read ***TABLE 2-SALES DOLLAR VOLUME ANALYSIS BY CUSTOMER***, and format the new table range to display two decimal places with the command */Range Format Fixed 2* <Enter> **M36..W55**.

Move the cursor to the formula cell in the top left corner of the new table (L35). Press <F2> (Edit), and change the offset number from 6 to 7. This change will cause the total sales (TOT-SAL) values, rather than the quantity (QTY), to be summed for every matching record. Execute the table with the command */Data Table 2 table2*. The input cells (1 and 2) stay the same, so press <Enter> twice to start the calculation. The result should look like Figure 5.

When looking for trends, you can set up tables with different combinations of fields. If you've been staring at the screen too long to make sense of all those numbers, use 1-2-3 to display the results in a graph. Infinite variations and enhancements are possible with 1-2-3's data commands and the data base statistical functions. ●

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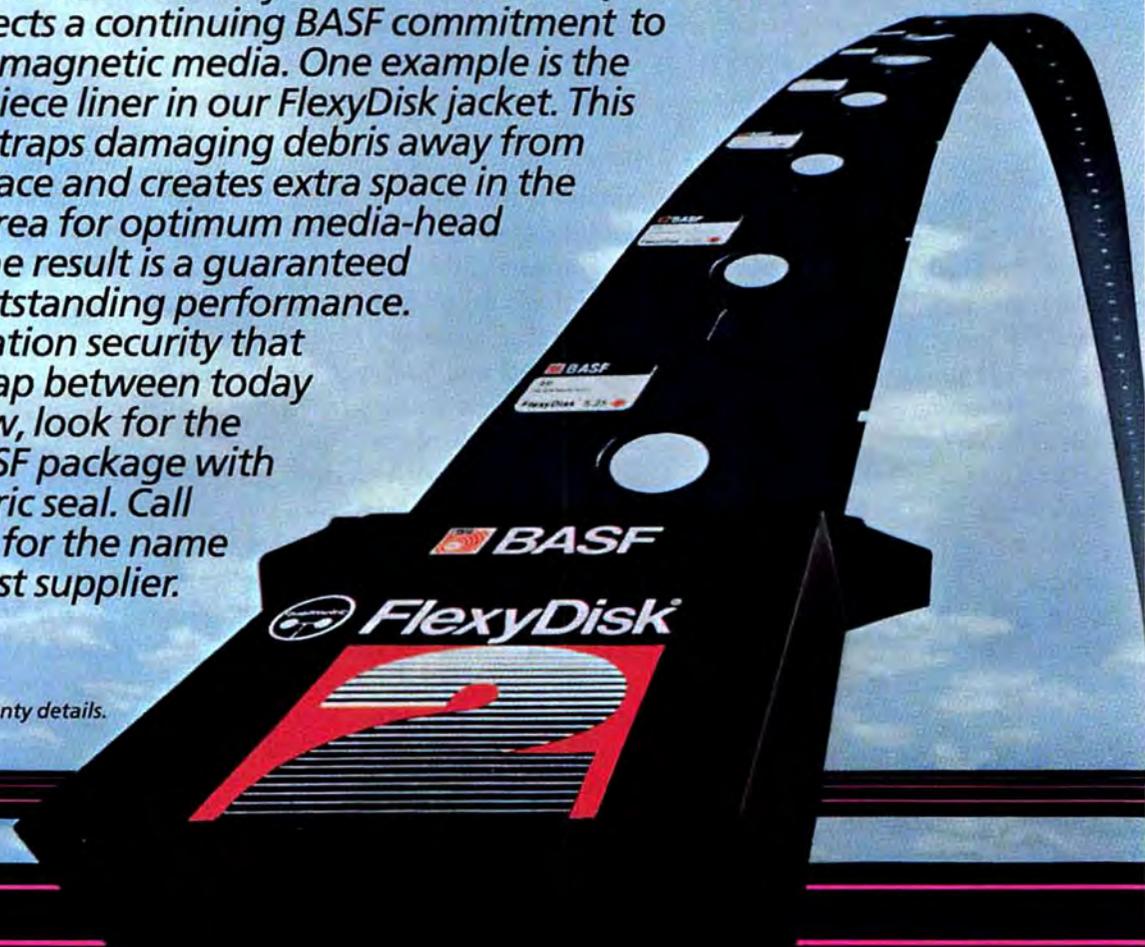
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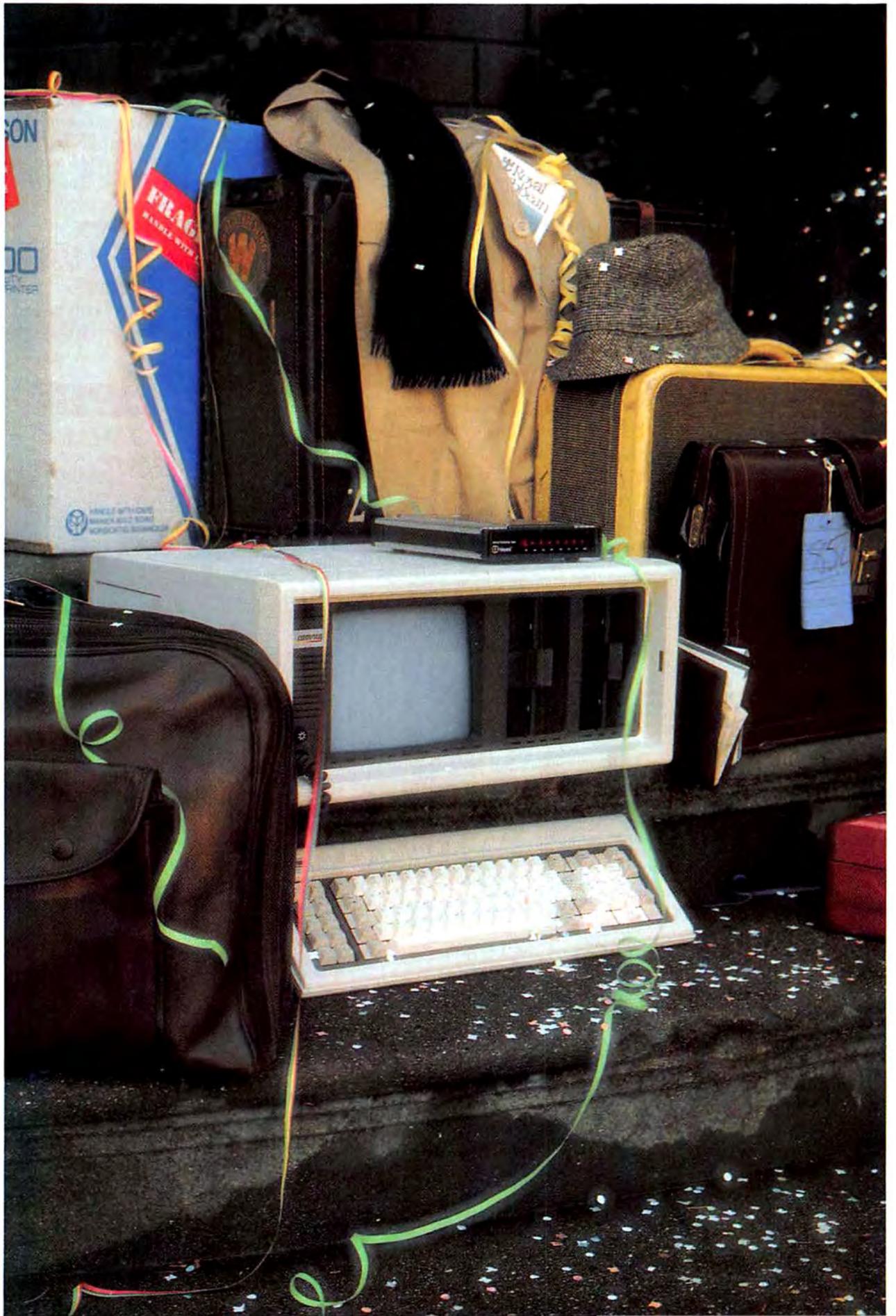
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Because my job involves frequent travel and my Compaq has been a constant companion through thousands of miles, often under woolly conditions, I've developed a compendium of essential pointers for touring with transportables.

■ Rules of the Road

Long before you board the aircraft, consider the first law of traveling with a portable: Don't feel compelled to take it merely because you can. If you aren't going to be based at one locale for at least a five-day stretch, you're probably better off without the machine. After all, you'll probably also need a printer, a box or two of disks, a small box of paper for the printer, a modem, some cables, and a complement of tools. A quick inventory of all this hardware reveals that you could be packing enough equipment to fill four cartons. So, unlike throwing in an extra suit or a James Michener novel, including a mobile computer with your travel gear ought not be an idle decision.

■ Getting There

Assuming you truly need the computer and assorted peripherals, the second law of traveling with a transportable concerns humility: The machine doesn't have to accompany you. Hefting a com-

puter may confer some measure of status, but it also imparts a measure of pain. Instead, have the unit shipped. You can forward the portable, the printer, and the accessories to your destination via an overnight delivery service such as Federal Express, Airborne, or Purolator Courier.

Most carriers want the equipment packed in factory cartons or the equivalent. If the carrier doesn't believe the computer is suitably packed, the company will

tional wisdom that carriers treat all objects like frisbees, most baggage handlers will take extra care if you alert them.

■ Cardboard Heroes

Remember the cardboard inserts that were in the disk drives when you first bought the machine? If you didn't save them, beg your local computer store for replacements. For a computer on the go, those slivers of cardboard are priceless.

Although a little care on your part is the best insurance for your hardware, also consider traditional insurance—a useful, but occasionally costly, outlay.

ask you to sign papers releasing it from liability before accepting the machine.

In any case, do for your Compaq or Portable PC what you'd do for your other luggage. Tag each piece permanently with your name and address and a phone number that will be answered while you're out of town. If you're not hung up on aesthetics, write the information on each piece of equipment with an indelible felt-tip pen, or use an engraving tool (available from most police departments). Don't be afraid to write *Fragile* in big, red letters on every carton. And take along extra shipping labels, sealing tape, and felt-tip markers, so you can send the stuff home again. Despite the conven-

Experience taught me this precept. The first time I retrieved my Compaq from the baggage claim, all seemed well. Shortly after I set the machine up, however, I began to get disk errors; soon I started to lose files I had saved only moments before, and then I graduated to losing entire directories—and with them all the files on the disk. It seems that a misaligned head was systematically wiping out major sectors of my floppies, a situation that factory-installed shock mounts apparently did not prevent.

Since that nightmare I've used those little cardboard inserts, and have so far avoided a recurrence. If you can't get a set, keep a junker disk in each drive during shipping.

Although a little care on your part is the best insurance for your hardware, also consider traditional

insurance—a useful, but occasionally costly, outlay. Overnight delivery services charge 40 to 60 cents per \$100 of your equipment's value (\$10 to \$15 for the average transportable). If you check the computer as airline baggage, expect to pay \$1 per \$100 value (\$20 to \$30). In addition, most carriers limit the total value you may declare. Many restrict valuation to \$5000; others, to \$10,000. American Airlines will insure property valued up to \$25,000.

When all is signed and sealed, the shipper will, for a reasonable fee, pick up the equipment from your door and deliver the goods directly to your destination. If you're bound for a branch office of your company, for instance, you can arrange to have the computer arrive before you do.

■ Tools of the Trade

Murphy, that familiar but perverse sage, drafted the third law of computers and travel. This postulate applies to the computer accessories you should bring on a trip: The one item you leave home will be the one you need.

Besides a printer and a box of floppy disks, I always pack a tool kit filled with items experience has proved valuable. The essential implements are the following:

Screwdrivers. Bring both slotted and Phillips-head screwdrivers, plus a 1/4-inch nut driver. You'll be amazed at how often these few simple items will save the day and how hard it is to find them in a strange town. They'll also help

you attach and detach cables to and from the computer's various ports.

Power strip. This is a souped-up extension cord designed to deliver a substantial amount of power to the equipment. Power strips usually feature four or six outlets and often include a circuit breaker. Such an extension cord enables you to plug in your computer and peripherals even when the only outlet is across the room.

Try to get a power strip with a built-in line filter. While working on location we often receive electricity from temporary circuits. This type of power is suspect at best and can create surge problems. A line filter reduces the chance of a data- or chip-damaging power surge.

If your computer, printer, or other device has an L-shaped plug, look carefully at how the power strip outlets are laid out. On some an L-shaped plug will cover adjacent outlets, rendering the blocked outlets unusable. Others have the outlets turned 90 degrees, which sends the cords out to the side and keeps them from interfering with each other.

Power strips can be pricey. If you don't want to spend the money, bring an extension cord and a triple outlet (often called a cube tap). Make sure the cube tap is designed for the grounded plugs found on all transportables.

Modular phone cord. You'll need this cord to attach an internal modem to a phone jack at your workplace. Because you'll eventually encounter a non-modular phone line, also stow a modular cord with alligator clips at one end.

If telecommunications is a big part of your agenda, another handy connector called an Amphenol-to-RJ11C adapter should find a place in your bag of tricks. This device enables you to connect your single-line modem to a multiline phone cord, such as those found in most offices. If you can't be sure of the phone setup at your destination, you'll probably find this adapter—available at many electronics stores—indispensable.

Miscellaneous items. If your plans call for an auxiliary monitor, add an RGB connector or another video cable to your checklist. And even though there's virtually no chance you'd forget them, double-check to make sure you've packed the printer cable, the computer's power cord, and your program and data disks. The best-laid plans often go astray for want of the obvious.

■ Movable Data

When you travel with irreplaceable data on floppy disks, there's no such thing as being too cautious. Obviously, never send your disks along with their backups. Separate the masters and the backups, and carry the backup copies with you, preferably in your hand luggage. This will spare you anguish (and much more) should the delivery service route your shipment to oblivion. The Compaq can be replaced with less hassle than the data it manipulates.

My recommendation is to ship the masters with the machine. This form of insurance protects you in case you accidentally park your hand luggage on the plane or in a hotel lobby. In any event, if you haven't made backups of every floppy disk, do so before

you depart. And if you're traveling with a hard disk machine, back up the hard disk and follow this procedure with the floppies that you plan to use.

■ Dispelling Myths

In addition to the three laws of computer traveling, a couple of myths prevail that should be dispelled.

Myth #1: X rays scramble data on floppy disks. I've never had a single file altered in the dozens of times I've put floppies through airport X-ray machines. If you're concerned, let the security guards inspect disk boxes by hand.

Myth #2 (for Compaq owners): The Compaq case is invulnerable. Yes, it looks like you could just snap it shut and send it out, but don't. This myth died abruptly when my Compaq arrived at the CBS News complex during the Democratic Convention in San Francisco. Both of the sliding doors that cover the ports had sprung open, and the case itself no longer fit tightly at the seams. Indeed, the entire shell was about to crack open. But even though the Compaq had been dropped hard, there proved to be no internal damage, and the case snapped back together fairly easily—demonstrating that this time, the machine was tougher than its wrapper.

If the computer's original packing or a cushioned substitute can't be found, use strips of gaffer's tape (it's silver and very sticky) to ensure that the keyboard and the sliding doors stay put while the

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PCW 4

unit is in transit. This approach is geared to the Compaq, but it makes sense for any similarly constructed portable.

■ Bon Voyage

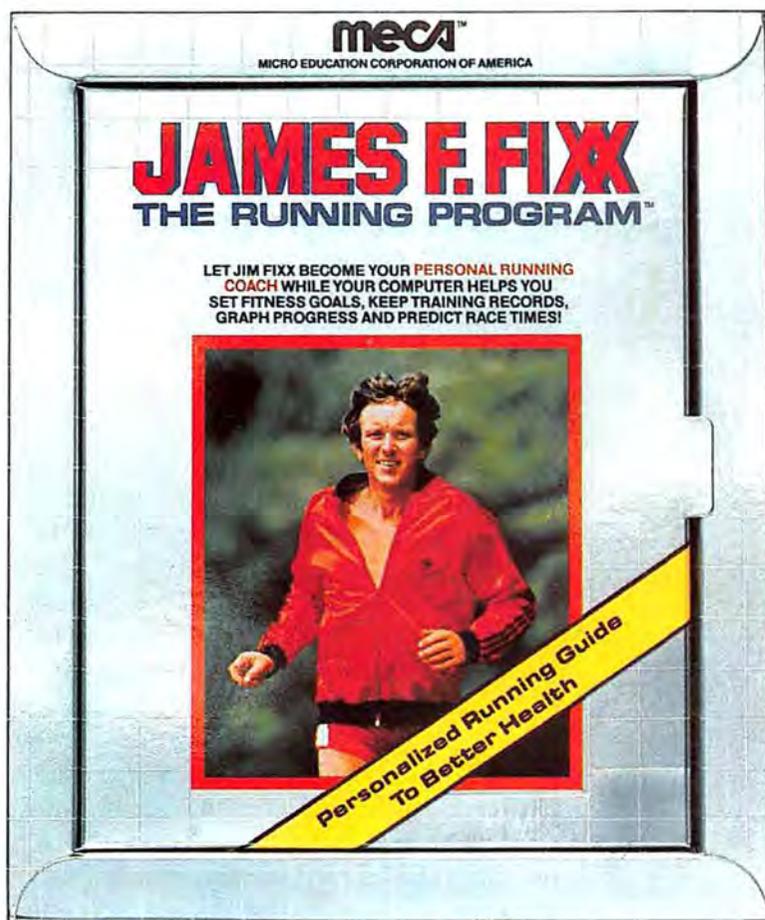
Remember that you don't have to go to all this trouble if you don't want to. We're gradually entering an era of laptop machines—those lightweight, super-compact, battery-operated wonders. But none truly replicates the PC (or the Compaq, for that matter).

For the traveler with a laptop, the major trade-off for on-the-road computing is PC compatibility. The minor trade-offs consist of doing without standard-size disk drives (or disk drives at all) and adjusting your eyes to the often dim liquid crystal displays found on lap machines. If you want a machine that will fit in your attaché case, resign yourself to being unable to run unadulterated PC program disks on it. You can also forget about taking your data disks from your office machine and using them on location.

If you want your transportable to be a productive companion on business trips, rely on practicality. Let common sense—that all-too-resistible force—dictate when it's best to take the machine and when it's wiser to let your computer remain an immovable object. ●

Edward Fischer is associate director of finance for CBS News.

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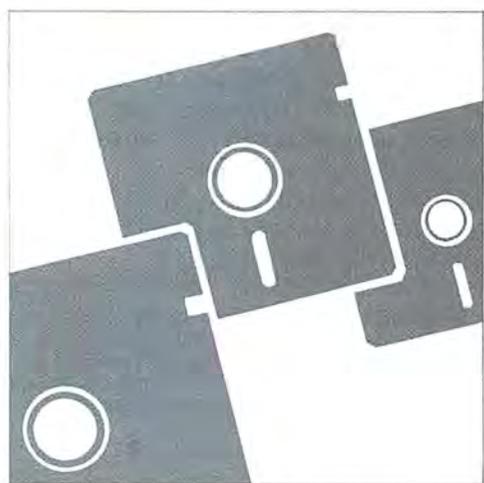
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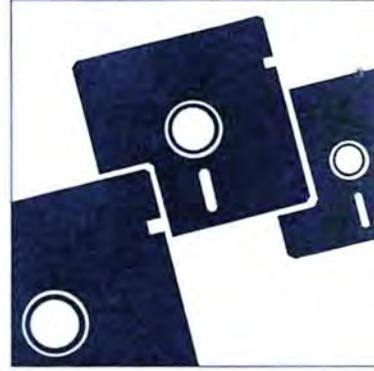
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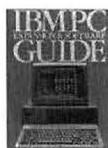
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Star-Dot-Star

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This month: low resolution 16-color graphics, a patch and a program for Turbo Pascal programmers, and an improved version of the Star-Dot-Star DATAMKR.BAS program

Edited by Steven Cook

Secret Graphics Mode

I read in the IBM Technical Reference manual that, with some special programming, a low-resolution mode with 16 colors is possible on the IBM PC. The manual fails to mention what must be done to obtain this low-resolution mode, but with some reading and research I finally discovered the secret. LOWRES.BAS is a BASIC program that demonstrates the IBM Color/Graphics Adapter's low-resolution mode, in which the screen is divided into 16,000 blocks (160 horizontal by 100 vertical), each of which can be any of 16 colors (see Figure 1).

To plot a point, set the variable PIXCOL equal to a color number from 0 to 15, set variables X and Y to the desired pixel coordinates, and then issue a GOSUB to the pixel-plotting routine. For demonstration purposes, LOWRES.BAS contains a subroutine that draws a picture on the screen using this mode and all of the 16 possible colors.

The program works by setting the registers of the Color/Graphics Adapter's 6845 CRT controller chip so that it produces a screen 80 characters wide by 100 characters long. Each character cell is a small rectangle twice as wide as it is tall. The program then sets each character byte of the display to 222 decimal. This value specifies a character that fills the left half of the character cell with the background color and the right half with the foreground color. Next, the program sets the character attribute bytes to 0. This makes both the foreground and background colors, and thus the entire screen, black. The attribute bytes

can now be used to control the foreground and background colors of a character cell; the foreground is displayed as the left half of the cell and the background as the right half. Being able to control the left and right halves of each "character" yields 160 blocks per line.

Clearing the screen takes a few seconds, but an assembly language routine could be written to control the character and attribute bytes at a dramatically faster rate.

It's a shame that IBM didn't include this mode in BASIC, but one hopes they will in the future. The graphics that can be produced are well worth the loss of resolution.

*Bernie Lawrence
Garland, Texas*

Editor's note: This program generates a great deal of video "snow" when accessing the screen, another situation that assembly language programming can correct.

DATAMKR Made Better

The program DATAMKR.BAS [*.*, PCW, Vol. 2, No. 11] has a couple of bugs. One causes the program to create an incorrectly terminated list of DATA, and the other causes it to stop processing when a Control Z (ASCII 26) character is encountered in the input file. The program DATAMKR2.BAS corrects those errors and also displays some characters during a conversion to avoid appearing as if it has gone out to lunch.

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On-screen help	yes	
Help from IRS manual "Instructions for Preparing Form 1040" available on line by line basis*	yes	
Official IRS Forms and Schedules included	yes	
Suggested retail price	\$64.95	
Availability: IBM, Apple, Macintosh, CPM (100+ formats) & Commodore 64	yes	

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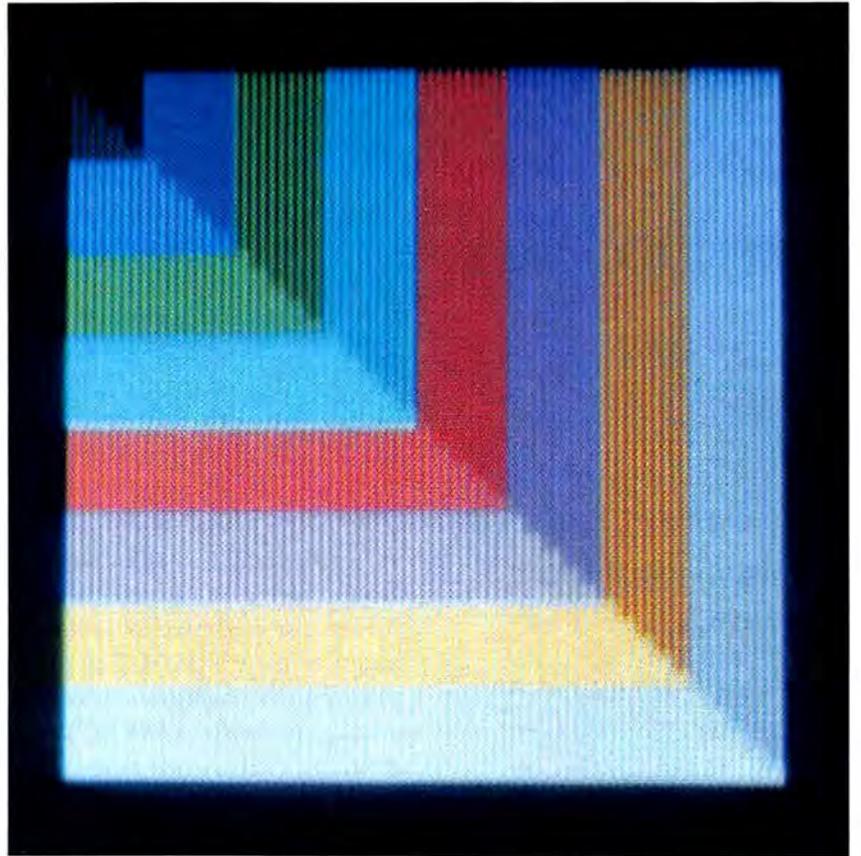


Figure 1: The IBM Color/ Graphics Adapter's low-resolution mode produces block graphics in 16 colors.

Editor's note: The line numbers of the lines that have been changed from the original DATAMKR program are underlined. Thanks to all the other readers who submitted their corrections.

Turbo Pascal Patch

When saving a program to disk, the Turbo Pascal editor/compiler automatically creates a backup file by changing the old file's extension to .BAK and then saving the new file with the extension .PAS. I consider the backup files to be a nuisance, especially since I must

delete them to recover the disk space they use.

The program TURBOFIX.BAS modifies the Turbo Pascal editor/compiler so that it "renames" the old file with the same name. The "new" file is then saved over the "old" version, and no backup file is created.

Stephen Wisdom
New York, New York

Editor's note: TURBOFIX.BAS is designed to patch Turbo Pascal, version 1.0. If you have version 2.0, change line 20 to read B = 11916:K = 11922

(continues on page 260)

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```
10 SCREEN 0
20 DEFINT A-Z
30 '
40 'Color/Graphics Adapter definitions
50 '
60 MODEREG=&H3D8:COLORREG=&H3D9           'control registers
70 MODESAVE=&H465:COLORSAVE=&H466       'BIOS saves the regs here
80 CRTREG = &H3D4:CRTDATA = &H3D5      '6845 CRT controller regs
90 HIRES=1: GRAPH=2: BW=4: VIDEO=8     'Mode register bits
100 G640=16: BLINK=32
110 '
120 '
130 'set up Color/Graphics Adapter for 160- by 100-block graphics
140 '
150 DEF SEG=0
160 MODE=0
170 POKE MODESAVE,MODE : OUT MODEREG,MODE
180 POKE COLORSAVE,0 : OUT COLORREG,0
190 '
200 'load new parameters into 6845 CRT controller
210 FOR REGISTER= 0 TO 11
220     READ REGDATA
230     OUT CRTREG,REGISTER:OUT CRTDATA,REGDATA
240 NEXT
250 '
260 'set mode for 80 column color and enable
270 MODE=HIRES+VIDEO
280 POKE MODESAVE,MODE: OUT MODEREG,MODE
290 '
300 'clear screen: Character = &hDE, Attributes=0
310 DEF SEG=&HB800
320 FOR CHAR=0 TO 15998 STEP 2: POKE CHAR,&HDE : NEXT
330 FOR ATTR=1 TO 16000 STEP 2: POKE ATTR,0 :NEXT
340 '
350 '
360 'initial data for 6845 (80 x 100 characters)
370 '
380 DATA 113      :'register 0   horizontal total
390 DATA 80       :'register 1   horizontal displayed
400 DATA 90       :'register 2   horizontal sync position
410 DATA 10       :'register 3   horizontal sync width
420 DATA 127      :'register 4   vertical total
430 DATA 6        :'register 5   vertical adjust
440 DATA 100      :'register 6   vertical displayed
450 DATA 112      :'register 7   vertical sync position
460 DATA 2        :'register 8   interlace mode (non-interlace)
```

LOWRES.BAS: A low-resolution, 16-color-graphics demonstration program

(continues on page 248)

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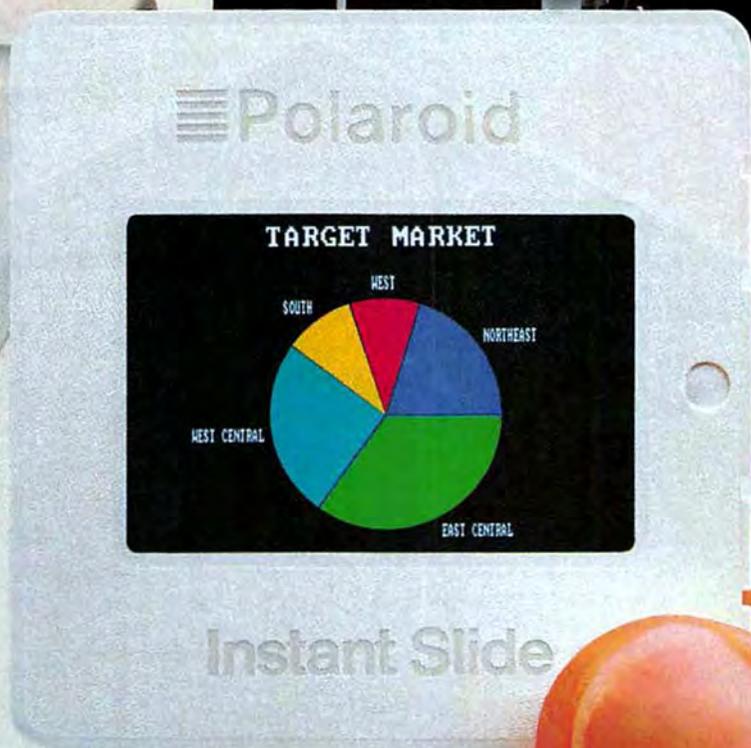
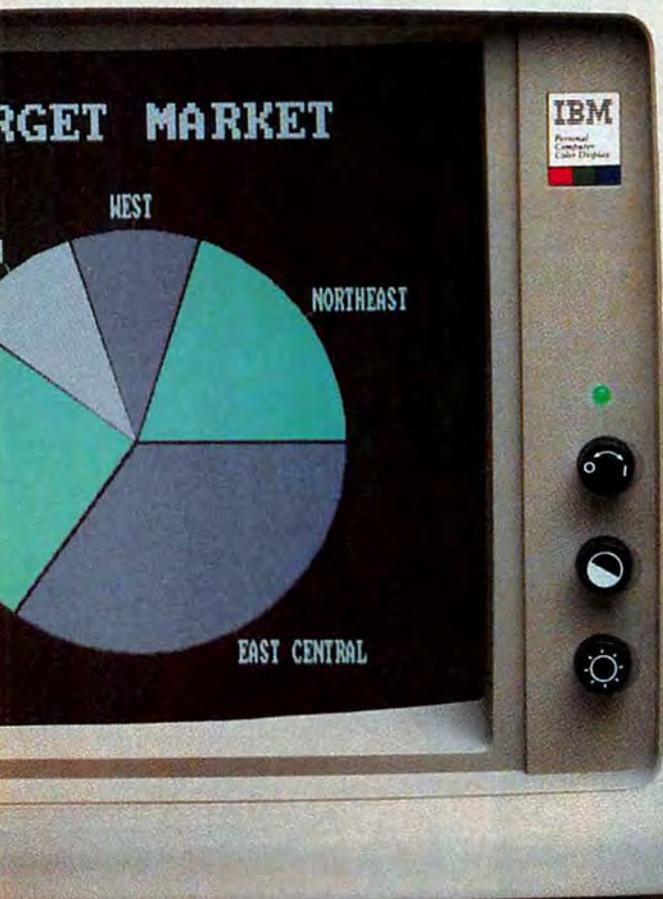
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470 DATA 1 : 'register 9 maximum scan line address
480 DATA 32 : 'register 10 cursor start (disables cursor display)
490 DATA 0 : 'register 11 cursor end
500 '
510 '
520 'draw screen
530 PIXCOL=0:Y=0
540 FOR T=1 TO 39
550     Y=Y+1
560     IF T MOD 5 = 0 THEN PIXCOL=PIXCOL+1 MOD 15
570     FOR X=1 TO T
580         GOSUB 720             'plot pixel at x,y
590     NEXT
600 NEXT
610 X=1:PIXCOL=8
620 FOR T=1 TO 39
630     X=X+1
640     IF T MOD 5=0 THEN PIXCOL=PIXCOL+1 MOD 15
650 '
660     FOR Y=1 TO T
670         GOSUB 720             'plot pixel at x,y
680     NEXT
690 NEXT
700 WHILE INKEY$="":WEND
710 SCREEN 2 : END
720 '=====
730 'plot PIXCOL at (X,Y)
740 '
750 PIXEL=X+(Y*160):PIXELADDR=(PIXEL AND &HFFFE)+1
760 NIBBLE=PIXEL MOD 2
770 IF NIBBLE=0 THEN POKE PIXELADDR,(PEEK(PIXELADDR) AND &HF)+PIXCOL*&H10
780 IF NIBBLE=1 THEN POKE PIXELADDR,(PEEK(PIXELADDR) AND &HF0) + PIXCOL
790 RETURN

```

LOWRES.BAS (continued)

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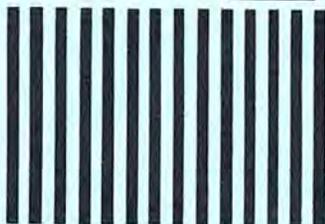
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```
10 DEFINT A-Z:CLS:KEY OFF:LOCATE 5,1:PRINT "Data Maker"
20 DEF FNH$(X)=RIGHT$("0"+HEX$(X),2):CMS$=CHR$(44)
30 '
40 PRINT:INPUT "Input filename--",N$:IF N$="" THEN END
50 OPEN N$ AS #1 LEN=1:BYTES=0
55 FIELD #1,1 AS BYTE$:LENGTH=LOF(1)
60 INPUT "Output filename--",F$
70 OPEN F$ FOR OUTPUT AS #2
80 '
90 LN=0:BYTES=0:INPUT "Beginning DATA line number";BL
100 PRINT #2,STR$(BL);" DATA ";:WRITE #2,N$
105 PRINT "File length =";LENGTH:PRINT "Working";
110 SUM=0:LN=LN+1:LX=0:PRINT ".";
120 PRINT #2,BL+(LN*10);"DATA";           'start a new line
130 '
140 IF BYTES=LENGTH THEN 210 ELSE GET #1:BYTES=BYTES+1
150 X=ASC(BYTE$):SUM=(SUM+X)*2:SUM=(SUM\256)+(SUM MOD 256) 'checksum
160 '
170 IF LX=0 THEN PRINT #2,STR$(LN);           'line number
180 PRINT #2,CMS$,FNH$(X);:LX=LX+1:IF LX<16 THEN 140 'count bytes per line
190 PRINT #2,CMS$,"-1";CMS$,FNH$(SUM):GOTO 110 'terminate after 16
200 '
210 IF LX>1 THEN PRINT #2,CMS$,"-1";CMS$,FNH$(SUM);CMS$ 'partial checksum
220 PRINT #2,"-1":PRINT "Complete.":CLOSE:GOTO 40
```

DATAMKR2.BAS: An improved
version of the DATAMKR pro-
gram in *.* , PCW, Vol. 2,
No. 11

```
10 'PC BASIC program to prevent Turbo Pascal
15 'from creating backup files.
20 B=10707: K=10713 ' Use B=11916 and K=11922 for Turbo V2.0
30 OPEN "TURBO.COM" as #1 LEN=1
40 FIELD 1,1 AS F$
50 ' Check for correct placement of this patch
60 GET #1,B:IF F$<>"B" THEN 120
70 GET #1,K:IF F$<>"K" THEN 120
80 ' Write "PAS" over "BAK"
90 LSET F$="P":PUT 1,B
100 LSET F$="S":PUT 1,K
110 CLOSE:END
120 BEEP:PRINT "ERROR!"
130 PRINT "You may have a different version of TURBO.COM"
999 END
```

TURBOFIX.BAS: A program
that modifies the Turbo Pascal
editor/compiler to prevent auto-
matic creation of backup files



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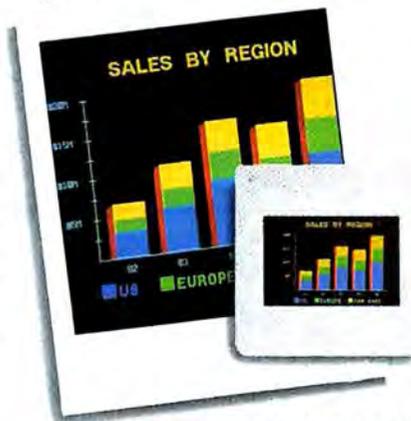
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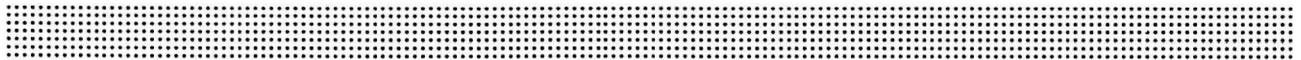
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```
{Written by Andy Decepida
using Turbo Pascal version 2.0 and PC-DOS version 2.10}

program IntrSample;

var
  ScanByte, AsciiByte : byte;    {AH, AL images}

{The GetScanCode subroutine to fetch the scan code of a keypress
via Turbo Pascal's INTRrupt facility follows

=====}

procedure GetScanCode (var ah, al : byte);

type
  regpack = record
    ax, bx, cx, dx, bp, si, ds, es, flags : integer;
  end;

var
  regpack : regpack;    {assign record}

begin
  ah := $0;             {read char function}
  with regpack do
    ax := ah shl 8 + al;
  intr ($16, regpack);  {keyboard I/O ROM call}
  with regpack do
    begin
      ah := ax shr 8;    {grab high byte of AX -- contains scan code}
      al := ax mod 256; {grab low byte of AX -- contains ASCII code}
    end
end; {of the GetScanCode subroutine

=====}

begin
  clrscr;
  writeln (' This is a demonstration of Keyboard Scan Code capture');
  writeln ('   using a subroutine to return the values in AH and AL');
  writeln ('   registers after a keypress from the user. ');
  writeln;
  writeln ('To quit this demo, just press the <Enter> key when you see');
  writeln ('   the [!] prompt');
```

continues

TURBOKEY.PAS: This program demonstrates one way to capture the PC's keyboard scan codes and meaningfully separate the returned values for testing by the calling program.

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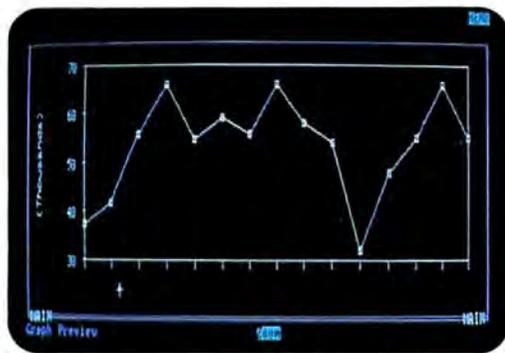
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Expandability	w/UltraRAM w/SoftPAK™ option card	Not Available Not Available

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1



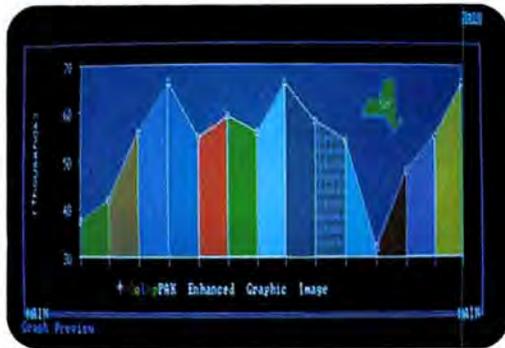
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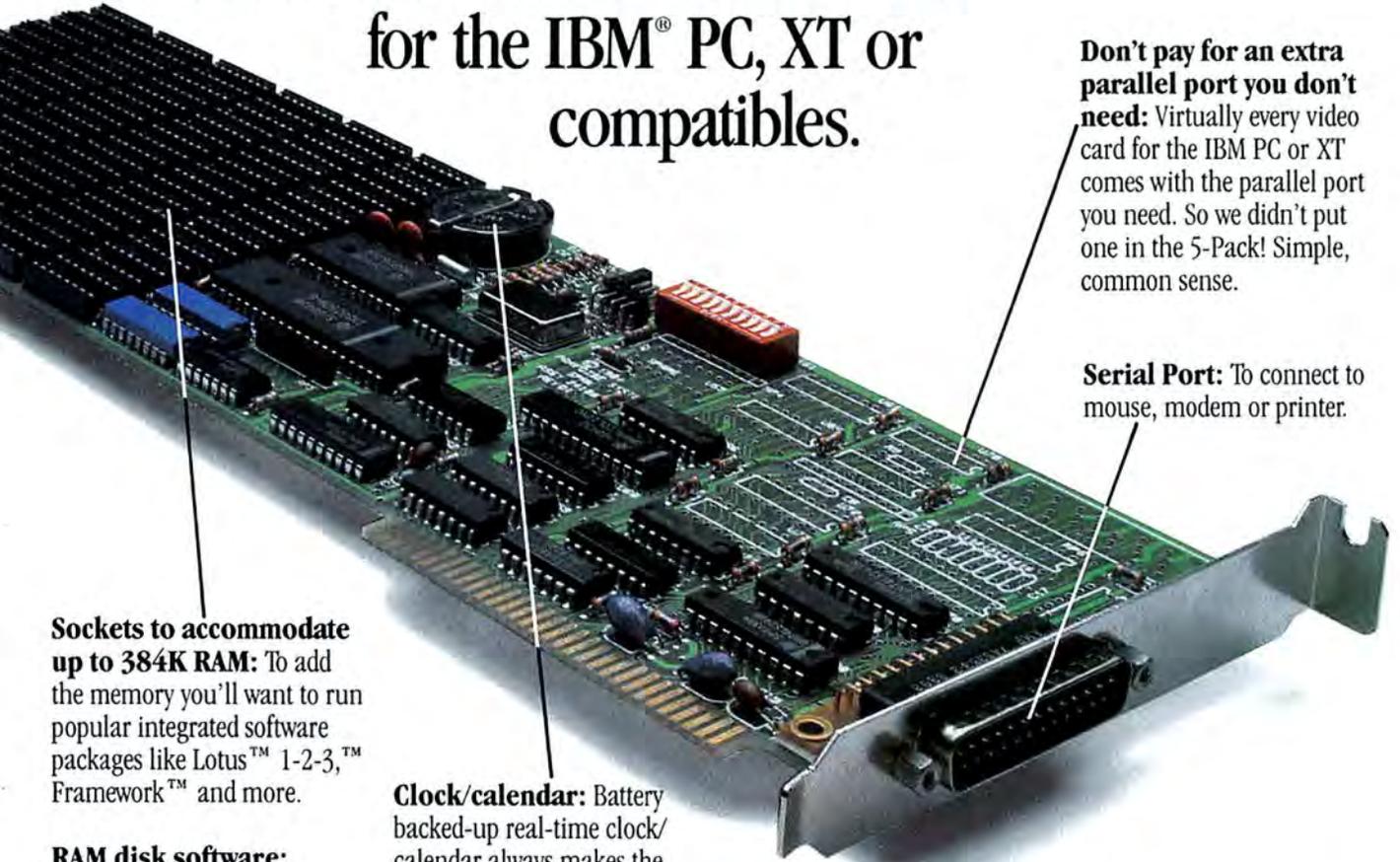
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```

window (1,7,80,25);
gotoxy (1,1);
lowvideo;

repeat {until ASCII 13 is returned by GetScanCode as AL value}

  write (' ! ');
  GetScanCode (ScanByte, AsciiByte);

  if AsciiByte <> 0 then           {If printable, write ASCII value}
    write (chr(AsciiByte),' -- ')
  else
    write ('Extended Scan Code ');

  writeln (' : AH > ',ScanByte:3,' AL > ',AsciiByte:5)

until AsciiByte = 13
end.

```

TURBOKEY.PAS (continued)

(continued from page 240)

Turbo Keyboard

The Turbo Pascal program TURBOKEY.PAS demonstrates a routine I have written called GetScanCode. The purpose of the routine is to return both the ASCII value and the scan code of a keystroke to the calling program. The routine uses Turbo Pascal's INTR function to call the keyboard interrupt routine built into the PC.

The calling program must declare two variables of the type BYTE; the values returned are compatible with the type INTE-

GER, so the value of the parameter AL returned by the routine can be written as an ASCII character using the CHR function.

Further information about the ASCII values that are returned by the various keys can be found in Appendix G of the IBM BASIC manual. Additionally, IBM's Technical Reference manual contains information about the scan codes returned by each key.

Andy Decepida
Toronto, Ontario, Canada

Editor's note: If you are even slightly curious about the Pascal language, I encourage you to try Turbo Pascal from Borland International in Scotts Valley, California. It's amazingly easy to use and

creates fast, efficient .COM programs that are thousands of bytes smaller than their Compiled BASIC counterparts.

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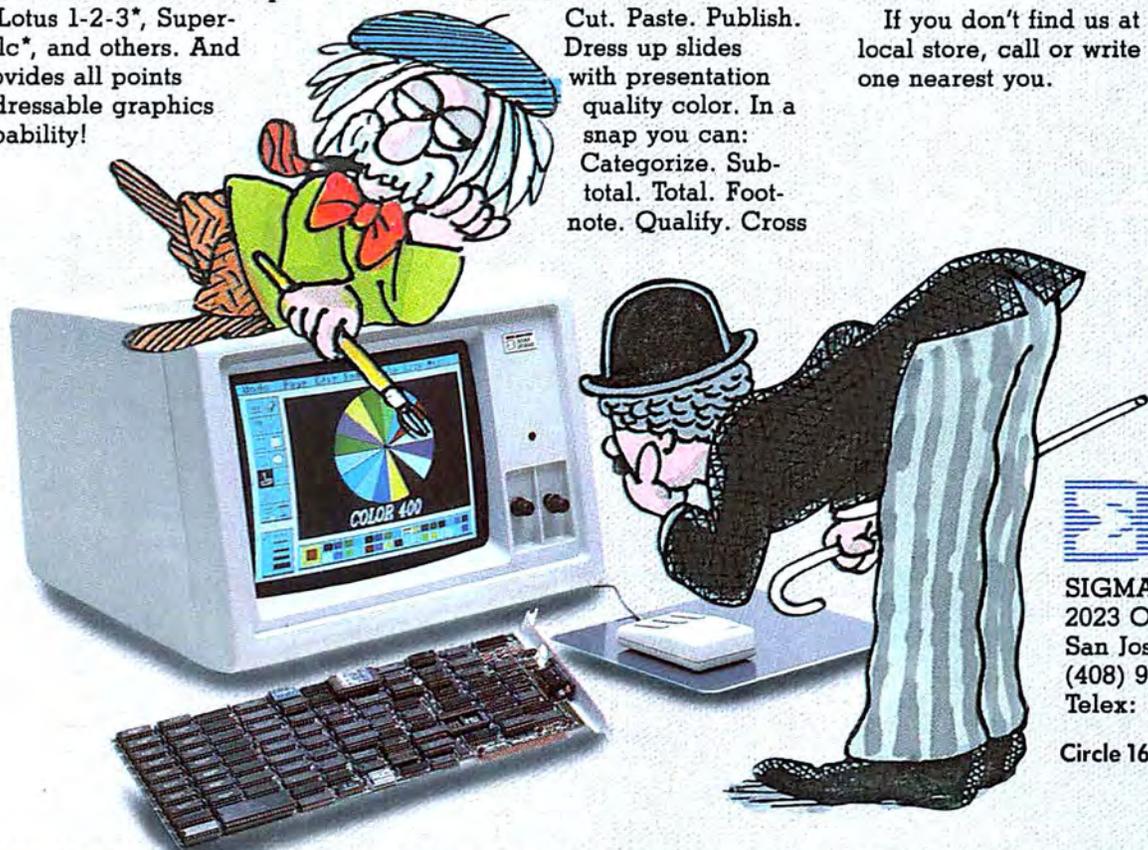
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Just Announced

An array of new PC products

Featured this month: a spreadsheet for the pfs series; two modems; a color monitor; two investment packages; and a program that creates custom fonts

Edited by Seth Novogrodsky

Hardware

Boards

Quarter Byte and Super I/O II
STB Systems has introduced two boards for the short slots in the IBM Portable PC and PC XT that also work in any PC's long slot. The Quarter Byte memory board can hold 64K to 256K of RAM. With the supplied *PC Accelerator* RAM disk software, memory beyond 640K can be used as a RAM disk or a print buffer. The Super I/O II board, which also comes with *PC Accelerator*, features an RS-232C serial port, a parallel printer port, a game port, and a clock/calendar. List price: 64K Quarter Byte \$259, 256K Quarter Byte \$519, Super I/O II \$229. STB Systems, Inc.
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COM-8 and COM-4
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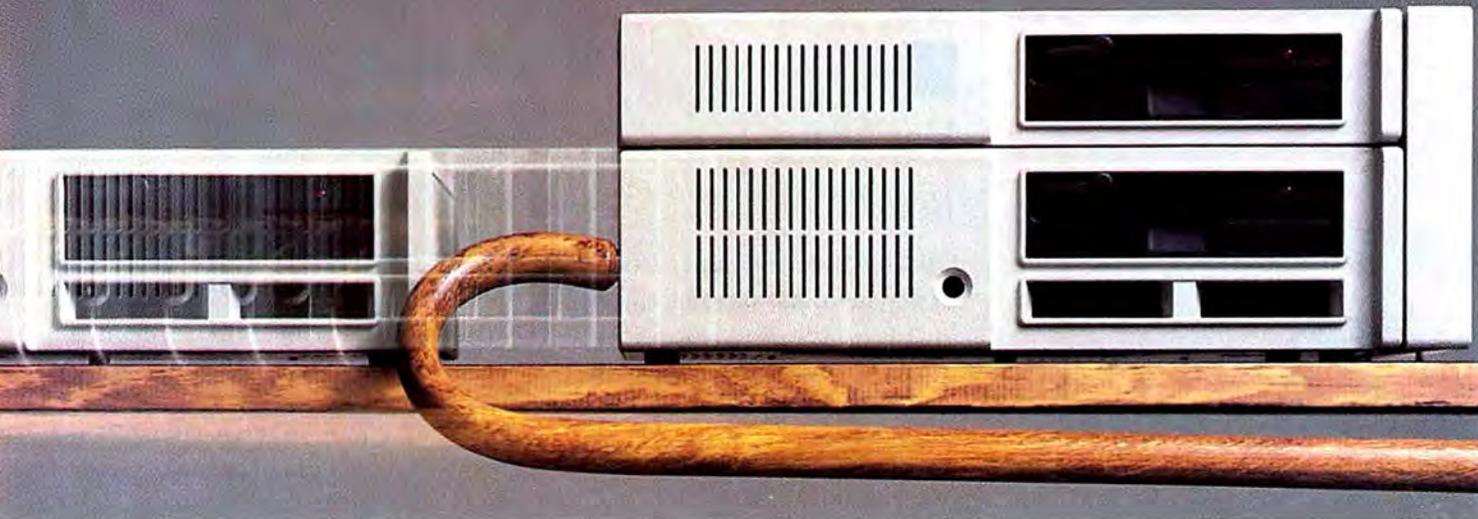
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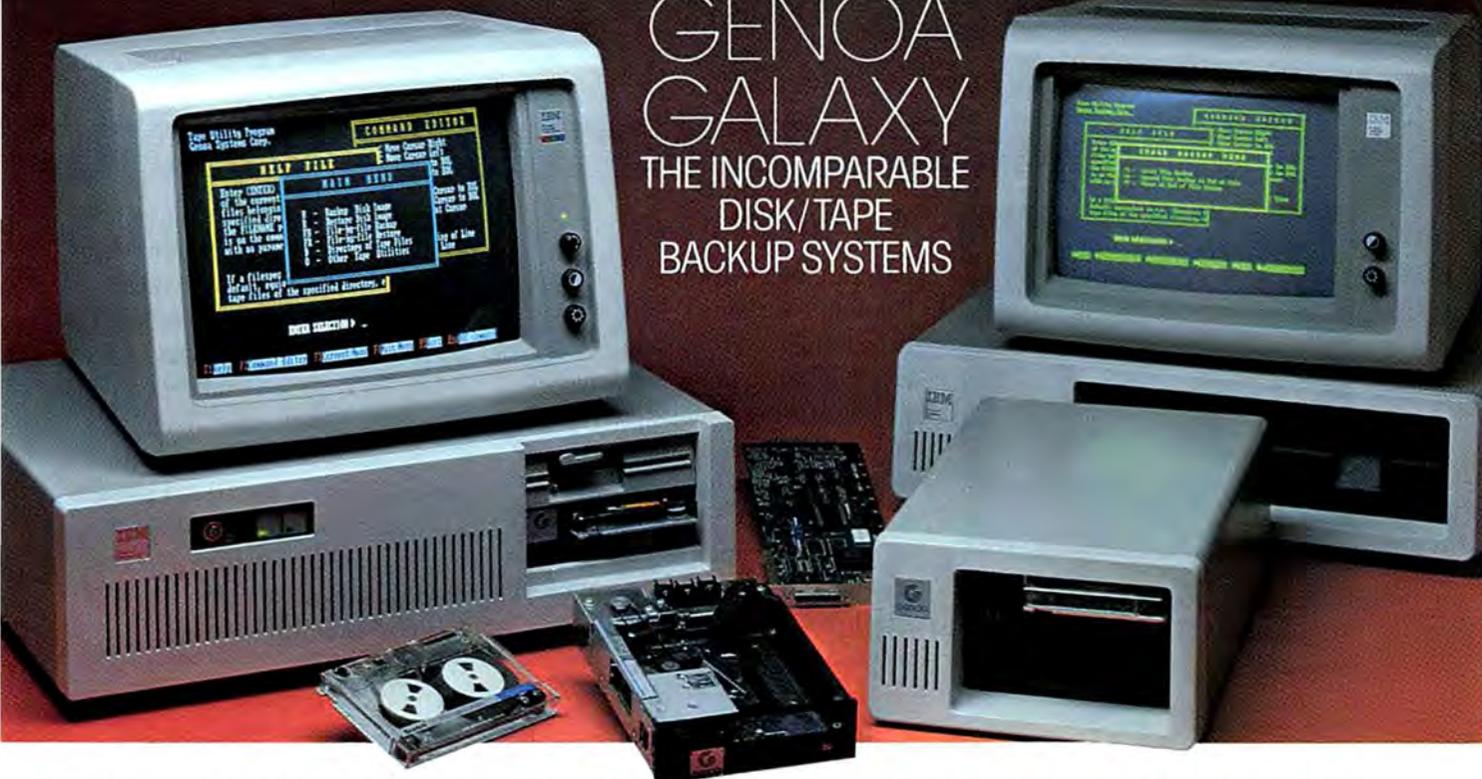
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GENOA GALAXY

THE INCOMPARABLE
DISK/TAPE
BACKUP SYSTEMS



Check this combination of new functions, ease of operation, speed and price!

Take a close look at the comparison chart below and you'll quickly see how Genoa's unique and powerful software provides the critical elements that you've been waiting for in a hard disk/tape backup system for your IBM® PC, XT,™ AT™ and compatibles.

Multi-window, multi-function displays, including the on-line simple Help Menu, the mouse-like Command Input and the intelligent command line editor enable the average user to operate this system in an easy, straightforward manner, getting help, if needed, from the screen — not the manual. Toggling between DOS and tape menus saves valuable time in every application.

Backup 20 mb in less than 5 minutes.

The Galaxy's speed, and the combination of Backup/Restore capabilities, is unmatched by any other tape backup subsystem available today. The system is fully network compatible and easily installed in less than 15 minutes. All Genoa hard disk subsystems, whether stand-alone or in combination with tape, include the correction for DOS 2.0 problems, a media defect map on the supplied diskette, and allow you to use the entire disk under DOS 2.0, 2.1 and 3.0. In addition, Genoa offers disk/tape drive interchangeability, which enables you to backup data from one hard disk and restore to another using Genoa's proprietary software.

20 MEGABYTE HARD DISK/TAPE CARTRIDGE SYSTEMS

	Genoa Galaxy 3120	Tallgrass TG-3020 TG-09	Alloy PC Qicstor	Sysgen XL	Mountain 01-4000-03
Multi Window, Multi Function Displays	✓				
On-line Help Menu Window	✓				
DOS/Tape Utility Toggling	✓				
Mouse-like Command Input	✓				
DOS-like Tape Directory Commands	✓				
Backup/Restore Time & Percentage Indicator	✓				% only
Image Backup/File by File Restore with Directory Display	✓				✓
File by File Backup/Restore by Directory or Subdirectory	✓	✓	✓	✓	
File by File Backup/Restore by Date or Last Modified	✓	✓	✓	✓	
File by File Backup/Restore with Appending & Exclusion	✓		✓		
File by File Restore to any Directory	✓				
Warranty	1 YEAR	6 mo.	90 days	90 days	6 mo.
Price	\$3295	\$3144	\$4595	\$3295	\$4495

The Genoa product line now includes graphics controller boards as well as internal and external models of hard disks and tape backup systems — each in stand-alone or combination configurations. They are designed for use with the IBM® PC, XT,™ AT™ and compatibles.

See your local dealer or call toll free for details.

1-(800) 325-0874 Outside Calif.
(800) 824-8372 Inside Calif.

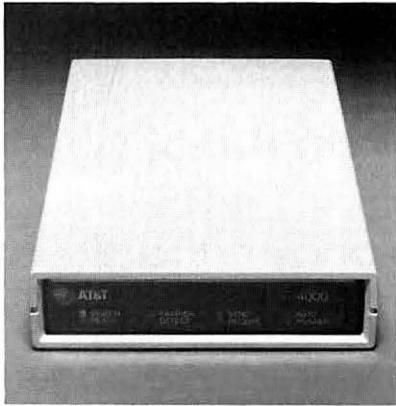
Dealer inquiries invited.

 **Genoa**
SYSTEMS CORPORATION

73 E. Trimble Road · San Jose, CA 95131
(408) 945-9720

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Circle 994 on reader service card



Model 4000, AT&T Consumer Products

Model 4000

AT&T has released its first stand-alone modem for personal computers. It operates at speeds of 0 to 300 bps or at 1200 bps. Commands to the modem can be issued directly from the keyboard or by application software. On-line help is available with a single keystroke. A built-in speaker allows the user to monitor dialing and phone-line activity until the call is answered. Both pulse and tone dialing are supported. The modem connects to the PC's serial port.

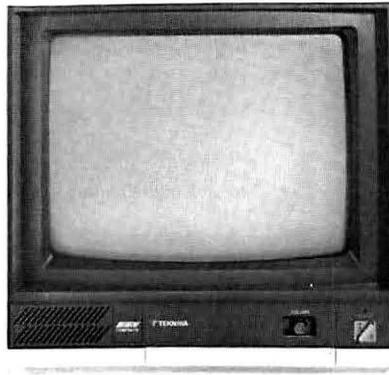
List price: \$499.95.

AT&T Consumer Products
5 Wood Hollow Rd.
Parsippany, NJ 07054
201/581-5185

Monitors

MJ-22 Color Monitor

Teknika Electronics' high-resolution 13-inch color monitor accepts either RGB or composite video input. Featuring a black matrix picture tube, the monitor has a resolution of 506 vertical dots by 240 horizontal dots and can display 25 lines of 80 characters. It is equipped with a front-mounted speaker in a beige cabinet. List price: \$439.95.



MJ-22 Color Monitor, Teknika Electronics

Teknika Electronics Corp.
353 Rte. 46 W
Fairfield, NJ 07006
201/575-0380

Printers

Xerox/Diablo C-150

This color ink jet printer uses drop-on-demand technology and can create thousands of shades from four primary colors (cyan, magenta, yellow, and black) and three secondary colors (violet,

green, and red). The printer can use clay-coated paper for more intense color, any recommended plain paper, or transparencies. It is compatible with programs such as *1-2-3*, *Press'n'Plot*, and *4-Point Graphics*. The Xerox/Diablo C-150 has a resolution of 120 dots per inch and prints 20 cps using a 12- by 20-dot matrix. A Centronics parallel interface is standard. List price: \$1295.

Diablo Systems Inc.
P.O. Box 5030
Fremont, CA 94537
415/498-7000

Personal Printer I and II

Designed for use with personal computers, the Personal Printer I and the Personal Printer II are multimode, Epson-compatible dot matrix printers. Both printers operate at 160 cps in draft mode and 27 cps in near letter quality mode. Dot-addressable graphics are also possible. The Personal Printer I has a 10-inch carriage and prints up to 80 columns at 10 pitch or 136 columns at 17 pitch. The Personal Printer II features a 17-inch carriage and prints up to 156 col-



Personal Printer I and II, Datasouth Computer

WordPerfect is just that.

PC World

At SSI, we face a monumental challenge; living up to the name we gave our word processing software. After all, with a name like WordPerfect, the product had better measure up. Obviously it's doing just that. For good reason.

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Most WordPerfect functions require only one keystroke, a simple press of a finger. And comprehensive, well-written documentation makes learning a breeze.

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In addition to standard word processing functions, WordPerfect includes several comprehensive, useful features not found on many word processors. Like a 100,000-word phonetic dictionary; multi-page footnoting capability; table of contents and index generation; automatic outlining and paragraph numbering; and a network version of WordPerfect.

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Circle 165 on reader service card

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even a beginner can soon master WordPerfect's most difficult functions, such as

PC World

InfoWorld

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Circle 820 on reader service card

for each one. This gives you excellent flexibility ... especially if your office has a number of different types. DISCOVERY helps you leverage your investment in existing company micros.

Before you buy a hard disk for your micro, learn more about DISCOVERY hard disk subsystems. Call Jerry O'Brian at (301) 628-0260, for more information. Do it today.

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104 Lakefront Drive
Hunt Valley, MD 21031

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Internal



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If you check prices, you'll find our \$399 ProModem card costs less than modems that don't do nearly as much. ProModem 1200B comes with a sophisticated communications package from Mycroft Labs called "MITE" which provides for transfer of any type of text and binary files, with five error checking protocols including X-Modem. You can't lose. Buy our ProModem 1200B and get a Comport free!

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**Transfer 50 Pages Of Text
Without Tying Up Your PC**

\$495

Priced at just \$495, our Hayes Compatible ProModem 1200 is the best 1200/300 baud standalone modem you can buy. It runs rings around Hayes and the rest.

One reason is our optional Communications Buffer and Alphanumeric Display which turn our ProModem into a veritable genius.

Imagine, unplugging your computer, taking it home for the weekend, and while you're gone having ProModem 1200 answer the phone, collect messages, send out electronic mail, and when you return, review all messages sent and received, and the exact time of each event. And we're talking about 50 pages of text or data!

Our \$99 Communications Buffer is a card that plugs into ProModem 1200's motherboard. It comes with 2K of CMOS battery backed-up memory, expandable to 64K. Part of the memory is used as a dialing directory, with the balance reserved as a buffer. Plus, for \$99 more an Alphanumeric Display can show time, date, and status and help messages.

Whether you go internal or external you'll be the winner if you choose Prometheus.



The Hot Line

**PROMETHEUS
PRODUCTS INCORPORATED**

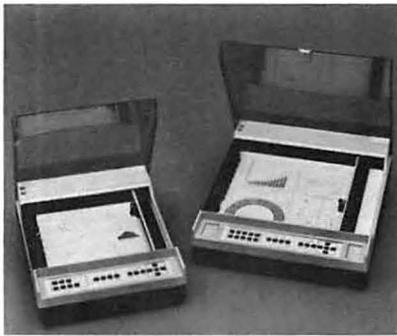
4545 Cushing Pkwy. • Fremont CA 94538

Circle 688 on reader service card

Call Now For
Complete Info...
415/490-2370

umns at 10 pitch or 256 columns at 17 pitch. A Centronics parallel interface is standard, and a serial interface is optional. List price: Personal Printer I \$695, Personal Printer II \$895.

Datasouth Computer Corp.
4216 Stuart Andrew Blvd.
Charlotte, NC 28210
704/523-8500



Colorwriter 6300 Series, Gould

Plotters

Colorwriter 6300 Series

Designed for advanced engineering, computer-aided design (CAD), business, biomedical applications, and basic and applied scientific needs, this series of plotters provides a full array of colors and uses several pen types—including fiber tip and roller ball—of selectable widths. The Model 6310 is a seven-pen, 8½-inch by 11-inch plotter, and the Model 6320 is a ten-pen, 11- by 17-inch plotter. A simple adapter accommodates Rotring or Pentel pens; pens for transparencies,

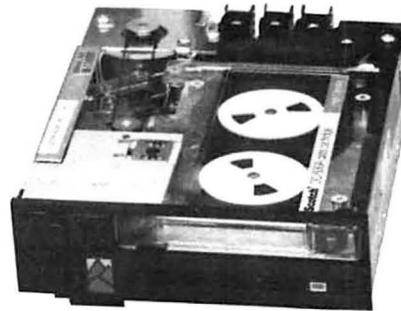
foils, and other clear media are also available. An optional continuous roll of chart paper for high-volume applications eliminates the need to change the paper manually. Both plotters use a standard RS-232C serial interface or an IEEE-488 interface. Three character sets are contained in the plotters' built-in firmware. List price: \$1995 and up, depending on configuration.

Gould Inc.
Marketing Services
Recording Systems Division
3631 Perkins Ave.
Cleveland, OH 44114
216/361-3315

Storage Devices

AT-FileSafe Tape

For the PC AT, the two AT-File-Safe Tape backup units, models FSTI27-AT and FSTI60-AT, provide 27MB and 60MB of formatted storage, respectively. The units



AT-FileSafe Tape, Mountain Computer

feature error correction code (ECC) logic and are compatible with AT local area networks. A full 20MB hard disk drive can be backed up in less than 10 minutes. AT-FileSafe's supplied software enables users to back up files from one disk and restore them to another disk. More than one tape cartridge can be used to back up a larger capacity hard disk, and several smaller backups can be placed on a single tape. List price: FSTI27-AT \$1595, FSTI60-AT \$1695.

Mountain Computer, Inc.
300 El Pueblo Rd.
Scotts Valley, CA 95066
408/438-6650

Miscellaneous

Model 9000 Business Keyboard

A replacement keyboard for the IBM PC, the Model 9000 features 40 separate function keys; a separate cursor keypad; an expanded numeric keypad including additional return, space, comma, control, alternate, and shift functions and all math functions; LEDs on the <CapsLock> and <NumLock> keys and the new <Printer On/Off> key; homing ridges for touch typists on the F and J keys, on the 5 key on the numeric keypad, and on the blank key on the cursor keypad; an adjustable, audible keyboard click;

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PANASONIC 1/2 height	129

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ALPHA OMEGA TURBO 10 (internal 10mb)	799
PEGASUS 10mb, 23mb, 40mb, 65mb, 140mb	CALL!
IOmega 10mb	2295
IOmega 20mb	2895

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AMDEK 300A/G	\$145/135
AMDEK 310A	175
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PGS MAX12	189
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QUADRAM AMBERCHROME	169
TAXAN (all models)	CALL!

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PARADISE MODULAR GRAPHICS	CALL!
PARADISE MULTI-DISPLAY	CALL!
HERCULES GRAPHICS	329

HERCULES COLOR	199
VUTEK (C, P, S)	219
QUADRAM QUADCOLOR I	215
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PERSYST COLOR	189
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TECMAR GRAPHICS MASTER	469
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TECMAR CAPTAIN w/64k	259
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MODEMS

HAYES SMARTMODEM 1200	\$469
HAYES SMARTMODEM 1200B	399
HAYES SMARTMODEM 300	199
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dBase II	299
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WORDSTAR 2000	280
OPEN ACCESS	CALL!

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IUS	CALL!
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MISCELLANEOUS

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PC MOUSE	129

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OKIDATA 84	699
OKIDATA 92	389
OKIDATA 93	599
EPSON RX 80	249
EPSON RX 80FT	CALL!
EPSON RX 100	415
EPSON FX 80	429
EPSON FX 100	CALL!
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DYNAX (ALL MODELS)	CALL!
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TOSHIBA 1351	1289
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NEC (ALL MODELS)	CALL!
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**Model 9000 Business Keyboard,
Enigma Research**

solid-state capacitive switches; and positive tactile feedback. A 6-foot coiled cable is included. List price: \$295.

Enigma Research
4534 Vista del Monte #104
Sherman Oaks, CA 91403
818/990-8631

System Software

Languages

IBM PILOT

The IBM Programmed Inquiry Learning or Teaching (PILOT) product is a command-type authoring language for computer-assisted instruction on the IBM PC, the PCjr, the XT, the AT, the 3270-PC, and the Portable PC. The language consists of one- and two-character statements that enable teachers and developers to write interactive lessons that use a variety of formats, including matching, multiple choice, true-false, simulation, fill in the blank, direct question, or text with

graphics. The program includes a text editor and a graphics editor. List price: \$200. Requirements: 128K, one disk drive, DOS 2.00 or later version.

IBM
National Marketing Division
Educational Industries Marketing
4111 Northside Pkwy.
Atlanta, GA 30327
800/426-3333

Utilities

BASIC Utilities

This package contains three utilities for BASIC programmers. Cref produces a cross-reference of any BASIC program. It arranges variables, branches, and BASIC keywords in an easy-to-read format that includes the line numbers in which each occurs. Pac reduces the size of BASIC programs and increases execution speed by eliminating unnecessary spaces and comments and concatenates lines of code. Form formats a BASIC program listing for easy reading and debugging. It indents FOR ...

NEXT loops, offsets REM lines, and breaks down multiple-statement lines into separate lines. All of the programs can read tokenized BASIC files. List price: \$20. Requirements: 64K, one disk drive.

Easyware
P.O. Box 41277
Minneapolis, MN 55446
612/559-4412

Application Software

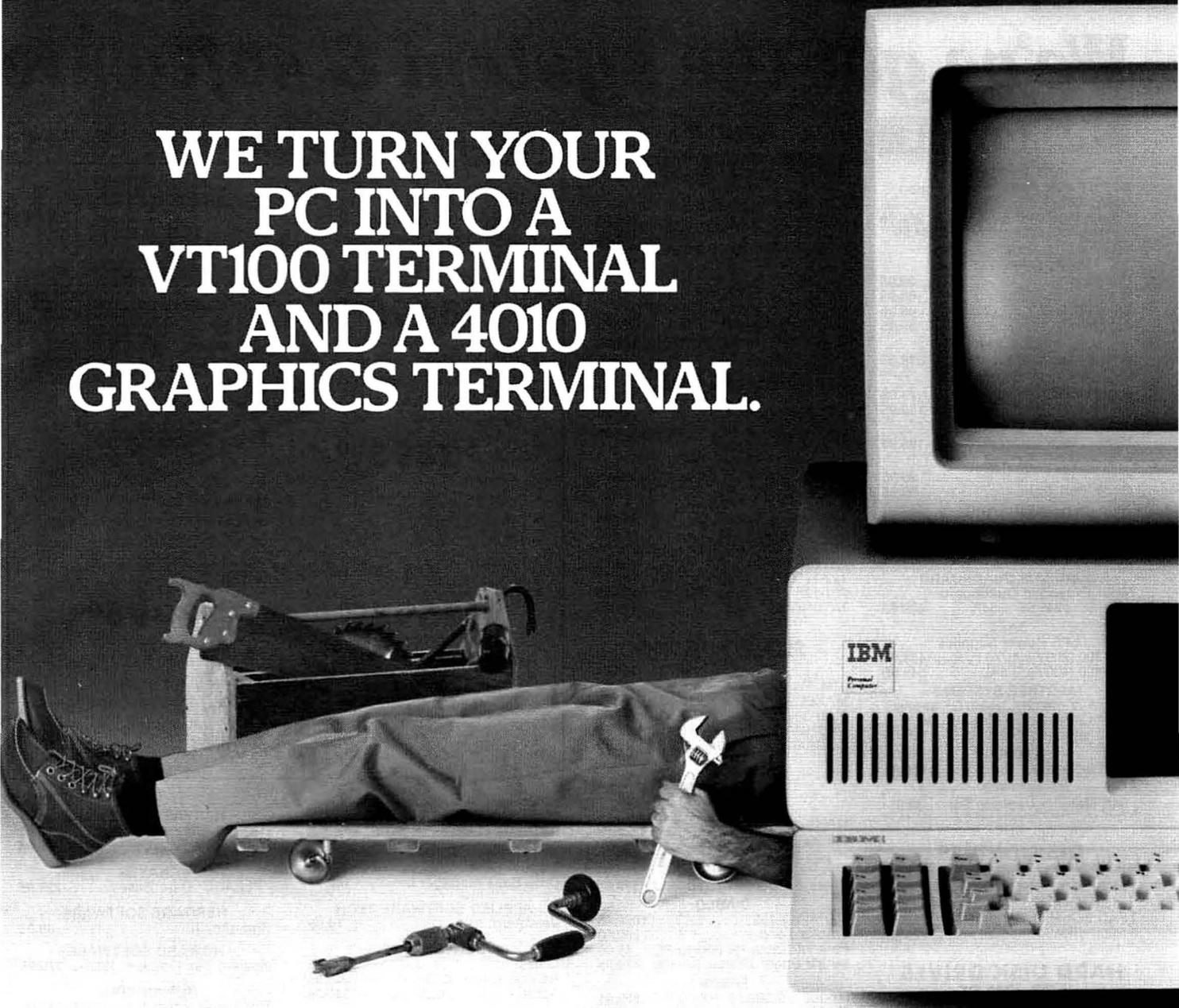
Business Management

IRS PC-Log

IRS PC-Log creates a detailed tax log that can be used in deducting PCs under the Accelerated Cost Recovery System (ACRS) tax laws. When you begin a session on the PC, the program asks whether the purpose is business, personal, or entertainment. After the session, the program records the time and date and allows you to enter a brief, descriptive comment. IRS PC-Log displays complete year-to-date statistics on command, giving total elapsed time for all sessions on the PC, elapsed time by category, and percentage of time per category. A complete listing of the log detailing each session can be printed at any time to aid tax planning or for attachment to a tax return. List price: \$19.95. Requirements: 64K, one disk drive.

Stellar Software
2932 Washington
San Francisco, CA 94115
415/346-5865

WE TURN YOUR PC INTO A VT100 TERMINAL AND A 4010 GRAPHICS TERMINAL.



The original VT100 terminal emulator for the IBM PC has something new under the hood: Tektronix 4010/4014 emulation. Now you can use one powerful, well-built software package for mainframe graphics, terminal emulation and file transfer.

VTERM/4010 gives you all of the features of VTERM II, plus Tektronix graphics. It can run mainframe graphics applications from SAS, ISSCO, Tektronix (PLOT 10), Precision Visuals, and many other similar packages. And VTERM/4010 will save pictures on disk, or draw them on Hewlett-Packard and IBM plotters.

But that's not all. As thousands of users know, the VTERM communications line comes standard with these exceptional features:

- Complete VT100, VT101 and VT102 emulation.
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- A highly reliable error-free file transfer with CRC checking, including complete host software for several host operating systems.

- XMODEM file transfer also supported.
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Coefficient Systems Corporation (212) 777-6707 611 Broadway, New York, N.Y. 10012

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 Controller for PC (req.) 124.95

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MONITORS

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 3550 letter quality 33 CPS .1379.00
 2050 letter quality 18 CPS 699.95
 Tractor Feed 3550/2050 209.95

OKIDATA
 OKI-92 379.95 OKI-93 629.95
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QUME
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 (Specify IBM PC parallel or standard Centronics parallel).

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TEXAS INSTRUMENTS
 855 with Tractor Feed 799.95

TOSHIBA
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IBM-PC HARD DRIVE SYSTEMS

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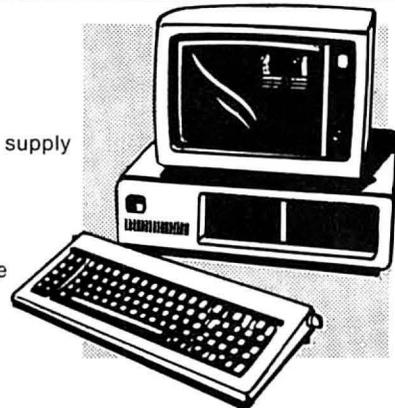
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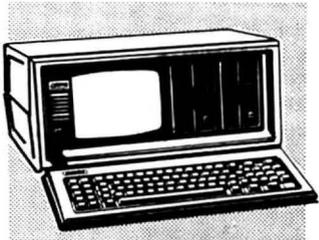
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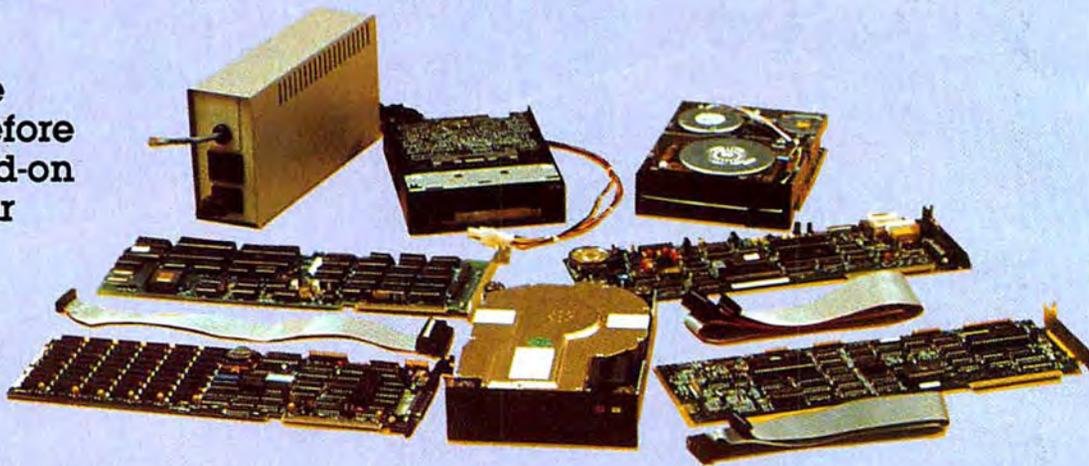
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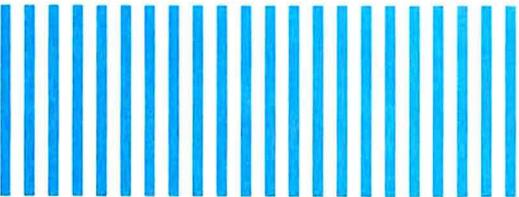
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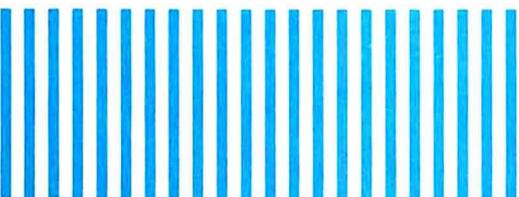
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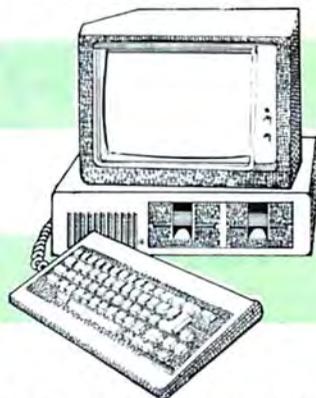
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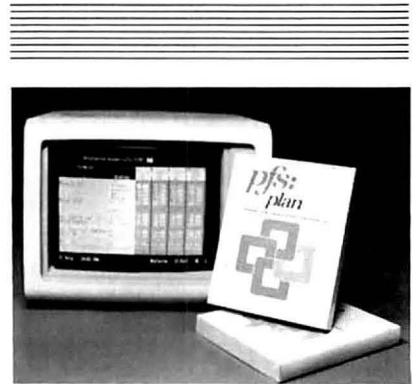
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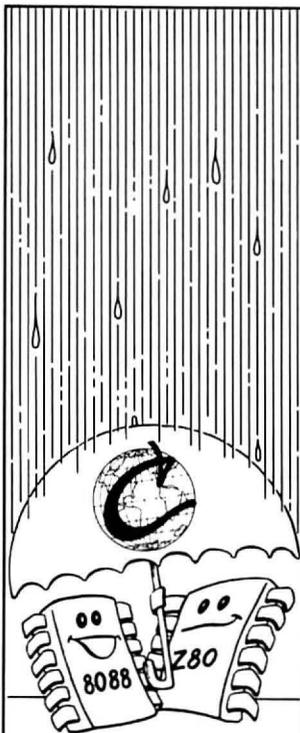
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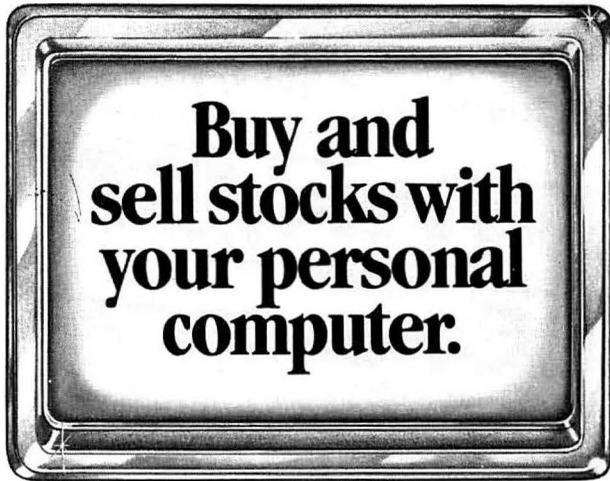
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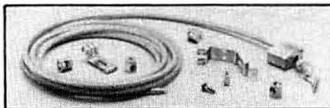
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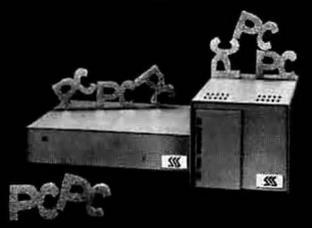
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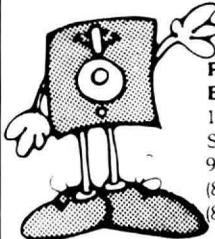
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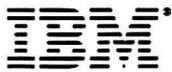
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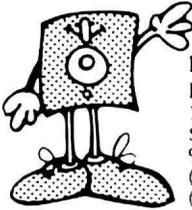
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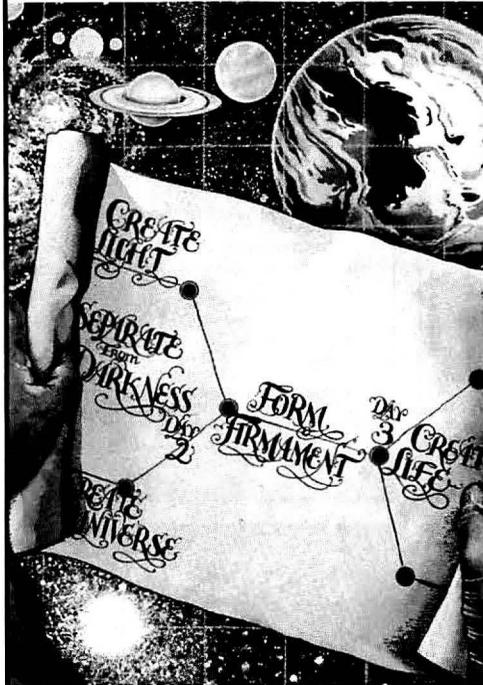
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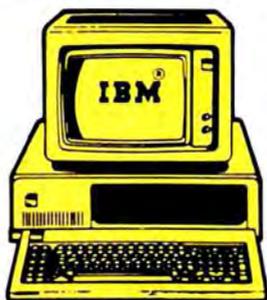
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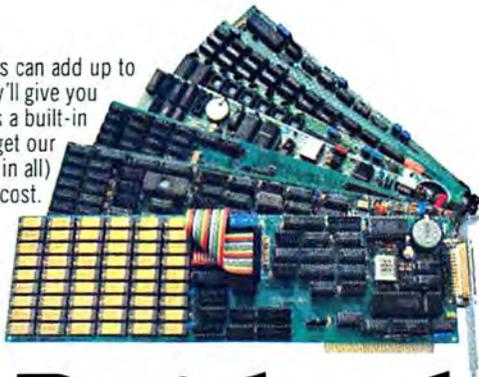
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