

LAN DATA BASES: WHICH ARE BEST? • DELL'S 386 SCREAMER

SPECIAL
SUPPLEMENT
INSIDE!
MICROSOFT WINDOWS:
THE NEW LOOK OF PERSONAL COMPUTING

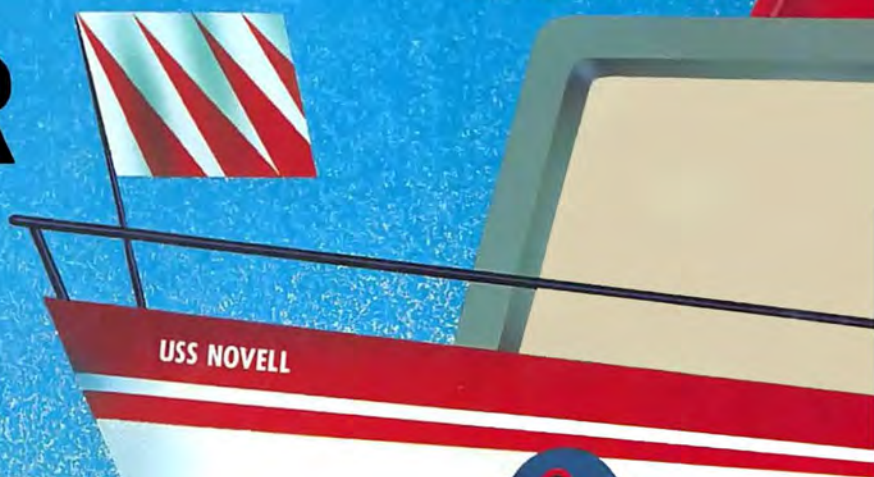
PC WORLD

THE BUSINESS MAGAZINE OF PC PRODUCTS AND SOLUTIONS

JUNE 1988 \$2.95 CANADA \$3.95

CHEAPER IS FASTER!

**NSTL benchmarks
show that low-cost 386s can
match or beat more
expensive LAN servers**



Paradox 2.0, the top-rated Network, 386, and



Paradox® is both the first family in DBMS and the top-rated relational database. Software Digest has ranked Paradox #1 for the past 2 years; PC Magazine gave Paradox its "Editor's Choice" award and InfoWorld named it 1987 "Product of the Year" for Database Systems.

Now there's OS/2

Paradox OS/2 is the newest member of the Paradox family—more are on the way and they're all 100% compatible with each other.

Paradox OS/2 allows you to take advantage of powerful OS/2 features such as addressing up to 16 megabytes of memory and running concurrent sessions. And Paradox OS/2 even lets you start new OS/2 sessions from within Paradox.

Harness the power of 386

Paradox 386 is powerful new DOS software for your powerful new hardware and it's designed exclusively for 80386-based systems. It also lets you ignore the old 640K limits and races through your data 32 bits at a time instead of just 16. It's a perfect solution for anyone faced with very large tables (tens of thousands of records or more) and/or large applications.

“As proof of Borland's commitment to delivering compatibility across diverse hardware and software environments, Paradox 386 and Paradox 2.0 can share the same databases and applications on a network.

Giovanni Perrone, PC Week

Paradox . . . it's the PC database-management system equivalent to turbo-charging an M-series BMW.

Giovanni Perrone, PC WEEK ”

The Paradox Network really works

Network users, you need Paradox's multiuser capabilities. The network runs smoothly, intelligently and so transparently that multiusers can access the same data at the same time—without getting in each other's way. (But safeguards prevent multiple users from altering the same data at the same time.) And with screen refresh you get real-time data updates on your screen.

“[Paradox is] a true network application, a program that can actually take advantage of a network to provide more features and functions, things that can't be done with a standalone PC.

Aaron Brenner, LAN Magazine

[Paradox] elegantly handles all the chores of a multiuser database system with little or no effort by network users.

*Mark Cook and Steve King
Data Based Advisor* ”

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relational database, has now OS/2 versions!



"Query-by-Example" gives you the right answer, right now

Our "Query-by-Example" (QBE) technique is just one illustration of the technological leadership offered by Paradox for the past 2 years.

QBE is fast and simple to use. Simply call up a form and check off the information you want.

2 (F6) to include a field in the QUERY; (F5) to give an Example

Sales	Stock	Customer	Init	Street
1	111			

PRODUCTS	Stock	Description	Price	Quant
1	111			

MS400	Customer	Init	Description	Price
1	111		Black handkerchiefs (13)	12,995.00
2	111		Robot-valet	149,995.00
3	111		Butchery panther	325,000.00
4	111		Digital grandfather clock	4,995.00
5	111		Robot-valet	149,995.00
6	111		Robot-valet	149,995.00
7	111		Street 00 Bottle	38,495.00
8	111		Robot-valet	149,995.00
9	111		Black handkerchiefs (13)	12,995.00
10	111		Robot-valet	149,995.00

Without having to write a line of code, you can, for example, get answers to queries like: *Find all the items we sold for more than \$1000 and tell me who ordered them.*

An artificial intelligence technique called "heuristic query

optimization" gives Paradox's QBE the ability to figure out not just the right answer, but also the fastest way to get the right answer.

QBE makes high-speed links between one piece of data and another and quickly sees the relationships your question calls for.

PAL:™ A powerful programming language

PAL, the Paradox Application Language, is a full-featured, high-level, structured database programming language that lets you write sophisticated Paradox programs (scripts) and applications. It includes such powerful features as looping constructs, arrays, branching, procedures, and a full set of functions.

“Most people we meet who give Paradox a try, end up switching to it . . .

*Mark Cook and Steve King
Data Based Advisor* **”**

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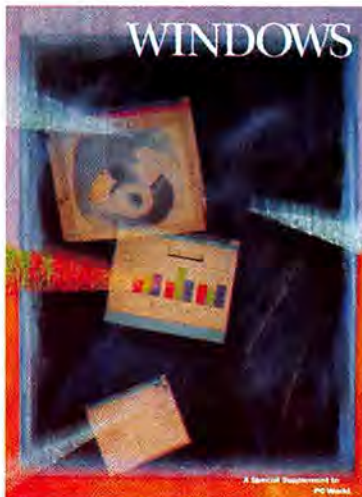
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C O N T E N T S

REVIEW

WINDOWS

A special supplement to PC World



Has Microsoft Windows finally come of age? What was once merely a small collection of Windows products is becoming a substantial family of multitasking applications. This PC World special supplement focuses on the Windows environment as a platform for the next generation of personal computing.
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126 LAN Servers for Less

Michael Goodwin

In the *Netware* world, it doesn't necessarily pay to buy a dedicated 386 file server. NSTL benchmarks prove that inexpensive 386s from Blackship and Dell outperform both Novell's 386A and Compaq's 16-MHz Deskpro 386.

134 Share the Wealth!

Hal Chapel and Marlene Nesary

What's the best multiuser LAN data base around? It depends on your application. PC World looks at three multiuser data bases with very different strengths: *Advanced Revelation*, *Paradox 2.01*, and *R:base for DOS*.

144 Hard Disk Housekeepers

Patrick Marshall

Fragmented files can dramatically slow a hard disk's performance, but some specialized tools can reunite those far-flung bits of data. We compare the performance and usability of *Disk Optimizer*, *DS Optimize*, *FastTrax*, and *Vopt* with the optimization programs found in *The Norton Utilities Advanced Edition* and *The Mace Utilities*.

154 The Hardware Shelf

Edited by Michael Goodwin

Hewlett-Packard's DeskJet delivers LaserJet quality for less than \$1000; Intel's Inboard 386/PC offers lower RAM capacity but higher speed and better workmanship than Quadram's Quad 386/XT; plus the Key Tronic KB 5153 touchpad keyboard and the Cumulus CuRAM-2 multifunction board for the PS/2.

172 The Software Shelf

Edited by William Rodarmor and Scott Spanbauer

Surpass 1.0 gets caught between *Excel* and *Quattro* in the spreadsheet price/performance battle; advanced editing features make *QuickBASIC 4.0* the best BASIC yet; *Micrografix Designer 1.1* rivals Mac design tools; plus *Publisher's Paintbrush 1.5* and *Dave 1.1*.

DEPARTMENTS

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Mike Hogan

Dell and Tandy introduce the first Micro Channel clones; Ashton-Tate takes aim at *1-2-3* and *Excel* with a new line of decision-support products; Compaq's next 80386 computer hits a snag, but earnings hit record highs anyway; rumors of AST's demise are greatly exaggerated.

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Burdened with OS/2 Extended Edition, the PS/2 line may turn out to be the most advanced boat anchor of all time.

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Edited by Eric Bender
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with a lawsuit; software leaders jump into the presentation graphics market.

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Dell improves on the AT standard with new high-performance computers; *3 + Open* spells a new era in LAN operating systems.

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Mike Hogan

Beyond Fax—a fax board and modem combo with a talent for work-group data sharing; AdLANtes, a local area network that gives DOS workstations access to UNIX applications; plus four plotter-emulation util-

FEATURE

230 Closer to the Promised LAN?

Eric Bender

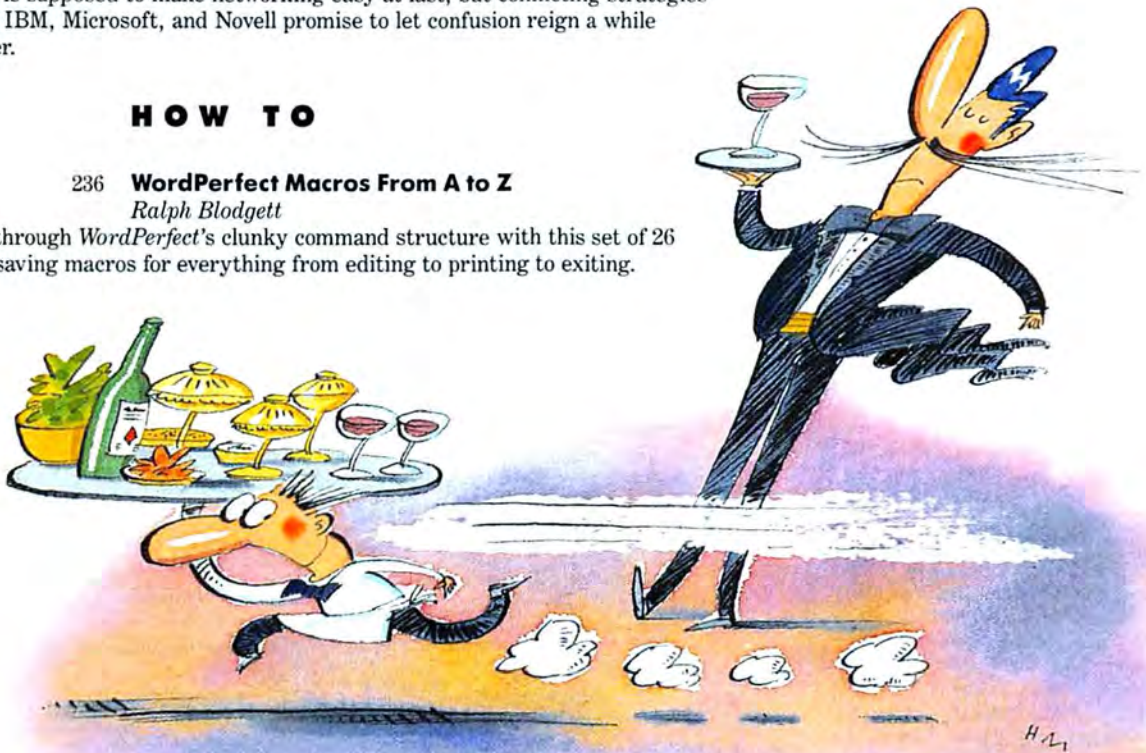
OS/2 is supposed to make networking easy at last, but conflicting strategies from IBM, Microsoft, and Novell promise to let confusion reign a while longer.

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236 WordPerfect Macros From A to Z

Ralph Blodgett

Cut through WordPerfect's clunky command structure with this set of 26 timesaving macros for everything from editing to printing to exiting.



LAN servers:
Small guys deliver
big-time performance,
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ities, three 1-2-3 add-ins, the MicroFrame 386 motherboard for the AT, and *Your Personal Investment Manager*.

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Robert Luhn

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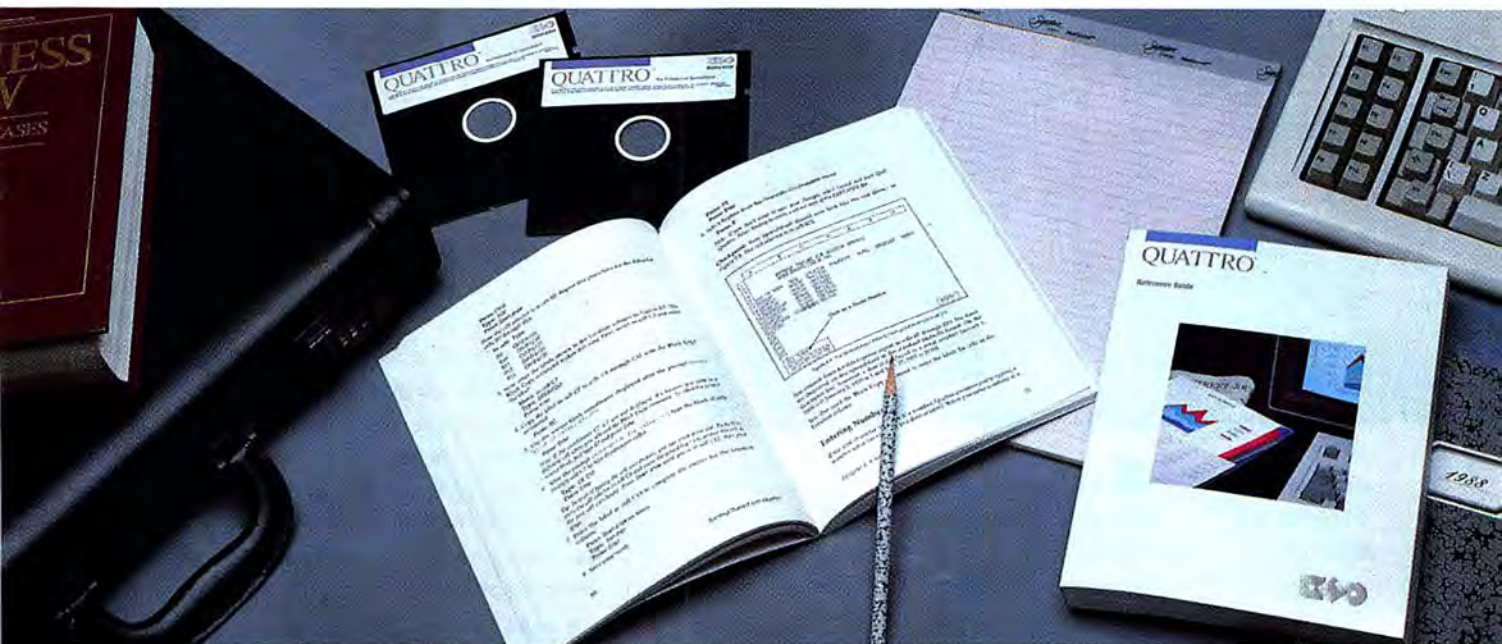
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"Those who are considering purchasing 1-2-3 will be better off with Quattro"

—John Walkenbach, InfoWorld



Here's what InfoWorld had to say about Quattro

"There are some clear advantages in choosing Quattro over the 1-2-3 of today: easier installation, no copy protection, improved speed, much better macros, excellent graphics, a customizable command interface, and direct compatibility with industry standard file formats. If cost is a factor, you can get five copies of Quattro for the same money that would buy two 1-2-3 packages."



Quattro includes SQZ!™ Plus data compression

A special implementation of SQZ! Plus, the spreadsheet file compression utility, is built into Quattro and comes to you absolutely free. SQZ! Plus for Quattro automatically compacts and expands Quattro spreadsheets by up to 95% during file saving and retrieving.

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Features: Improving the industry standard

"Quattro takes the industry standard and improves upon it in the areas that count most. It addresses many of the weaknesses of 1-2-3 and adds quite a few of its own unique touches."

"Perhaps Quattro's main advantage over most other spreadsheets is its minimal recalculation capability. When you make a change in your spreadsheet, only affected cells are recalculated, greatly speeding things up in most cases."

"Other Quattro features that improve upon the 1-2-3 standard include auto-record macros, vastly superior graphics, and easy installation."



Performance: Markedly superior to 1-2-3

"Our benchmark tests show Quattro markedly superior to 1-2-3 in file saves and retrieves."

"Quattro's graphics are a sight to behold."

"Quattro makes working with macros practically painless. If you're into complex 1-2-3 macros, the debugging feature alone is good reason to make the switch to Quattro."

"No one can argue that Quattro is anything less than an excellent spreadsheet value."

Excerpts from John Walkenbach's review of Quattro in InfoWorld, January 11, 1988.

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Working With a Net



Associate
Editor Michael
Goodwin,
author of
"LAN Servers
for Less"

Associate Editor Michael Goodwin learned about local area networks "like any other poor fool with a little knowledge and a manual—by putting one together." That experience led straight to this month's head-to-head comparison of 386-based network servers ("LAN Servers for Less") and its surprising winners—a pair of low-cost systems that beat Compaq's 16-MHz Deskpro 386 and Novell's dedicated server in every performance category.

Anyone who's ever been up to the elbows in Ethernet boards, hard disk servers, coaxial cable, and network software will appreciate Goodwin's account of how this month's cover story came about.

In 1986, Goodwin was teaching magazine writing at San Francisco State University and moonlighting as a computer consultant for clients like Citicorp. When the journalism department decided to install its own PC network, he got the call to help.

"It was a one-on-one battle with the technology," he recalls. "I'd go home at night in despair, with print queues and hardware interrupts swirling in my head. At the end of the process, I felt I knew some of the answers, but there was one question I couldn't resolve: What was the best server to use?"

With a background in engineering, Goodwin knew the answer lay in direct experimentation. That set the stage for his first project

for *PC World*, an April 1987 face-off between 3Com's *3+Share* and Novell's *Advanced Netware 286*. "We learned a lot about hardware and software, but I *still* didn't know which was the best choice for a network server."

Since then, of course, there's been a steady stream of 386 machines at every price/performance point. And there's no question that these systems make outstanding network servers. "With a 386 server," says Goodwin, "the code runs so fast that you can forget you're on a network, whereas on an AT server, even simple tasks can make you feel like you're computing underwater."

But is there a difference between 386 machines? That's where Goodwin says National Software Testing Laboratories' performance benchmarks prove essential. "Based on those tests, if you were setting up a network and asked what to use as a server, I'd have no hesitation recommending one of the low-cost 386s that did so well at NSTL."

Also in this issue: Hal Chapel and Marlene Nesary ("Share the Wealth!") review three heavyweight network data bases. East Coast editor Eric Bender ("Closer to the Promised LAN?") takes users behind the scenes where the leading network vendors are struggling toward a consensus. You'll find a review of hard disk optimizers, previews of 3Com's OS/2 network operating system and Dell's latest PCs, and 26 timesaving macros for *WordPerfect* users. And don't miss the results of January's PC trivia test. Even our editors missed one! ●

Ed Bott

Ed Bott
Managing Editor

"Within a few days, SideKick *Plus* became even more indispensable than SideKick"

Dick Pountain, Personal Computer World

Here's what Personal Computer World had to say about SideKick® Plus:

"When the news of SideKick Plus arrived, I made up a shopping list of the improvements I would like to see ... Borland has provided all these things and much, much more."

Intelligence and elegance of design

"I discovered that the same intelligence and elegance of design that initially attracted me are still there, and certain new features like the customizable menu system represent a real breakthrough in user interface design."

Sophisticated memory management

"Memory management in SideKick Plus is so sophisticated that it almost amounts to an alternative operating system ... The amount of memory tied up is tiny (less in fact than old SideKick!) ..."

The Phonebook: Fully-featured communications

"The Phonebook has come a long way ... For one thing, it has acquired a fully featured communications package which can work in the background: you can upload and download files while continuing to work on your PC ... The Script language is one of the best I have seen."

The Notepad: Power for serious writing

"The Notepad is as powerful as many word processors ... I would happily use it for serious writing." "Up to nine notepads can be opened simultaneously with SideKick Plus."

Outlook: The best outline processor

"Outlook is ... the best outline processor I've tried, comfortably beating ThinkTank, PC-Outline, and Ready! in elegance and ease of use."

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The File Manager: Competing with the standalones

"The File Manager ... performs a similar function to standalone utilities like Xtree, Quick DOS, or the Norton Commander, and shares features with all of them."

The Time Planner: Hugely enhanced

"The Time Planner has advanced even further than the Phonebook ... it has been designed with networking in mind."

Plus a lot more

"The enhanced cut-and-paste functions are perhaps the most attractive feature of SideKick Plus ... [it] has a powerful, consistent ability to cut-and-paste from any application to any other."

"The calculator is no longer one, but four calculators; you can switch the type to Business, Scientific, Programmer, or Formula."

Positively addicting!

"In my view, the individual applications in SideKick Plus are of such a standard that I would be hard put to better them with a collection of standalone applications ... I remain an addict."

*Excerpts from Dick Pountain's review of
SideKick Plus in Personal Computer World,
March 1988.*

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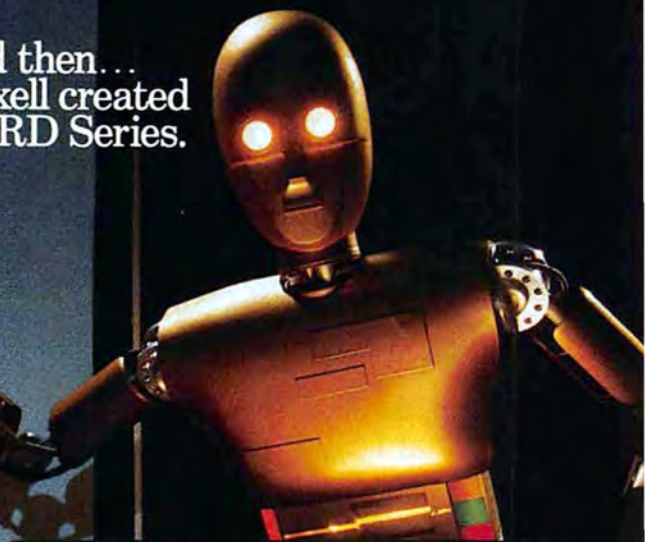
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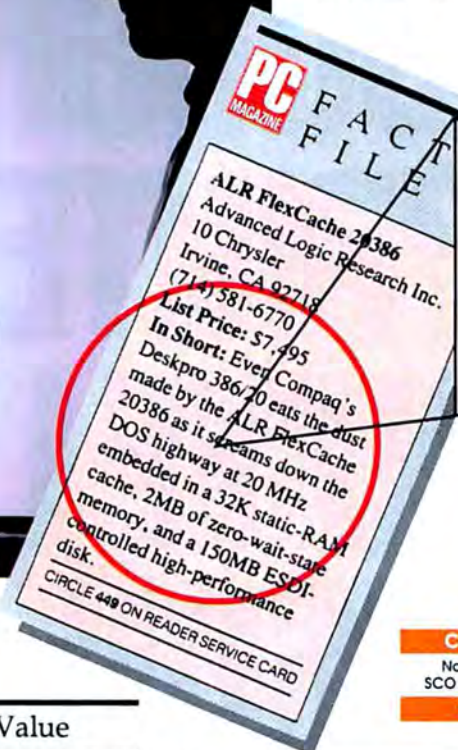
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Have you read the latest from PC Magazine about ALR's FlexCache 386?



"Even Compaq's DeskPro 386/20 eats the dust made by the ALR FlexCache 20386 as it screams down the DOS highway..."

PC Magazine, March 15, 1988

A Philosophy of Value

At Advanced Logic Research (ALR) the philosophy of getting more for your money has become a tradition. A tradition recognized by a long line of excellent reviews from all the major trade journals. FlexCache 386 Series is based on the ALR 386/220, PC Magazine's choice as "The Best of 1987". Now the fastest PCs available, the FlexCache Series approach mini-computer performance and offer you the most for your money.

FlexCache dual bus architecture separates the standard 8MHz peripheral bus from the high-speed memory bus. This permits access at the 16MHz or 20MHz CPU clock rate. By keeping frequently used data close at hand, the cache memory controller eliminates wait states 95% of the time. Since 90% of all data transfers relate to the data bus, long delays in computations disappear.

Faster Than IBM or Compaq

This innovative design allows for up to 60% faster CPU/memory data through-put than the IBM PS/2 model 80-071 with the much touted microchannel. And the FlexCache 20MHz CPU "...consistently lays down a coating of dust on Compaq's IBM-basher."

-Compaq DeskPro 386/20.



Compatible

Novell, DOS 3.X,
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TOP OF THE NEWS

Micro Channel Clones Arrive

*Dell, Tandy,
Others Plan
Systems
Compatible
With the PS/2
MCA Bus*

Tandy Corporation and Dell Computer Corporation have announced computers compatible with IBM's Micro Channel Architecture (MCA) PS/2 models, while at least two other companies plan to do so. Dell led off a week of late-April introductions by announcing two 20-MHz PS/2 compatibles—an 80286-equipped Model 60-like System 400, and an 80386-based System 500 comparable to IBM's Model 80. Both will be available in the fourth quarter, with pricing to come in August. Chairman Michael Dell claims that his systems will be up to 40 percent faster than their IBM counterparts. Meanwhile, Tandy says that it will begin volume shipments of a 20-MHz Model 80 compatible in July. Tandy chairman John Roach claims that the 20-MHz, zero-wait-state Tandy 5000 MC will

be 30 percent less expensive than a similarly configured Model 80. All of the Tandy and Dell computers have asynchronous bus architectures that will use add-on boards designed for the PS/2 and, like IBM's MCA, are capable of arbitrating among multiple intelligent devices. Dell expressed optimism that the company will be able to obtain MCA patent licenses from IBM, while Roach claims that Tandy's current cross-licensing agreements with IBM will protect it from a patent suit. IBM recently promised to liberalize its licensing policy but raised the prices of all licenses significantly. Mitac International and Acer Technologies Corporation, both of Taiwan, are negotiating MCA licenses with IBM for fourth-quarter releases.

Ashton-Tate Positions for Spreadsheet Wars

*Decision-Support
Products
on the
Horizon*

One of the largest and most diversified microcomputer software companies, Ashton-Tate has decided to end its conspicuous absence from the high-end spreadsheet wars now being fought among Lotus, Microsoft, and Borland International. The Torrance, California-based company is forming a new business unit, targeting what it calls decision-support tools. Ashton-Tate is not only developing a product to compete with Lotus's *1-2-3*, Microsoft's *Excel*, and Borland's *Quattro*, it also will attack the entry-level multifunction market now dominated by Software Publishing's *PFS: First Choice*. Executive Vice President Roy Folk, who will head this new operating unit, would not provide specific details, but both future products reportedly will

draw on technology now incorporated in Ashton-Tate's *Framework* integrated series. To that end, Folk has announced *Framework III*, which includes several spreadsheet and telecommunications enhancements and will offer a smooth upgrade path to any future offering. In addition, Ashton-Tate hopes to capitalize on the relatively weak data bases of competing spreadsheets. *Framework III* and all future Ashton-Tate products will directly read and write *dBASE IV* files, providing a central data repository and enabling users to download corporate data to *dBASE IV* through the Ashton-Tate/Microsoft *SQL/Server* and then pull it into a spreadsheet.

Compaq Plans a 25-MHz 80386

*Delayed by
Memory
Shortages
and Heavy
Demand
for Current
Models*

Compaq Computer Corporation is reportedly developing a high-end computer based on the new 25-MHz Intel 80386 chip. Originally scheduled for release in June, the Deskpro 386/25 has been held up by shortages of dynamic random access memory chips and Compaq's inability to meet demand for its current computers. A source close to the company says the Deskpro 386/25 will be configured much like the Deskpro 386/20, with 1MB of memory, asynchronous Flex Bus architecture, a 5¼-inch floppy drive with a 3½-inch option, and a hard drive. The 386/25 will employ memory and disk caching with options for an Intel 25-MHz 80387 or a Weitek math coprocessor. The system will retail

for under \$10,000 when equipped with a 130MB drive or for under \$13,000 with a 300MB drive. Compaq expects to sell the system to current users of CAD/CAM/CAE; power spreadsheets; and data base, accounting, and other performance-intensive applications. Every model of Compaq's 80386 line has been on back order since introduction; the demand has produced unexpectedly high revenues and profits for the billion-dollar-plus company. Compaq has told analysts it will top Wall Street's revenue projections by logging more than \$425 million in sales and earnings of \$20 million for the quarter ended March 31.

AST Turns It Around

*System
Vendor
Surprises
Analysts*

Confounding predictions that its expansion into systems would be its ruin (see "Is Success Killing AST?" *PCW*, April 1988), AST Research closed out its second consecutive quarter with record sales and earnings. AST logged \$105 million in revenues for the third quarter ended March 31, up 90 percent from the same quarter a year earlier. More significantly, earnings of \$5.5 million (40 cents a share) were up 38 percent from the same quarter a year earlier and 135 percent from the second quarter, in which AST surprised analysts by posting earnings of 17 cents a share. The latest quarters represent a sharp turnaround from the penny-a-share performance AST reported for the first quarter and caused AST stock prices to jump 3¼ points the first week in April. "These numbers

have clearly taken the street by surprise," reports Benny Lorenzo, technology analyst for the San Francisco investment banking firm of Volpe & Covington. "Nobody around was looking for 40 cents," adds Lorenzo. "That's for sure." The Irvine, California-based AST had shipped more than 100,000 Premium/286s by April, with another 30,000 on back order. Thanks to the computer's popularity, AST has boosted its gross margins on the machine and introduced a workstation line and the 80386-based Premium/386 with much more attractive margins. Approximately 70 percent of AST's revenue now comes from its computer line.

Maxtor, Verbatim Ready Erasable-Optical Drives

*Replacements
for Backup
Tape,
Winchesters*

It appears that Maxtor will become the first company to ship production models of erasable-optical drives for PCs, stealing a march on Eastman Kodak's Verbatim subsidiary and several Japanese companies also poised to introduce devices. The San Jose, California, Maxtor plans to have production quantities of 3½-inch drives in the hands of customers by late fall so that erasable-optical sub-systems could be available by year-end. Maxtor's Fiji I will sell at retail for \$1995 and accommodate 160MB single-sided removable cartridges with 140ms average access times. Fiji I is slower and more expensive than traditional Winchester disks, but it is a good replacement for comparably priced backup tape because it offers much faster access, maintains Maxtor optical marketing director Dana

Gauthier. Meanwhile, Verbatim plans to take more direct aim at Winchesters, emphasizing speed rather than capacity. Its 50MB, 3½-inch drive will have a 70ms access time but will cost as much as \$2500 and won't be ready before the first quarter of 1989. Maxtor also has released a 1-gigabyte, 5¼-inch drive for minicomputers with an average access time of 43ms. All achieve write/erase capability with magneto-optics, a hybrid of laser and traditional magnetic disk data recording techniques. Erasable-optical drives don't burn pits in the recording surface of a laser disk as do WORM devices. Rather, they heat the surface via laser beam and record on it magnetically. They then read data by bouncing another laser beam off the surface and checking how this reflected beam is polarized.

IBM Taps Interleaf

*Expensive,
Feature-Rich
Workstation
Product
Comes to PCs*

IBM has teamed up with Interleaf, a 7-year-old provider of sophisticated and highly integrated desktop publishing workstations, to jointly market *IBM Interleaf Publisher*, a \$2495 feature-rich desktop publishing program. Based on Interleaf's \$12,500 Technical Publishing System, *IBM Interleaf Publisher* is appropriate for long, paginated documents as well as for page-by-page layout of what-you-see-is-what-you-get brochures and newsletters. For example, the software automatically lays out a long document so that copy can flow from page to page and graphics can be anchored to the appropriate text. *IBM Interleaf Publisher* also

includes a group of highly integrated applications for word processing, chart making, drawing, and line art editing, with indexing and cross-referencing between text and graphics throughout. Designed for network environments, *IBM Interleaf Publisher* is file compatible with all other releases of the program on platforms that range from the Macintosh II to DEC workstations. It can produce PostScript-compatible files and requires 6MB of memory and 40MB of storage on an 80386-based PC like IBM's PS/2 Model 80. IBM will manage the marketing and distribution of *IBM Interleaf Publisher* to the dealer channel.

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Ives Brant

Computer Software News

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Stanford 386-20

9/20 MHz 23 MHz Throughput
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\$2299*

Stanford 386-18

9/18 MHz 21 MHz Throughput
Same configuration as in system 386-20 except: intel true 32 bit 80386-16 CPU • Plus basic system features.

\$2049*

Stanford 286-16

8/12 MHz 16 MHz Throughput
Intel 80286-12 cpu, 8/12 MHz software (keyboard) switchable clock • Award BIOS, Norton SI (Ver 3.0): 15.8 • DRAM can be expanded to 1 MB on M/B • Selectable between 0 wait state or one wait state • 8 expansion slots (5-16 bits, 3-8 bits) • Socket for 80287 math co-processor • Plus basic system features.

\$1119*

Stanford 286-12

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Sun Announces PCs

*First Firm To
Exploit 25-
MHz 80386
Processor*

Hoping to branch out into new markets and defend itself against incursions by PC competitors, technical workstation vendor Sun Microsystems has introduced a new family of high-end PCs. Its top-of-the-line Sun386i/250 is the first computer to use Intel's new 25-MHz microprocessor and runs at 5 MIPS. Sun also offers a 20-MHz Sun386i/150 that runs at 3 MIPS. Both will hold up to 16MB of memory on the motherboard and include a built-in 80387 coprocessor and a 32K static RAM cache. Both have four 32-bit and four 8/16-bit slots, hard disk options of up to 981MB (with 327MB in the system), and monochrome or color monitor options up to a resolution of 1152 by 900 pixels. Sun will compete with Compaq and IBM for Fortune 500 technical and power users through a direct sales force, with a select group of value-added resellers

selling to smaller firms. The supplier sees opportunities in specialized vertical applications like electronic publishing as well as in industries where its technical workstations have not had much presence to date, like banking/finance/insurance, manufacturing, and medicine. The 386i family comes ready for networking with built-in Ethernet adapters and the Sun Operating System, a UNIX derivative that can host off-the-shelf DOS applications. Sun also announced *Netdisk*, a network software package that allows PCs and diskless workstations to access servers from various vendors that support Network File System networks. Pricing will range from \$8000 to \$15,000 for the 386i/150 and from \$14,000 to \$20,000 for the 386i/250, depending on monitor, memory, and storage configuration.

Alpha Debuts Integrated Package

*Aims for
Compatibility
With Stand-
Alone
Best-Sellers*

In May Alpha Software will release an entry-level word processing, spreadsheet, data base, and communications package that features close compatibility with industry-standard applications. *AlphaWorks*, which fits on a single 3½-inch disk for portables, reads 1-2-3 version 2.0 .WK1 files with graphics (but not 1-2-3 macros), and its flat-file data base is compatible with *dBASE* .NDX, .DBT, and .DBF files. The package supports the LIM 4.0 expanded memory specification and can open nine documents, nine data bases, nine spreadsheets, and two communications sessions at the same time. Any two sessions can be seen in a horizontally split screen. Data is transferred between them via a

clipboard, and a macro recorder works across all the applications. Alpha Software will continue to sell its original integrated offering, the \$129 *Electric Desk*. During the past four years, 100,000 copies have been sold, about two-thirds of them bundled with inexpensive compatibles from companies like Hyundai, Cordata, and Samsung. *AlphaWorks* will sell for \$195 and compete with Software Publishing's *PFS: First Choice* and *Microsoft Works*. Using the Software Publishers Association monthly data, Alpha Software president Richard Rabins estimates the market for entry-level integrated packages at 350,000 copies a year.

Diconix Prepares Portable Color Printer

*Prints
Three Colors
and Black
From Four
Cartridges*

Kodak subsidiary Diconix may release a portable color printer for CAD/CAM and business graphics applications by year-end. The 80-column Color 200 printer measures 8½ by 13 inches, weighs 10 pounds, and uses four snap-in ink jet cartridges in cyan, magenta, yellow, and black arrayed side by side. The printer will print on plain paper and transparencies and at a speed of 150 cps in black-only mode for general word processing. Diconix has shown a demo model to analysts, although "the print quality and speed are not up to what final specs will be," says marketing and communications

director Dick Ernst. "The intent is simply to show the future capability of ink jet." Diconix also has given analysts a peek at a two-color version for accent or spot-color applications such as forms printing or printing of proofreading edits in different colors. The company now sells the Diconix 300 and 300W black ink jet portable printers, which employ a single-cartridge head technology, licensed from Hewlett-Packard, and use Diconix's own ink. HP has offered the single-head PaintJet color desktop printer for almost a year. ●



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Computerworld's March 7, 1988, front-page story stated that OS/2 could cost "nearly \$5,000 in additional expenses" for each IBM PC AT...to cover the costs of memory expansion and a new display.

"Even if you just bought an IBM Personal System/2 Model 50 last week," the report continued, "you are probably looking at extensive upgrade costs..." \$1,750 for more memory, alone.

Plus, you'll need to add the costs of new applications software, the costs

Operating System...And You'll Pay.

of training, and the costs of the system.

All in all, a very expensive upgrade.

"How can you say this operating system is compatible...when half our computers can't even run it."

Take a look around at the mix of PCs your company uses.

Think one version of OS/2 can be used as a company standard?

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The Cure for MacEnvy.



For years PC users have been conditioned to think of their computers in certain terms. Dependable. Versatile. Dull. To get superior graphics, some claimed that you need a different type of computer altogether. They said *their* computer was everything the PC wasn't. Easy to use. Graphically exciting. Fun. PC owners were, well, *green* with MacEnvy.

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The Clash of the PC Titans

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Interface War is going to change the
history of personal computing—

and it's going to create some
myths, too.



David
Bunnell

Do you remember the clash of the PC titans, many thousands of upgrades ago, when the Great Icon did battle with the Wizard of the Northwest?"

As the HyperChronicler began to download his epic, the info-travelers huddled around the glow of their screens. It was a good night for saga sharing. Five hundred thousand screens in America alone were glued to the HyperChronicler's bandwidth, and there was to be a delayed-transmission simulnet over the Glasnost Network.

The Japanese had front row seats, and NEC, Fujitsu, and Hitachi forked out several hundred million DRAMs to be corporate sponsors. Digital hawkers were busy selling CD-I tee-shirts and Ted Nelson Memorial Hyperbuttons on the network. Excitement was building audibly in the Data Dome. Then the lights and music slipped into HyperDrive, and the myth telling began.

The HyperChronicler told his tale. Splices of antique television documentaries, neolithic software programs, and yellowed clippings from ancient *Wall Street Journals* playing on the screen captured the apocalyptic mood of those tumultuous days.

The year was 1985. The Great Warrior Sculley rose to the leadership of the Apple tribe after he

expelled Steven P. Shaman from its midst. Gassée the Urbane was appointed Senior Vice Merlin of Magical Development. The neighboring tribes in the valley saw the proprietary smoke signals and shuddered. The powerful sorcerers of the Hewlett-Packard and Xerox tribes took heed and began to stockpile their arms.

Lord Sculley was locked in a territorial dispute with the Great Gates over the Macintosh-like graphic user interface of Microsoft's *Windows 1.0*. Gates, called the Wizard of the Northwest by some, had the upper hand because the Apple tribe had recently been attacked by the biggest tribe of all, whose domain lay far to the east in the forests of Armonk, New York.

The Atman of Apple and the Master of Microsoft met face to face, not on the battlefield but at Chief Esther Dyson's enclave. Sculley knew he had to make peace with Gates because Apple had enemies in the valley. And Microsoft was creating software spells and applications for the Magic of Macintosh. Both tribes entered into a peace treaty of sorts.

But Sculley knew that a day would come when he would again
(continues)

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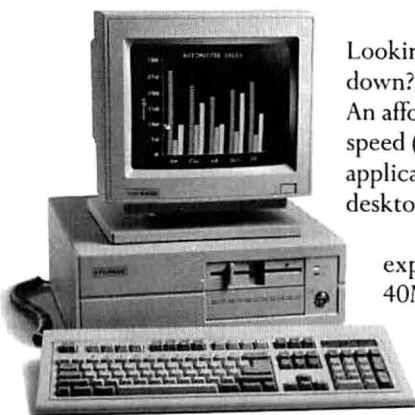
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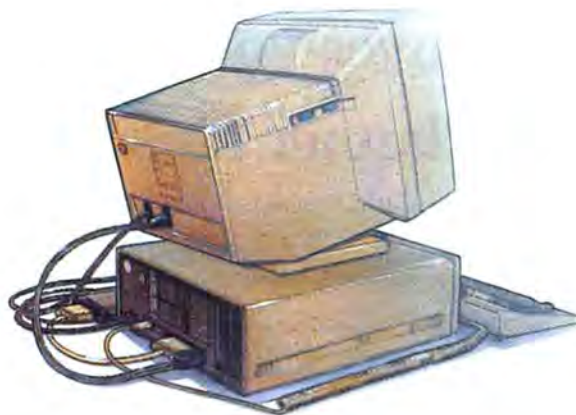
face the Northwest Wizard. He met in secret with a member of his High Council—an excellent organizer and skirmish fighter called William of Campbell. Together they developed a plan to split off part of the Apple tribe and create Claris, a smaller software family. Sculley wanted to be certain that Apple would never again be dependent on a foreign software tribe like Microsoft.

While Sculley was bolstering his software flank and preparing for the next confrontation with the Wizard of the Northwest, Apple and Microsoft engaged in verbal warfare and hurled taunts at each other. Gassée the Urbane railed against the weakness of other tribes who licensed their crown jewels to enemy camps.

And Sculley declared that Apple was the strongest company in tribal computing precisely because it owned its own operating system. The tribe from Armonk, though immense, was entirely dependent on Microsoft. In fact, all the major tribes—the Hewlett-Packards, the Compaqs, the Tandys, and even the Great Eastern Clones—depended on Microsoft for their systems.

Thus by 1987 it came to pass that the Master of Microsoft was suffusing the Magic of Macintosh through *Windows*, and also that Hewlett-Packard called forth a *New Wave* incarnation of the Macintosh interface that worked with the nefarious *Windows 2.03*.

Apple began to fear these alliances. Its secret weapon had been stolen by barbarians who were adapting this powerful magic to their own weapons
(continues)



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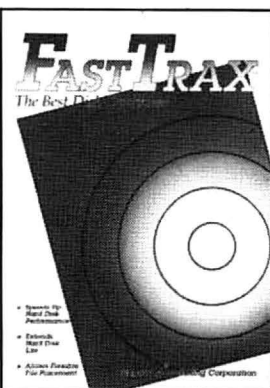
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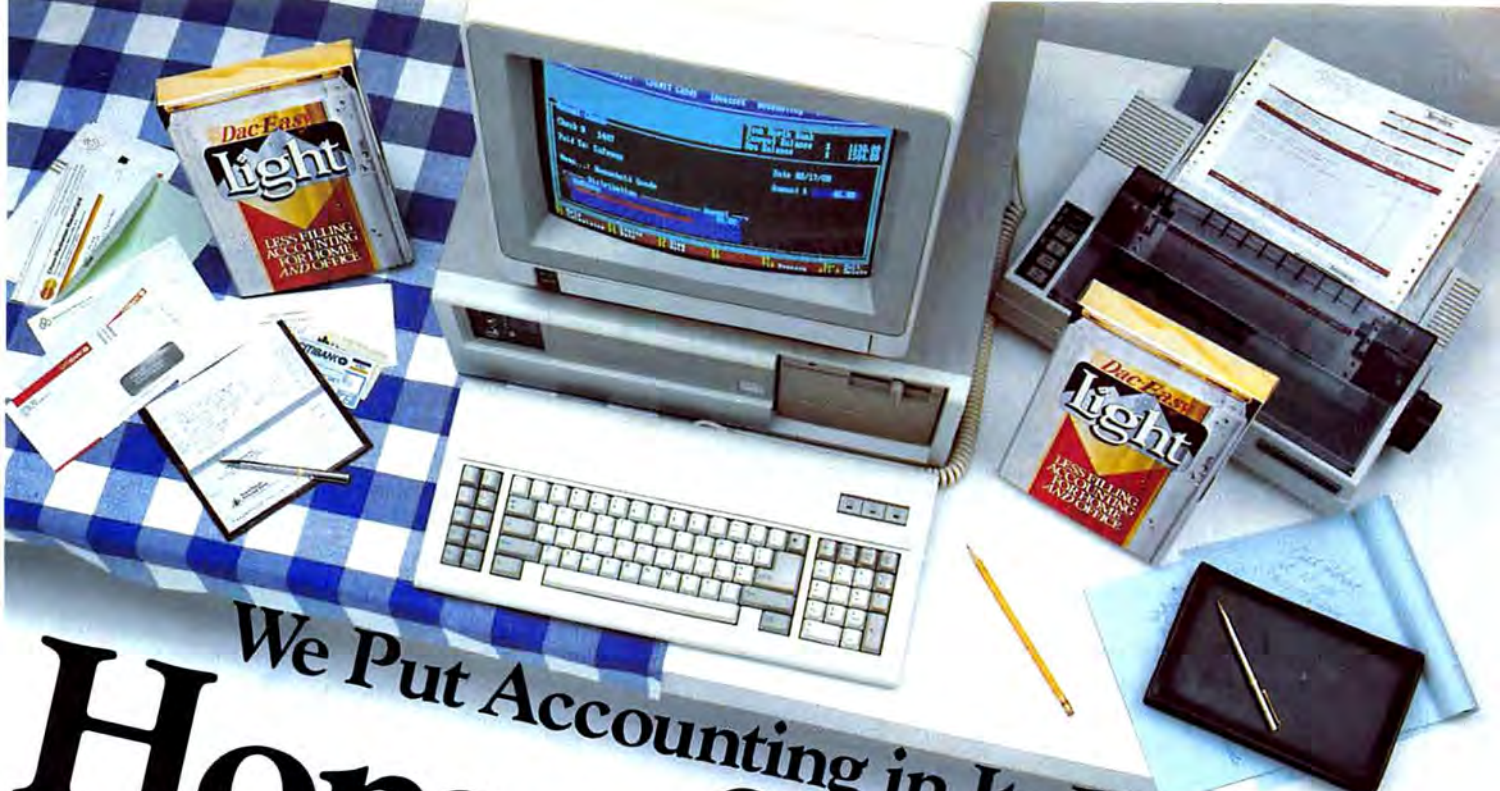
and machines. One tribe, the Lotusians, was developing a 1-2-3 spreadsheet for the Macintosh that promised to be as good as or even better than Microsoft's *Excel*. Ashton-Tate was developing a Mac *dBASE*. A *WordPerfect* for the Macintosh was under way too. And High Councillor Campbell was developing high-end Macintosh software in the fiefdom of Claris.

So Lord Sculley decided that 1988 was the right time to make Apple the only PC company in the world that was totally free of Microsoft's spell. He unleashed his army of attorneys to challenge the Great Gates and the Howling Hewlett-Packard. Apple petitioned the Great Judiciary to keep Microsoft and Hewlett-Packard from stealing the Magic of Macintosh and from providing its secrets to all the other tribes.

Would Sculley outmaneuver the Wizard? Or would the advancing software warriors plunder civilization as Apple knew it, so carefully cultivated in Cupertino?

I can't tell you how the Hyper-Chronicler finished his saga that night in the Data Dome, but I can tell you that the clash of the PC titans is really a battle between different visions of the personal computer world. There is Microsoft's MS-DOS-OS/2 vision, there is Apple's, and let's not forget the UNIX dream. Which vision will eventually prevail?

The implications of the titans' battle are enormous. If Microsoft is legally prevented from delivering its Presentation Manager technology to IBM, perhaps IBM will have to develop its own oper-
(continues)



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ating system—or go elsewhere to find it.

Meanwhile, a small group of people from Xerox PARC has split off to form a new company that plans to develop yet another graphic interface. Who knows? Maybe they'll end up licensing it to IBM! Then Microsoft will lose big, because it won't be able to provide the PC industry with the plethora of products it now controls. Mind you, Microsoft's loss isn't necessarily Apple's gain.

If the court doesn't act quickly on Apple's lawsuit against Microsoft and Hewlett-Packard, there will be much uncertainty about Microsoft and about Apple as well. This may open up the market for workstation manufacturers, especially as their prices fall to the level of Apple's high-end Macintoshes. One promising contender is Sun—with its open-architecture RISC machine, SPARC chip, and UNIX operating system.

No matter what happens between the warring tribes, they should watch their backs. I read recently that IBM has offered to supply vital computer chip technology to its archrival Digital Equipment Corporation. Why? Because Big Blue doesn't want DEC to become too dependent on Japanese suppliers. The HyperChronicle will have his work cut out for him in future installments of the titan epic. ●

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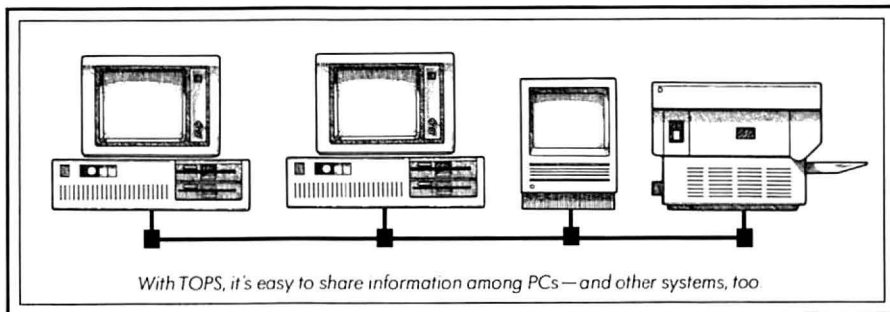
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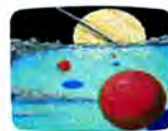
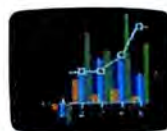
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LETTERS

Reactions and responses from the PC World community

Qualified Critique

David Bunnell's recent editorial ["IBM: Reality Checks Versus Myths," *PCW*, February 1988] gives a fair assessment of IBM in 1988. In taking issue with my treatment of IBM in my book *Computer Lib*, however, he ignored what I think is the key point: During the sixties, IBM created a system of virtual bureaucratic enslavement. People could use computers only through corporate computer centers, which were bureaucracies controlled by IBM. The personal computer explosion represented the pent-up lusts and needs for computers that this bureaucracy refused to service.

Since 1980, as I point out in the new edition of the book, IBM has done many good things, including introducing the open-architecture PC. So my criticisms are intended to shed historical light on how we got here, not to impugn the IBM of today.

Ted Nelson
Director, Project Xanadu
San Antonio, Texas

Nipping at Big Blue's Heels

I have to quibble with David Bunnell's February defense of IBM. He says, "When critics go around and say that IBM only does what's good enough—well, the fact is that it *is* good enough." I wonder how long it would have taken IBM to intro-

duce the AT and PS/2s without the clone makers hot on their heels? Thank you, Compaq (and all the other IBM competitors), for pushing the Big Blue blimp to offer better choices and technology.

John E. Carter
San Antonio, Texas

Wise Up, Hayes

The review of *Smartcom III* by Eric Brown and Art Wilcox ["Smartcom Wises Up," *PCW*, March 1988] is excellent. I was a heavy user of *Smartcom II* and ordered the new program assuming it was an upgrade. Instead, I got a highly sophisticated program that I had neither the time nor the inclination to learn.

Worse, *Smartcom III* actually takes a step backward by limiting macros to 32 characters, too few for a two-line telex address. What I (and presumably tens of thousands like me) need is an upgrade of *Smartcom II* that maintains the format and simplicity of my old standby. Are you listening, Hayes?

Peter Crumbine
Greenwich, Connecticut

Count Him Out

I must take strong exception to part of Richard Landry's column ["The Next Software Revolution," *PCW*, March 1988].

(continues)

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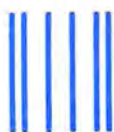
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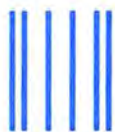
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◆ It is this painstaking attention to detail that has allowed Acer to grow 100% a year, for the past 10 years. We're also big on delivering quality products at an affordable price.

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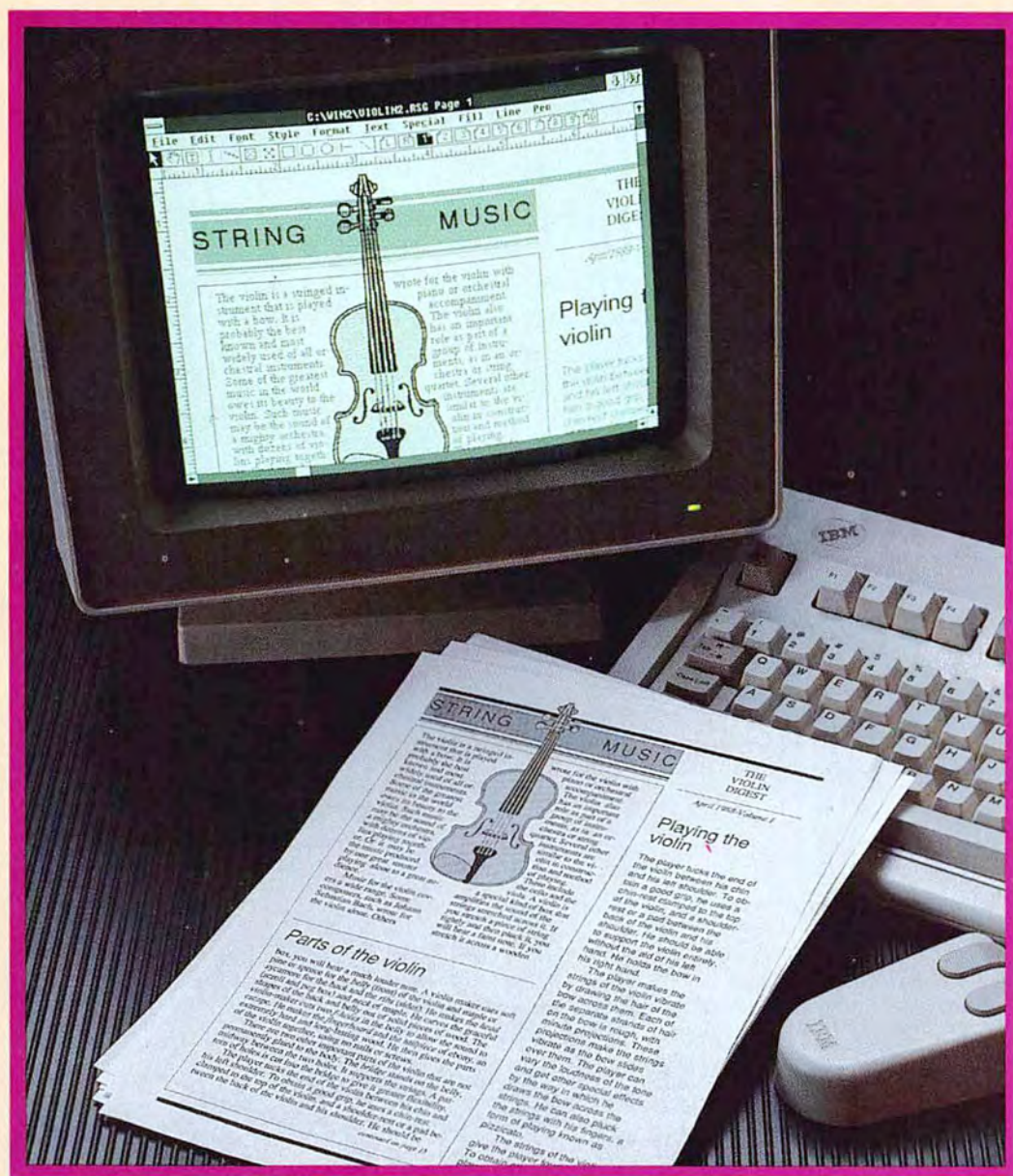
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Selling four or five versions of the same program, each aimed at a different class of users, seems like nothing more than a sales gimmick and a rip-off of the software-buying public. Both users and retailers trying to sort out upgrade features and pricing would encounter monumental confusion. Imagine walking into a store and asking the salesperson to describe the differences among 15 or 20 word processors. It's hard enough to get a handle on the current diversity of programs; further diversification would make that difficult situation impossible.

*David W. Kukuk
San Jose, California*

Ready for the Revolution

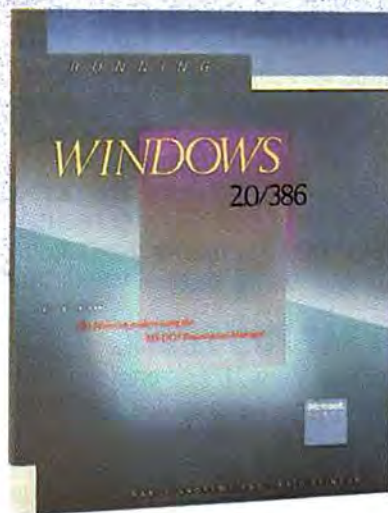
Thanks for making my day, Mr. Landry. I came home from work, sprawled on the couch, and stewed over the computer upgrade we're facing at the office. We need OS/2, PS/2, and the Micro Channel about as much as a hole in the head. Cursing IBM for pulling the same bait-and-switch maneuver with PCs that they pulled with mainframes, I turned to my March *PC World* and was greeted by your thoughts on the coming software revolution. Here's hoping you're right on target—and thanks for easing my worries, at least for today.

*Philip W. Namy
Bloomington, Indiana*

SQL Encore, Please

I was surprised by the short shrift William Urschel gave Software Systems Technology's Xdb ["Tomorrow's Data Bases (continues)"]

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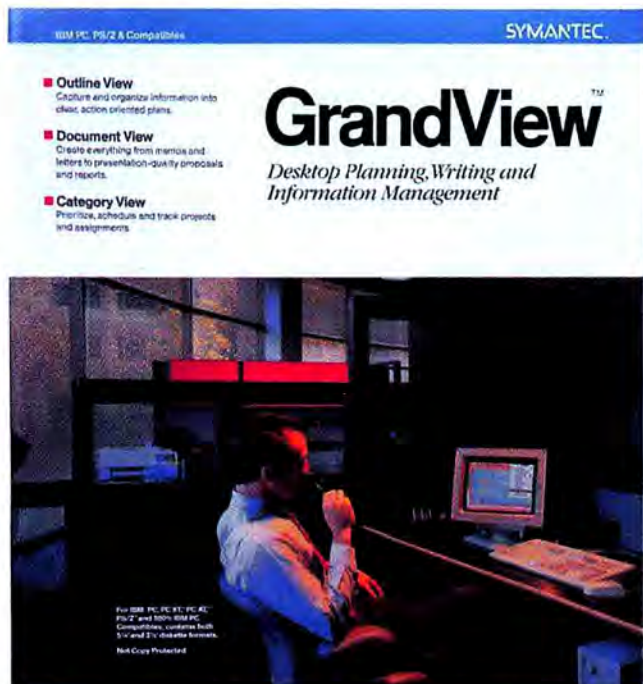
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Circle 84 on reader service card

Today," *PCW*, February 1988]. *Ingres* and *Informix-SQL* may have advantages over *Xdb* that justify their higher list prices, but those advantages are not readily apparent to the reader of Mr. Urschel's article. At about a third the price of *Ingres* and *Informix-SQL*, *Xdb* even compares favorably to *dBASE III Plus*, when you consider all the *dBASE* add-ons you would have to buy to match *Xdb*'s range of built-in features. *Xdb* deserves a closer look, particularly from those who claim to be arbiters of good software.

George Danziger
Amherst, Massachusetts

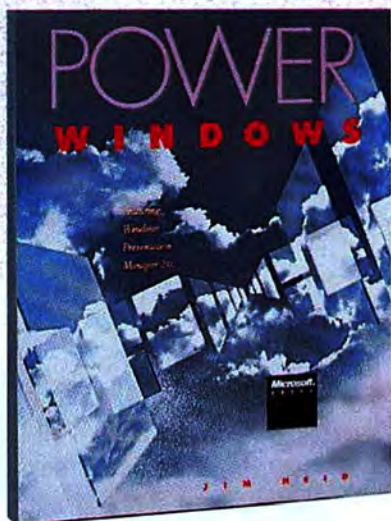
The Other One

Who is this Zachmann guy, anyway? He says smart things about computers and about IBM, but—is this the same William F. Zachmann who writes for *InfoWorld*? You see, your Zachmann is a clean-cut, friendly-looking chap with a Senator Paul Simon bow tie; theirs is a bearded hippie/college professor type. Have Zachmann's published opinions forced him into some sort of federal witness relocation program? You know, false beard, change of clothes, etc. If so, I'd like to point out that someone forgot one of the basics—changing his name.

Name withheld by request
Lyme, New Hampshire

In fact, *InfoWorld*'s Zachmann is the evil twin of our Zachmann. The two were separated at birth and, inexplicably, are both named William F. Zachmann. To further confuse mat-
(continues)

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Want to coax more speed, efficiency, and power out of Microsoft Windows 2.0 and Windows/386? Here's how. **POWER WINDOWS** is packed with ideas, information, dozens of great sample routines, and scores of tested techniques to help you: ■ streamline startup procedures, and disk- and file-management with MS-DOS Executive ■ combine the power of MS-DOS with the visual elegance of Windows ■ configure a fast, efficient hardware setup and determine your optimum memory needs ■ maximize Windows' multitasking and data exchange capabilities ■ customize your WIN.INI file ■ use a powerful PostScript printer with Windows ■ and more.

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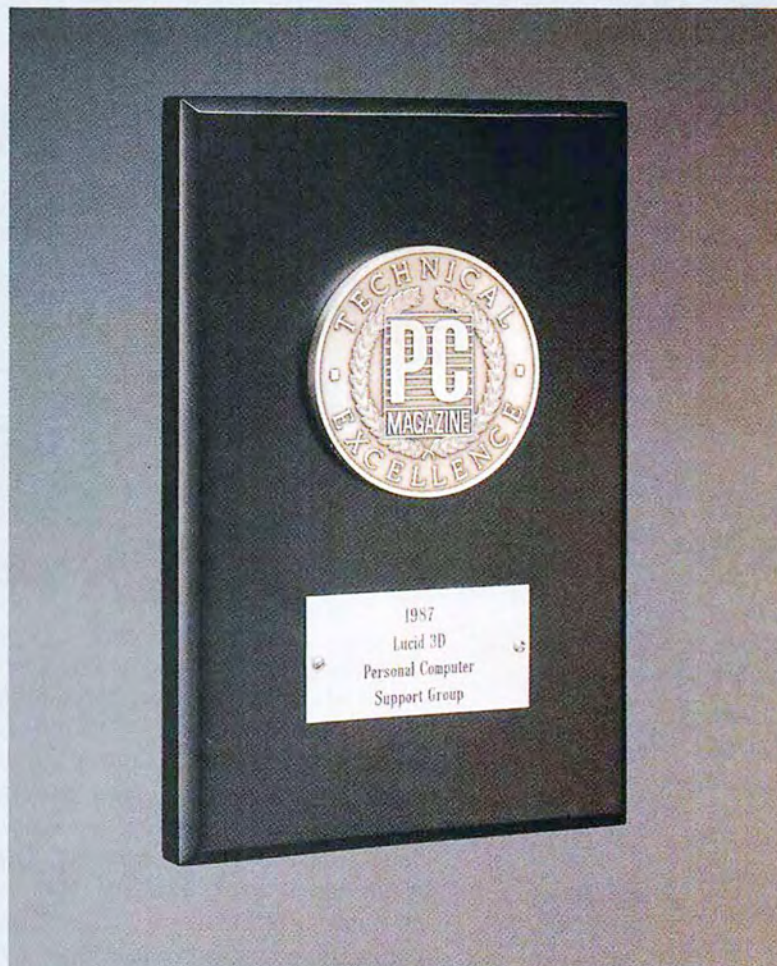
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Lucid is as simple as the pictures show. And you don't have to write formulas to do that. All you do is look at the other file, navigating through easy, point and shoot directories. When you come back up (with one key) the link is made automatically for you.

Everything about Lucid works that way. Users say "It is so intuitive that I really don't need a manual." That's because we use something we call a visual command menu. Jim Seymour, the noted PC columnist, talking about Lucid in a recent article said, "If there ever was an interface idea so good it ought to be stolen and widely used, this is it."

Memory Resident

You can pop Lucid up instantly while working in your word processor or any other program. You can cut anything on the screen and paste it right into Lucid, or cut anything from a Lucid worksheet and paste into the application below. You can even run Lucid on top of 1-2-3 if you like, and cut and paste information from one to the other, including formulas.

Notepad Behind Every Cell

Another 3-D feature is that any cell can also contain a multiple page note window that you instantly access with a single keystroke. You can write notes, memos or letters that relate to your work, save them as individual files and even print them separately or with your spreadsheet.

Other Features

Lucid has over 100 innovations that cause users to say it is the best of all the spreadsheet offerings! Things like: **Speed** - background, minimal and visible recalc. **Macros** - learning macros, autoexecute macros, macros work between spreadsheets, user defined macro menus. **Mouseability** - total Mac-like mouse access, but easy keyboard control as well. **Color or Mono** - 17 user controlled color displays. **Audit** - six displays and printouts. **Windows** - multiple sheets on screen at

same time. Multiple views of the same sheet. Pop-up windows of function formulas, range names, favorite labels, macro names, file names, even a calculator. All let you select and insert right



Fig. 2. Here we are instantly. Notice the lower left corner showing we are on level 2. Grey - takes you back. There is no limit to the levels you can go. Move right down to transaction level if you like.

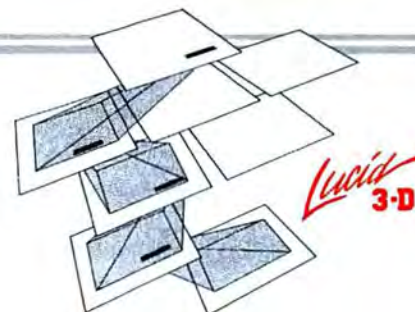
into your spreadsheet. All windows (even notes) resize and move where you want them. **Cut and Copy** - between spreadsheets, documents and between sessions. **Help** - press F1 anywhere, you get help specific to what you are doing.

Masterwork

Lucid is more than a bag of features. It is a masterwork. The overall feel is tight and polished. In fact, Paul Somerson, executive editor of PC Magazine, used one word to describe it, "Slick".

PCSG has built an excellent reputation as a developmental laboratory. Now those who have worked with Lucid 3-D tell us "you have done it again. This is software everyone should have."

Even if you don't plan to abandon 1-2-3, Lucid makes sense. Files are converted between them with ease so there's not



"The Best idea I've seen for a spreadsheet in years"

Jim Seymour, Columnist, PC Magazine, PC Week



Fig. 1. Let's get the detail on those ad costs, just move the widebar to that cell and press one key (grey +).

Co-Winner of the 1987
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Microsoft's Excel



Fig. 3. Of course, Lucid does multiple windows. Notice, you can simultaneously open windows in different directories, different drives, even down as many 3-D levels as you like. No one else can do that.

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Circle 201 on reader service card

ters, a third Zachmann—a sort of yuppie sea captain—has surfaced in the pages of our April 1988 issue. —Ed.

Devil Macros

Eric Alderman's description of the new *Word* macro capabilities ["Word 4.0: Fast at Last," *PCW*, February 1988] convinced me to go out and buy a copy. I was willing to tolerate the sluggishness of *Word*'s graphic display in exchange for the ability to view subscripts and superscripts on screen in their proper positions. To my dismay, however, I discovered that *Word*'s macros are worse than useless.

I created a macro that assigns <Alt>-B to the <F4> key for single-keystroke boldfacing (a

feature familiar to *WordPerfect* users). When I invoke the macro, the A: and B: drives both whir, followed 2 long seconds later by the message 'End of macro'. Any keystrokes entered during the 2-second gap are sucked irretrievably into the void. If you love a mystery, this program is for you. Otherwise, face Orem, Utah, and offer silent thanks to *WordPerfect* Corporation.

W. L. Brown
San Diego, California

Undeserved Praise

Microsoft should be castigated rather than praised for making *Word*'s macros prone to attacks of sleeping sickness. With a medium-size document and glossary loaded, macros often take many seconds to begin execution, an

annoyance that worsens when you're working near the end of a document. The program is a giant step backward for Microsoft.

Allan Fries
Seattle, Washington

Right Machine, Wrong Application

I've read and reread Paul Meyers' review of the PS/2 Model 25 and find that it mistakenly addresses a "business-think" audience. From my perspective (the world of K-12 education), the buying choice is clear: Either switch to powerful and economical DOS machines like the Model 25, or buy more of the incredibly limited Apple IIe's.

(continues)

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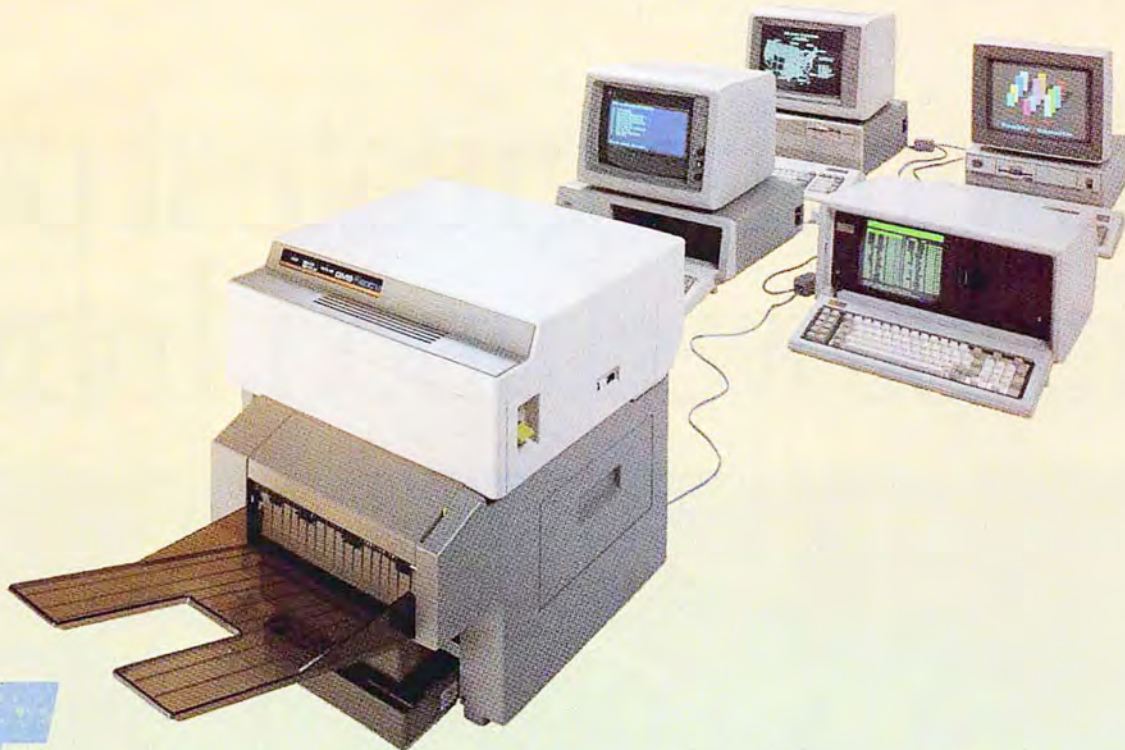
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Type casting The QMS-PS 800 II comes with 35 resident typefaces (you can download more if you like). PostScript allows you to scale type to virtually any size, from minuscule to mammoth. PostScript also enables you to design, and redesign, your documents with exacting detail. You have total control over the final appearance of documents, with the ability to place text and graphics anywhere on the page. In short, you get the complete desktop publishing power that only PostScript can give you.

Critical acclaim The QMS-PS 800 II is certain to receive rave reviews on your network. And for a single-user set-up, there's the QMS-PS 810 laser printer. For a demonstration of either, call **1-800-523-2696** for the location of the Laser Connection dealer nearest you. And be sure to ask for *The Sourcebook*™ – our exclusive catalog filled with the latest laser printer products and enhancements.

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lets you "illustrate" a point anywhere in your document. So whether you want to place an image in mid-sentence, alongside a

mances can be ing WordPerfect 5.0.



you create documents containing numerous type fonts and font sizes without having to change your margins, tabs or column definitions. You can also choose whatever



Parallel columns now extend past a page break automatically. And spacing can now be changed within a column.

typefaces your printer allows — from an assertive, extra-large times roman

bold to an elegant, extra-fine italic — and 5.0 makes all the necessary spacing adjustments automatically as you go.

If you're interested in a uniform look — in newsletters, for example — WordPerfect 5.0 has a new Style feature that lets you easily specify the format of your text. Styles are very flexible and can include size and font attributes, text, and other formatting specifications.

And WordPerfect 5.0 offers many other sophisticated advances. Like an improved Preview that shows you what your document will look like before you print; letting you see actual font sizes, proportional spacing and justification. It also lets you zoom in on details, display an entire page of text and graphics at once, or view facing pages together.

There's also the new Master Document feature, which allows you to combine files. So if you're compiling portions of a major pro-



WordPerfect 5.0's improved Preview feature lets you see what your document will look like before you print.

posal or putting together chapters of a book, you can assemble a table of contents and an index, generate references and print the entire document easily.

Additions also include automatic referencing, automatic redline and strikeout, an alternative mnemonic interface, enhanced macro and macro editing capabilities, and improved parallel columns.

Check out all that the new WordPerfect 5.0 has to offer. It's the powerful performer from the company that's produced the number-one selling word processor for over two years running. For more information, write to WordPerfect Corporation, 1555 North Technology Way, Orem, Utah 84057. Or call (801) 225-5000. (In Canada, 1-800-267-2499.)

EEEE
EEEEEE

Typefaces can be mixed at will — up to 250 on a single page, depending on printer capabilities. And print sizes span a wide range.



WordPerfect® Document Processing

Documents shown were printed on a Hewlett Packard LaserJet Series II printer. WordPerfect is a registered trademark of WordPerfect Corporation. All other brand and product names are trademarks or registered trademarks of their respective companies.

Circle 175 on reader service card

The Model 25's one-piece cabinet, 3½-inch floppies, and ability to run sophisticated software unavailable for the Apple make it a better value for that most common of personal computer buyers, the taxpayer. More important, the Model 25 is the kind of computer young users must be familiar with if they are to be employable in the 1990s.

Don Channing
Richmond, California

Computing Breakthrough Unnoticed

Given *PC World's* usual perceptiveness when it comes to changes in the personal computing industry, I was surprised

that no one saw the real significance of the emergence of products like *@Liberty* and *The Bal-er* ["Worksheets Without 1-2-3," *PCW*, March 1988]. With these packages' ability to produce programs as bulletproof as any compiled in C or BASIC, 1-2-3 has now acquired many of the capabilities of a sophisticated fourth-generation language. Compiled spreadsheet programs are easy to use, offer an intuitive—and for many people, familiar—interface, and are inexpensive to distribute. The topic seems as worthy of an editorial as any—how about it, Messrs. Bunnell and Landry?

Joe Nestor
Greenville, New Hampshire

Where's the Cache?

I was disappointed by performance benchmarks in *PC World's* February issue comparing 386-based computers that employ disk caching to others that do not. In "Deskpro Pushes the Limit," three machines that use disk caching are tested. However, "Surprise! Cheap 386s Deliver" pits five 386 clones not using disk caching against the Compaq Deskpro 386 and the IBM PS/2 Model 80, both of which use caching. Finally, *The Hardware Shelf's* review of Zenith's Z-386 Model 40 compares that computer, without caching, to the aforementioned Compaq and IBM machines—even though the review clearly states that Zenith includes a disk caching

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driver with DOS. Because computers that do not use caching software are at a disadvantage, I feel that the comparisons are misleading.

Alan Grattan
Brockville, Ontario
Canada

PC World's tests are intended to reflect real conditions in the computer market. The machines we test are all standard configurations as shipped by the manufacturer; when that standard configuration includes disk caching software, the computer is tested using caching. In the case of the Zenith Z-386, the system we reviewed did not include caching software, though Zenith included it with later versions of

the machine. As Mr. Grattan points out, the review does reflect this development, but fails to explain why caching was not running during tests. We regret the omission. —Ed.

Corrections and Clarifications

Charles Seiter's worksheet compiler review ("Worksheets Without 1-2-3," PCW, March 1988) incorrectly states that Brubaker Software's *The Baler* can't handle worksheets larger than 256 rows by 128 columns. Brubaker informs us that *The Baler* handles worksheets as big as 8192

rows by 256 columns, but addresses a maximum of 32,000 cells, which may be distributed throughout the worksheet.

The \$2395 price listed for the Silent Partner BIOS 286 AT (*The Hardware Shelf*, PCW, February 1988) was incorrect. Distribution + Plus, the distributor, reduced the computer's price to \$1695 in December 1987.

Letters should be mailed to Letters, PC World, 501 Second St., San Francisco, CA 94107, or sent electronically to MCI Mail PCWORLD/179-3813, Compu-Serve 74055,412, or The Source STE908. All letters must include the writer's name, city, and state and should not exceed one double-spaced typewritten page. We reserve the right to edit letters. ●

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Circle 74 on reader service card

Because.



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Which means it's as fast as most 386 computers, running MS⁺ OS/2 and MS⁺ DOS at blistering speed. All from a tiny little corner of your desk.

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—Al Poor, Editor's Choice, PC Magazine

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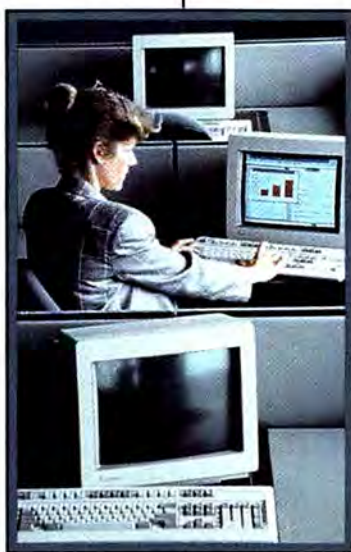
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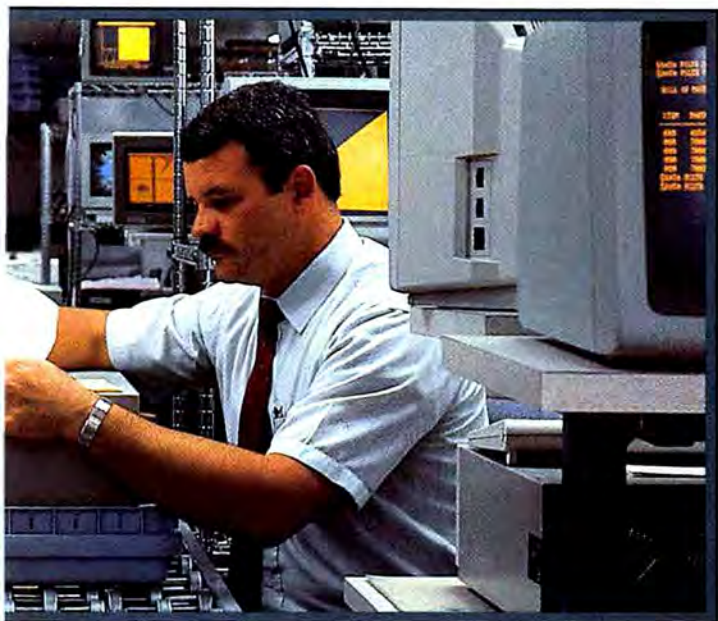
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—Eric Knorr, PC World



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Dell products are available on GSA contract #GS00K87AGS6127. Call us to get GSA pricing.

THE NEW SYSTEM 310.

The top of the line. It's the highest performance 80386 computer available, faster than the IBM[®] PS/2[™] Model 80 and the Compaq[™] 386/20. It runs at 20 MHz, with the latest 32-bit architecture for complete MS[™] OS/2 compatibility and maximum performance. Since it also has Intel's[™] Advanced 82385 Cache Memory Controller, and high performance disk drives, the System 310 is ideal for intensive database management, complex research and development, CAD/CAM, and desktop publishing. As a network file server the system offers an unbeatable combination of price and performance.

Standard Features:

Intel[®] 80386 microprocessor running at 20 MHz.
1 MB of 80 ns 32-bit RAM expandable to 16 MB without using an expansion slot.
Advanced Intel 82385 Cache Memory Controller with 32 KB of high speed static RAM.
Socket for 20 MHz 80387 coprocessor.
5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
Dual diskette and hard disk drive controller.
Enhanced 101-key keyboard.
1 parallel and 2 serial ports.
200-watt power supply.
Real-time clock.
8 expansion slots (6 available with hard disk drive controller and video adapter installed).
Dell System Analyzer.
MS-DOS and MS OS/2 compatible.
Security lock with locking chassis.
12 month on-site service contract (Available on complete systems).
Options:
1 MB RAM upgrade kit.
20 MHz Intel 80387 math coprocessor.
2 MB or 8 MB memory expansion boards.

SYSTEM 310	With Monitor and Adapter		
Hard Disk Drives	VGA Mono	VGA Color	VGA Color Plus
40 MB-28 ms	\$3,799	\$3,999	\$4,099
90 MB-18 ms ESDI	\$4,599	\$4,799	\$4,899
150 MB-18 ms ESDI	\$5,099	\$5,299	\$5,399
322 MB-18 ms ESDI	\$7,099	\$7,299	\$7,399



THE NEW SYSTEM 220.

As fast as most 386 computers, at less than half the price—more power for the money than any other system. An 80286 system that runs at 20 MHz, with less than one wait state. Completely compatible for both MS-DOS and MS OS/2 applications (it runs OS/2 faster than IBM PS/2 Model 80), and with a remarkably small footprint, the System 220 is the ideal executive workstation for database management, business, or sophisticated connectivity applications. The system uses page-mode interleaved memory; the page-mode RAM operates at less than one wait state, and inter-leaving results in a performance increase of about 15 percent.

Standard Features:

80286 microprocessor running at 20 MHz.
1 MB of RAM expandable to 16 MB (8 MB on system board).
Integrated diskette and VGA video controller on system board.
One 3.5" 1.44 MB diskette drive.
Integrated high performance hard disk interface on system board.
Enhanced 101-key keyboard.
1 parallel and 2 serial ports.
LIM 4.0 support for memory over 1 MB.
Real-time clock.
Three full-sized AT[™] compatible expansion slots.
Socket for 80287 coprocessor.
Dell System Analyzer.
MS-DOS and MS OS/2 compatible.
Security lock with locking chassis.
12 month on-site service contract (Available on complete systems).
Options:
3.5" 1.44 MB diskette drive.
Intel 80287 coprocessor.
1 MB RAM upgrade kits.

SYSTEM 220	With Monitor		
	VGA Mono	VGA Color	VGA Color Plus
One Diskette Drive	\$1,799	\$1,999	\$2,099
40 MB-29 ms Hard Disk	\$2,499	\$2,699	\$2,799
100 MB-29 ms Hard Disk	\$3,399	\$3,599	\$3,699



THE NEW SYSTEM 200.

A great value in a full-featured AT compatible. An 80286 computer running at 12.5 MHz, this system is completely MS OS/2 compatible. It's ideal for general business applications, as well as software development, local area networks, CAD/CAM, and desktop publishing. The System 200 offers high speed drive options, industry standard compatible BIOS, and on-site service. At these low prices, the System 200 is the best value in the 80286 marketplace. As Executive Computing said of this computer's predecessor, "If faster processing speed and low cost are two key issues affecting your purchase decision, this machine might be the ideal choice for your office."

Standard Features:

Intel 80286 microprocessor running at 12.5 MHz.

640 KB of RAM, expandable to 16 MB (4.6 MB on system board.)

5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.

Dual diskette and hard disk drive controller.

Enhanced 101-key keyboard.

1 parallel and 2 serial ports.

200-watt power supply.

Real-time clock.

6 expansion slots. (4 available with hard disk drive controller and video adapter installed.)

Socket for 8 MHz 80287 coprocessor.

Dell System Analyzer.

MS-DOS & MS OS/2 compatible.

Security lock with locking chassis.

12-month on-site service contract (Available on complete systems).

Options:

512 KB RAM upgrade kit.

8 MHz Intel 80287 coprocessor.

SYSTEM 200 With Monitor and Adapter				
Hard Disk Drives	Mono	VGA Mono	VGA Color	VGA Color Plus
20 MB	\$1,799	\$1,999	\$2,199	\$2,299
40 MB-40 ms	\$1,999	\$2,199	\$2,399	\$2,499
40 MB-28 ms	\$2,199	\$2,399	\$2,599	\$2,699
90 MB-18 ms ESDI	\$2,999	\$3,199	\$3,399	\$3,499
150 MB 18 ms ESDI	\$3,499	\$3,699	\$3,899	\$3,999
322 MB 18 ms ESDI	\$5,499	\$5,699	\$5,899	\$5,999



THE SYSTEM 100.

A full-featured, yet economical one-piece computer for office, school, or home. This system is fast, easy to use, and ready to run with Dell Enhanced MS-DOS 3.3, Microsoft DOS Manager, and Microsoft Works software—more than a \$400 value, included at no extra charge. Complete MS-DOS compatibility means you can run thousands of programs for business, personal finance, education, and entertainment. And the System 100 can grow, with the high quality options listed below. A price leader in 8088 technology, the System 100 boasts an innovative design that allows for more power, speed and convenience than most of its competitors.

Standard Features:

Intel 8088 microprocessor running at 9.54 MHz selectable to 4.77.

640 KB of RAM.

3.5" 720 KB diskette drive.

Diskette drive controller integrated on system board.

Integrated high-quality 84-key keyboard.

1 serial and 1 parallel port.

Two full-sized expansion slots available when video adapter is installed.

One half-sized expansion slot used for video adapter.

Socket for 8 MHz 8087 coprocessor.

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Security Tie-Down bracket.

Dell Enhanced MS-DOS 3.3

Microsoft DOS Manager,

Microsoft Works.

Options:

3.5" 720 KB diskette drive.

8 MHz Intel 8087.

SYSTEM 100 With Monitor and Adapter				
	Mono-chrome	CGA Color	VGA Mono	VGA Color
720 KB Diskette Drive	\$799	\$899	\$999	\$1,199
Two 720 KB Diskette Drives	\$949	\$1,049	\$1,149	\$1,349
20 MB Hard Disk	\$1,299	\$1,399	\$1,499	\$1,699



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Stuart Alsop, P.C. Letter.

"PagePerfect offers a combination of word processing and desktop publishing that's hard to beat.

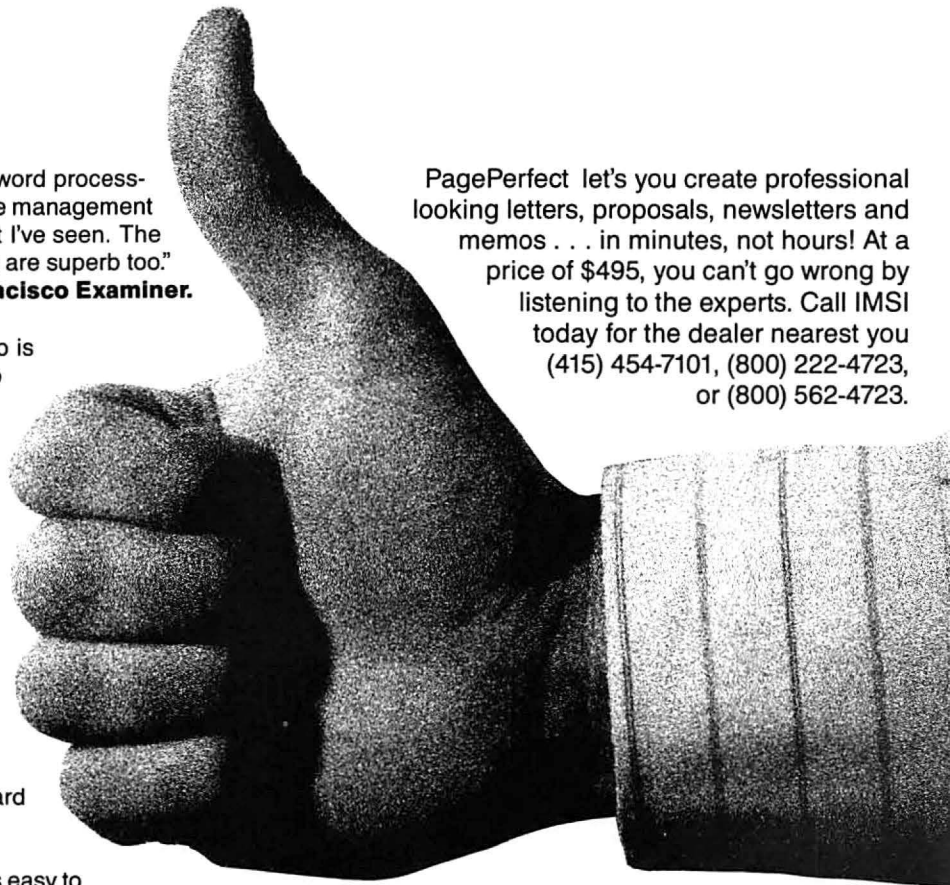
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**Richard
Landry**

Our on-again, off-again relationship with integrated software is heating up once more. It started in 1984 when Lotus introduced *Symphony* and Ashton-Tate brought out *Framework*, two complex products that promised advanced multitasking under DOS but ended up enjoying only lukewarm acceptance among power users. Today, easy-to-use products like *Microsoft Works* and *PFS: First Choice* are fostering a renaissance of the genre among new users, executives with limited computer needs, and office-at-home workers. But users of all stripes still harbor the suspicion that their specialized computing needs can't remain satisfied for long by any sort of integrated package.

On the face of it, this reasoning seems sound. For one thing, integrated software doesn't respect the training investment companies have made in stand-alone packages. Users who've mastered *1-2-3* or *WordPerfect* become novices all over again when they start using integrated products. More troubling, integrated software may introduce incompatibility with the mission-critical applications that tend to drive a business (the *dBASE* customer list, for example). In short, integrated software may seem to offer an attractive all-in-one solution for entry-level users,

but its practical advantages vanish in the real world of work.

As prevalent as that view is, though, it doesn't reflect the reality of integrated software today. New versions of the most popular integrated packages reveal their manufacturers' growing concern for adherence to industry standards. And some packages are emerging as core products around which software developers are building their entire product strategies. As a result, smart buyers are taking a second look at the role integrated software can play in their companies' overall purchase plans.

Take American Airlines. What would possess that company to license *Microsoft Works* for more than 12,000 file servers connecting its much-publicized diskless PS/2 Model 30s? Look beyond the economy of buying a \$195 package that performs four of the most common PC applications—word processing, spreadsheet, data base, and communications—and you'll see that *Works*' most immediate attraction is its IBM SAA-style interface. In character mode *Works* looks, feels, and smells like the graphics-based *Windows* or the upcoming OS/2 Presentation Manager.

(continues)

So what? For Big Blue shops, *Works*' visual similarity to the Presentation Manager translates into a low-cost way to get staff up and running on the next generation of application software. If and when American Airlines purchases the high-powered hardware necessary to run OS/2 applications, its employees will already possess the basic knowledge of how such applications work.

Something more: Staff will have a chance to taste the benefits of multitasking firsthand. That's a new way of working for most PC users, and the degree to which multitasking improves productivity is the critical issue in deciding whether companies will get sufficient bang from the hardware buck that OS/2 requires.

But similarity to big-time applications is just part of the formula that's making integrated software look more and more attractive. A more significant issue is the degree of compatibility between multitasking packages and the stand-alone products that set software standards.

Despite their success among entry-level users, *Works* and Software Publishing's *PFS: First Choice* have only limited ties to the upscale world. *Works* can read 1-2-3 release 1A files but has to convert release 2 files to 1A format. Moreover, it can't read *WordPerfect* files, and even has to convert word processing files from Microsoft's own *Word*. *First Choice* can produce files readable by Software Publishing

products *First Publisher*, *Professional Write*, and *Harvard Graphics*, but that's about it. Even *Symphony* has some problems here. It can read and write files from its 1-2-3 sibling, but not from *dBASE*.

Alpha Software's new integrated package, *AlphaWorks*, goes them all one better by being file compatible with every version of 1-2-3 as well as *dBASE III*. That means that not only can *AlphaWorks* users access *dBASE* and 1-2-3 files for queries, reports, or "what-if" scenarios, but they also can integrate the resulting *AlphaWorks* files into their mission-critical applications. That capability eliminates one of the most obvious objections to integrated packages: a poor upgrade path to the most popular high-powered stand-alone programs.

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But even Alpha's approach seems tame compared to the strategy Ashton-Tate has in mind for its newly introduced *Framework III* (see "Ashton-Tate Positions for Spreadsheet Wars" in this issue's *Top of the News*). As Ashton-Tate officials recently explained, *Framework III* is designed as a stepping-stone to a broader family of decision-support products that will share an affinity for *dBASE*. "We don't consider spreadsheets to be the fulfillment of the promise of decision support," says Ashton-Tate executive vice president Roy Folk, making a back-handed reference to Lotus's plans for broadening the role of *1-2-3*.

Instead, in a world increasingly dominated by data bases,

Framework III will serve as the DOS user's doorway to data residing in *dBASE IV*. Beyond that, *Framework* users will be able to go through *dBASE IV* under OS/2 to access mainframe information by means of the Ashton-Tate/Microsoft *SQL/Server*.

Such capabilities define the benefits that multitasking decision-support software can deliver—an analytical view of the vital production information that determines the health of an enterprise, and better communication among decision makers by means of reports, graphs, and electronic mail. By the way, *Framework III* can read/write 1-2-3 files as well as *dBASE* files, and it performs transparent, background conversions between its files and those of many popular word processors, including *WordStar* and *WordPerfect*.

Framework III's example underscores the role OS/2 should play in the office, at least in the near term: as a LAN operating system connecting DOS workstations and sharing data among them. Integrated software is only one of the ways for DOS users to efficiently tap the power of OS/2, but it's also one of the most sophisticated. And the benefit of lowered hardware costs is only the beginning.

As always, I'm interested in your opinions on this or any other subject. Write to me at *PC World*, 501 Second St., San Francisco, CA 94107, or send an MCI message to Richard Landry/301-3685. ●

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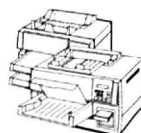
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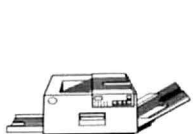
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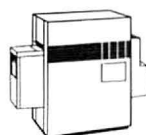
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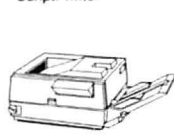
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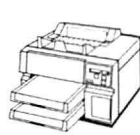
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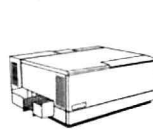
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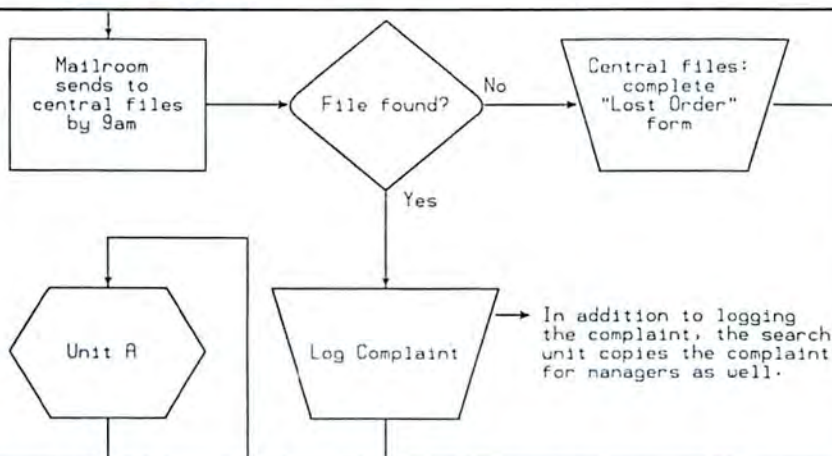
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* March 10, 1987 issue, page 278

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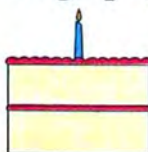


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I Was a Network Administrator!

Stewart Alsop nearly drowns
in a sea of network strategies—

and lives to tell the tale.



Stewart
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To tell you the truth, I didn't think local area networks were that big a deal at first. Mostly I thought the only people who got excited by networks were systems analysts and nerds. As far as I was concerned, networks were a whole new language. And since I failed German in college, I wasn't about to tackle something that involved LANs, LU 6.2s, twisted pairs, topologies, token rings, and other foreign terms.

It happened just like in the supermarket tabloids. First, I acquired a laser printer. Then others in my three-person office wanted access to it, so we decided to plug it in to a network. But the only person who knew anything about computers was me, so I was elected to set up the network.

I decided to keep things cheap and simple and use a low-speed network that would run on twisted-pair cabling—so I could “use the extra wires in the phone system” (as several reviews so succinctly put it). We were moving into a new office, so we could just piggyback on the phones we were installing and not have those unsightly wires lying around on the floor or snaking into the ceiling. And speed didn't matter so much since all we wanted was to give more than

one person direct access to the laser printer.

After moving in we discovered that the telephone installer had decided to be efficient and use the extra pairs of wires for the telephones. Nobody had told this person about computer networks and how telephones always had an extra pair of wires. We had one wire that carried two phone lines into our two-line phones. Plus we had two other, separate phone lines, one each for the facsimile machine and the modem. The installer got away with two two-pair cables, splitting the second between the facsimile machine and the modem.

So I bit the bullet. Using my exhaustive technical training (a glance at the manual), I installed twisted-pair cabling through the ceiling, doing my best to get the wire to hang down unobtrusively in the corners. Boy, did I feel great the first time I got a laser printer 30 feet away from my computer to print out a document. I had, all by myself, installed a three-node network—after only 3 hours of sweating and inhaling asbestos-like ceiling insulation. I was an expert, for goodness' sake!

(continues)

It was cool, printing pages over the network. At first, I used to run over to the printer to see if I could beat the little blinking light. (I couldn't.) Then we discovered the concept of shared disk space. There are software packages that actually let you share a hard disk that's attached to another computer. The network program we used didn't require us to dedicate a whole machine to be the server (which keeps track of what's happening to the various hard disks, printers, and other devices on the network). Instead, this program lets any user configure his or her machine so that it becomes a server for any other machine, which is a very free-enterprise approach to network management.

In no time we were merrily backing up our important files over the network, which was somewhat faster than using floppy disks. And we felt justified in getting a 40MB hard disk to share in addition to our personal 20s. Pretty soon, we had an awesome 100MB of disk storage on line.

Then we discovered electronic mail. Oh, boy! We could send messages to each other without getting out of our chairs. I discovered I could send notes to myself about deadlines. But electronic mail actually requires a lot of organization, since you want all your messages collected in one spot so that your machine doesn't always have to be logged on. Many mail packages require a dedicated computer in order to work right. We found one that didn't.

What people don't tell you when they are acting like experts is exactly where those wires are supposed to go.

We did discover that whoever had the server program on his or her machine had a hard time getting any work done, since the machine would slow to a crawl whenever someone else sent or read a message. So we bit the bullet again and set a machine aside to become the mail server (using the shared 40MB hard disk). Now we had five nodes (three people, one printer, one mail server) with 100MB of on-line storage. We had built this network up in the space of six months. We eliminated pink message slips from the office, since anybody who answered the phone could just send an electronic message to the person who missed the call. We were gaining weight because we weren't getting as much exercise, but we were spending more time in front of our computers and getting more work done each day.

I read somewhere that I was basically the equivalent of a network administrator. I began to

get a sense of overarching power and mastery. A network administrator. Wow! Why stop there? Why not think of our system as an information center? I began sitting in front of other people's machines at night and updating their software, making sure they were good citizens on the network.

Then we found out we had to move again, because we were hiring another person and needed more room for product demonstrations and meetings. Now, as any good network administrator will tell you, the absolutely best time to over-specify a network is when you're doing construction, since the walls are open to accept wiring.

It was clear to me, newly minted expert, that we needed to plan for a high-speed network that could eventually manage our prospect and customer data using multiuser, relational data bases with 4GL application development capabilities for specialized tasks. (We had been using a simple flat-file data manager.) It was also clear that the way to go, again, was to use twisted-pair cabling, but for Ethernet this time. Ethernet is well established, supported by everybody but IBM, and runs at 10 megabits per second, which is two and a half times faster than the next fastest "standard" network. So why pussyfoot around?

Everybody I talked to who seemed to know what they were talking about said the same thing: Put in six extra pairs of twisted-pair wire, beyond what *(continues)*

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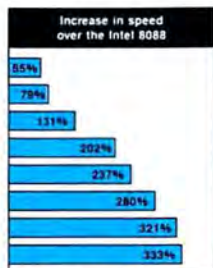
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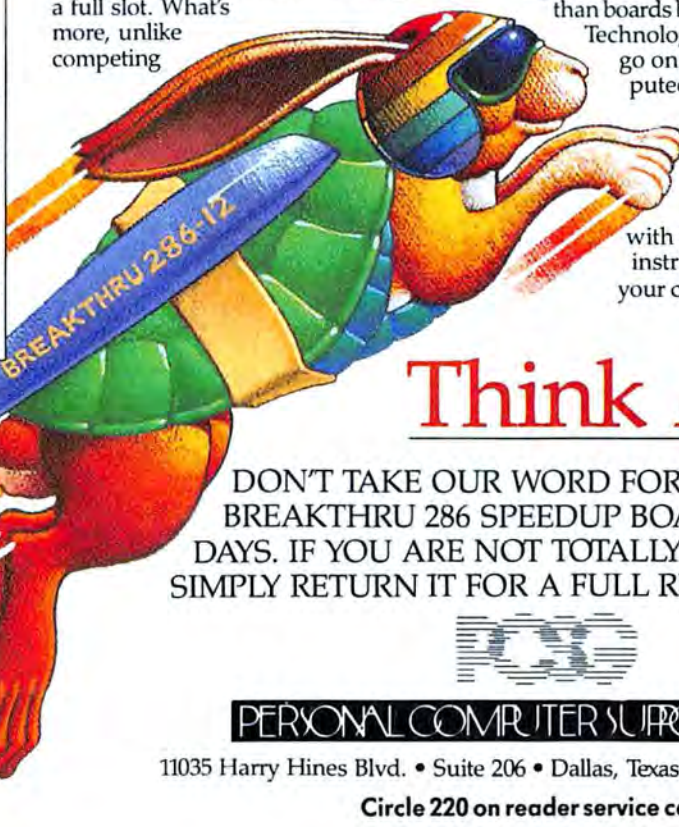
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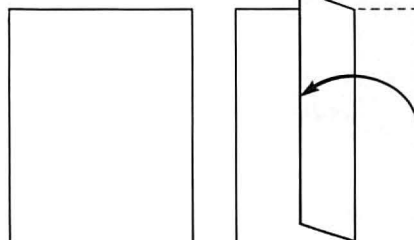
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you need for the telephones. That seemed straightforward enough. After we decided what telephone system to install, we just ordered up another six pairs of wire. But since telephone wire that is installed in business systems seems to come in four-pair cables instead of the two-pair cables that most homes are wired with, we ordered eight pairs.

What people don't tell you when they are acting like experts is exactly where those wires are supposed to go. Another thing they don't tell you is that the people who put telephone wire into walls don't know diddly about computers, networks, modems, facsimile devices, or any other technology that doesn't end in p-h-o-n-e. I can tell you one thing, though. I was bound and determined that these telephone people wouldn't steal my network wires again!

Our little low-speed network was running on what's formally called a bus topology, which means that the network signals run down one wire that's not connected to anything else except the devices on the network. So I confidently told the telephone installer that I wanted the network wires (as opposed to the phone, facsimile, or modem wires) to be a bus. He nearly left the building looking for a bus stop, so I made it real clear: I told him that I wanted four cables, each with a pair of wires, to run from one office to another without even touching the phone wires.

That all sounds neat, but guess what? My mania had finally gone overboard. Twisted-pair Ethernet runs on a ring or star

topology, but not on a bus. So now we have about \$1000 worth of twisted-pair cable sitting inside our nice brand-new walls that is mostly useless to our existing network (since it needs only one of those eight pairs), our future network (since the wires are laid out in the wrong topology), and our telephone system (since phone systems use a star topology). I was ruined. My self-image as an expert and industry guru was dashed. Clearly I didn't have what it took to be a true network administrator.

But I did survive. Yes, we've now replaced all our machines with 32-bit computers using at least 40MB of disk space locally, and replaced the old mail server with another 40MB of disk space. We now have a total of 200MB of disk space on line. But we're still using our old slow-speed network and our old single-file data base (although we've heard rumors that the next version of the program will give us multiuser access to our files). And we have gotten rid of those unsightly wires hanging from the ceiling. But I'm back to thinking of myself as just a plain user. I don't try to talk to telephone people anymore. And I don't muck around with other people's machines, even if their owners ask for help. ●

Stewart Alsop is editor and publisher of P.C. Letter and a contributing editor for PC World.

How Farsighted Executives Are Using Their PC's For The Fun Of Profit.

By William J. Spink

For years now you've been hearing about the wonderful things personal computers will do for The Executive of the 80's—at least in theory.

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"No problem," according to Posner.

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Walt Casey agrees. "Dow Jones News/Retrieval is simple enough for anyone who's at all comfortable with computers to use it effectively from their very first day online."

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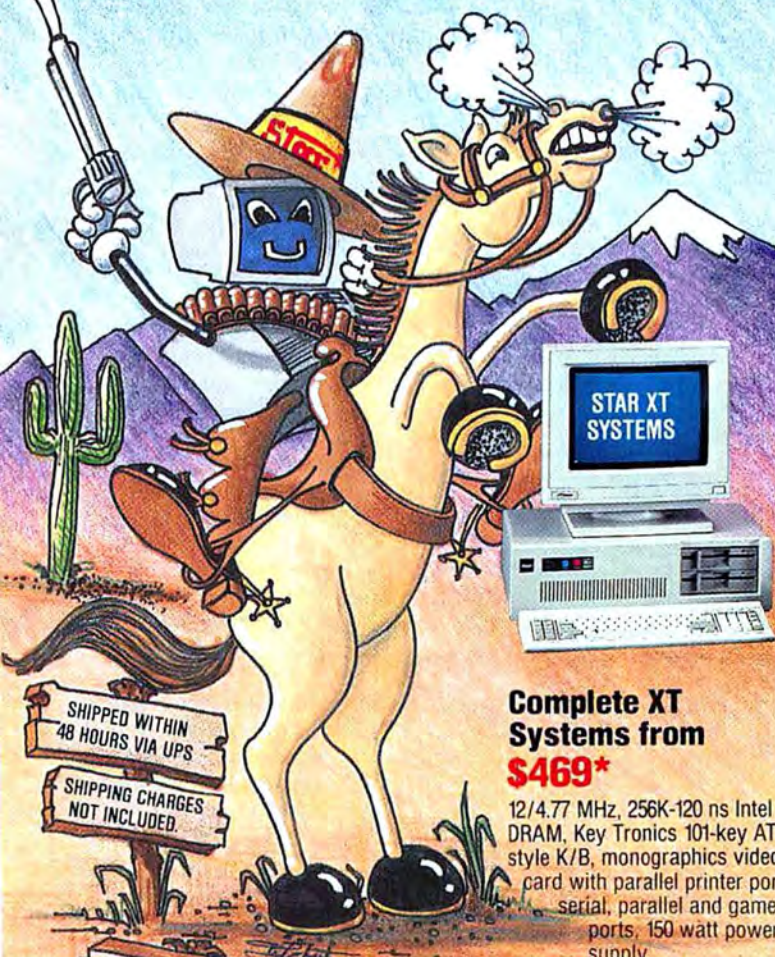
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OS/2 Extended Edition and IBM's PS/2 Strategy

IBM loyalists, brace yourself for a shock!

As the details of OS/2 Extended Edition emerge, it's uncertain whether the PS/2 will have the power to make it a viable solution for more than a handful of users.



William
F. Zachmann

With the announced July 1988 delivery date for IBM's OS/2 Extended Edition 1.0 just around the corner, this is a good time to take stock of IBM's PS/2 strategy and the role OS/2 Extended Edition will play. The key lesson seems to be that things don't always work out the way you would like, even if you're the world's largest computer company.

The Best-Laid Plans

With the original PC, XT, and AT, IBM had made a mistake by creating an easily duplicated de facto standard. The result was wide-open competition, with hundreds of vendors offering products with some combination of better features or lower prices. It wasn't a mistake IBM intended to make again.

The solution, taken from the lessons of Apple's proprietary Macintosh and DEC's proprietary VAX bus, looked easy. IBM would simply use its considerable engineering talent to build a system that would be technically difficult and legally impossible to copy.

The first step in IBM's strategy was the Micro Channel Architecture (MCA), which was built into the original PS/2 Models 50, 60, and 80. Incorporating lots of copyrighted and patented

technology, the MCA was meant to enable IBM to sue anybody who tried to copy the architecture without IBM's permission.

The company would thus prevent all other vendors from building compatible systems. Or, if it chose to, IBM could selectively license the MCA to anyone who did not pose a major competitive threat, or license it under terms and conditions that would accomplish that end.

IBM's saber rattling about MCA clones shows that it isn't interested in making the MCA a standard in the true sense of the word. International standards bodies require that if any standard incorporates, for example, valid patents, those patents must be licensed on a nondiscriminatory basis at reasonable fees before the standard can be adopted. IBM clearly had no intention of creating such a standard with the PS/2 MCA; the point was precisely to prevent that.

The second step in IBM's strategy was OS/2 Extended Edition. Unlike OS/2 Standard Edition, which Microsoft has the right to license to every other vendor in the world, OS/2 Extended Edition is strictly an IBM

(continues)

product that won't be available from any other vendor.

Since OS/2 Extended Edition can run effectively only on IBM PS/2 systems incorporating the Micro Channel Architecture, it requires either an IBM-built PS/2 or what amounts to a 100 percent compatible. And as long as IBM's intellectual property rights over the patents, copyrights, and trade secrets incorporated in the MCA are effective, no other vendor can build a system capable of running OS/2 Extended Edition—unless IBM lets them.

So as long as IBM is able to convince customers they need OS/2 Extended Edition, the company will be in the driver's seat. Unfortunately for IBM, however, the whole plan looks like it's coming thoroughly unstuck.

In the first place, OS/2 Extended Edition is going to require lots more resources than most PS/2s have got. Second, OS/2 Extended Edition really doesn't offer users much more power than the DOS systems they've been using for some time. Third, independent software vendors are clearly prepared to offer users of industry-standard AT-compatible systems all the capabilities of OS/2 Extended Edition at much lower costs and with much more modest processing, memory, and secondary storage requirements.

The 386 Connection

OS/2 Extended Edition obviously suffers from the same basic problems that will prevent OS/2 generally from being very useful to most users in the short run. Fundamentally, OS/2, although written for the "brain damaged" Intel 286 processor, can't really

Even the Model 60 can't deliver satisfactory performance with OS/2 Extended Edition.

deliver satisfactory performance on a 286-based system.

Of course, it will run on a 286-based system. But then *Microsoft Windows* version 1.0 ran on an XT or compatible with CGA graphics. Nobody used it, however, because the performance was poor compared to what you could get if you ran programs directly under DOS. OS/2 suffers from much the same problem on a 286-based system. It needs at least the power of a 386 to deliver the level of performance that's currently acceptable.

OS/2 Extended Edition, even in the 1.0 version lacking the Presentation Manager, requires more processor cycles, memory, and secondary storage than the Standard Edition. When the Presentation Manager is added in version 1.1, it will require even more.

It has always been understood that OS/2 Extended Edition wouldn't run on an IBM PS/2 Model 50. The fine print in IBM's announcement letters made that clear last April. However, even the Model 60 can't deliver satisfactory performance with OS/2 Extended Edition. A 10-MHz Intel 286-based system—in fact, *any* 286-based system—isn't really up to the task.

Even if Model 60 owners are willing to spend enough to buy

the extra memory (and maybe disk capacity) necessary to run OS/2 Extended Edition, they are still stuck with a system that's too slow for real-life use. That means that nearly 95 percent of the IBM PS/2s sold in 1987 can't run OS/2 Extended Edition with satisfactory performance.

Worse, OS/2 Extended Edition hardly does anything that makes it worth the bother anyway. It doesn't give you much more than do OS/2 upgraded versions of standard products written for MS-DOS. The Data Base Manager offers a level of functionality that can't compete even with Symantec's Q&A. Nearly every other data base management system offers or will shortly offer more powerful relational capabilities.

At the same time, the OS/2 Extended Communications Manager offers little beyond a reinstatement of the communications capabilities already available under DOS. And limitations of the OS/2 DOS "compatibility box" make it difficult (if not impossible) to run standard MS-DOS communications applications under OS/2.

Future Shock

It's increasingly evident that there won't be much reason for the majority of users to migrate to OS/2 until late 1989 or 1990, when a 386-specific version becomes available to run on systems truly capable of delivering adequate performance with OS/2. In the meantime, most OS/2 users will find that data base and communications products from third-party software vendors offer more power at lower costs than does IBM's OS/2 Extended Edition.

(continues)

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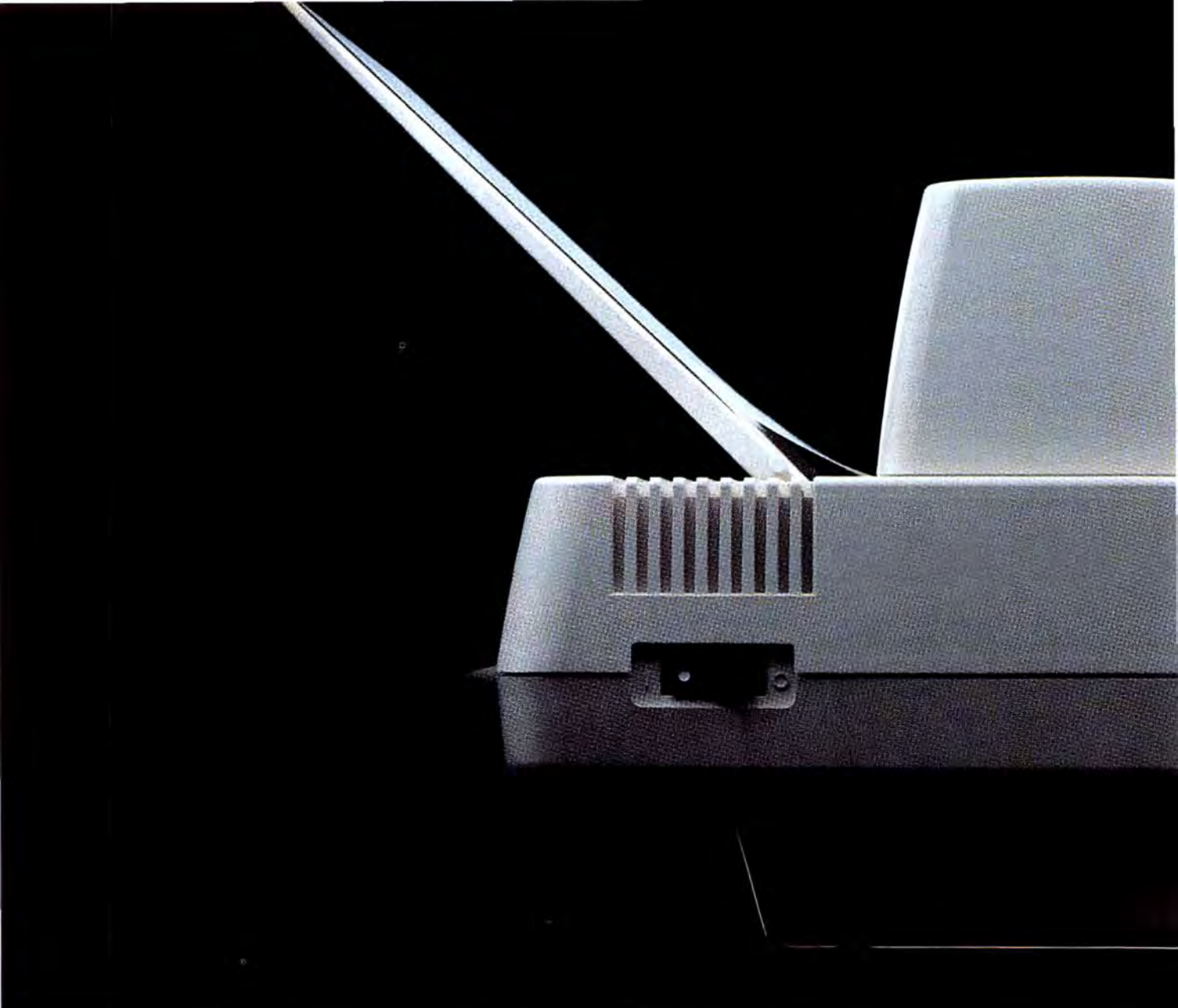
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The unhappy result for IBM is that OS/2 Extended Edition fails to provide a real incentive for users to buy IBM's proprietary Micro Channel Architecture machines any time soon. Worse, those who purchased an IBM PS/2 Model 50 or 60 assuming that they were climbing on the

bandwagon will discover their system really hasn't got the horsepower to deliver more than they could have had at a lower cost on an AT compatible.

It's no accident that IBM's advertising campaign early this year avoided specifics about individual products and proclaimed that IBM addressed "the bigger

picture." That is the kind of approach vendors take once it becomes clear that their products don't really stack up against the competition or that the overall product strategy isn't working.

While a "concept sell" of OS/2 Extended Edition to corporate executives may work in a few iso-



lated instances, it isn't going to persuade the majority of the people who have to do the real work of implementing information systems in those organizations. The result is likely to be that IBM will continue to lose ground to a growing array of competitors.

Until IBM stops devoting so much effort to trying to eliminate competition and starts working harder to build better products than its competitors do, the company will face an accelerating downward spiral affecting all aspects of its business. If IBM OS/2 Extended Edition is the best the company can come

up with, it is unlikely that IBM will preserve the leadership role that so many still expect from the behemoth of Armonk. ●

William F. Zachmann is senior vice president at International Data Corporation.



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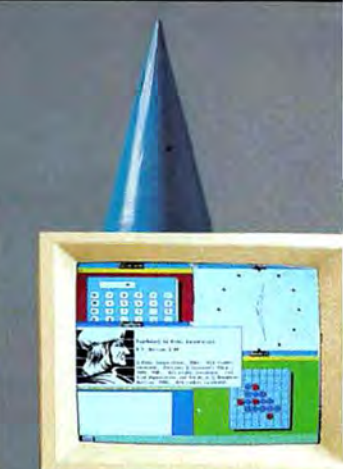
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INDUSTRY **IO** OUTLOOK

Edited by ERIC BENDER

Suit Stuns Developers

Microsoft, Hewlett-Packard Resist Big Mac Attack

Apple Fights for Software Edge



Apple's lawsuit attacked both Microsoft Windows and HP's NewWave (above), an environment that trains friendly "agents" to automate tasks across applications.

By suddenly slapping a copyright-infringement lawsuit on Microsoft and Hewlett-Packard, Apple Computer attacked its largest software supplier and provoked such an outcry from other developers that Apple CEO John Sculley was rumored to have removed "Chief Listener" from his business cards.

Apple claims that both Microsoft Windows 2.03 and HP's NewWave, an application environment built on top of Windows, encroach on its copyrights for Macintosh visual displays. Microsoft executives express mystification, denying any in-

fringement and pointing to a 1985 licensing agreement in which Apple cleared the way for Windows 1.0. "That agreement covers visual displays, and we are in full compliance," declares William Neukon, vice president of law and corporate affairs.

"It's not clear what Apple is objecting to," remarks Bob Frankenberg, general manager of HP's information systems group. "If it's windows, we don't think Apple originated those; we had a product in the mid-seventies, and many other people did too. If it's icons, that's not a big issue; we can modify them."

Windows 2.0 was unveiled almost a year before the suit was filed and differs little from its predecessor except in the use of overlapping, rather than tiled, windows. This led to widespread speculation that the ultimate target of the suit is IBM—whose OS/2 Presentation Manager, a joint project with Microsoft and a direct descendant of Windows, is due this fall. Apple's move may also mean doom for the expected Macintosh hardware clones.

The courts have issued few—and sometimes conflicting—rulings on intellectual property rights for software. At press time no one could confidently predict the case's outcome, although most anticipate an out-of-court agreement, with cosmetic changes to the software in question. That was the result after Apple threatened to sue Digital Research over its GEM environment in 1985. The GEM rollout faltered during the resulting delay.

Developers are nearly unanimous in their condemnation of Apple's move, but they don't shrug it off. Mark Zachmann, chairman of Z-Soft, sums up the common attitude. His firm is going ahead with its development plans but expects the suit to drain momentum from Microsoft's work on the Presentation Manager.

(continues on page 92)

Presentation Graphics Poised for Rapid Growth

Companies Bet Heavily on Presentations With Influence

In 1985, when Apple Computer's Steve Jobs was trying to sell laser printers, he endorsed Adobe Systems and Aldus and suggested we all turn our memos and reports into "documents with influence." It worked.

Today many large suppliers hope for a replay of (continues)

U.S. Sales of Presentation Graphics



Desktop Presentations predicts steady growth in sales of presentation graphics products—a larger market than desktop publishing.

Presentation

(continued)



CRAIG MOORE

Graphics software is taking off, says Software Publishing's Tess Reynolds.

the desktop publishing scenario in presentation graphics. Firms as diverse as Ashton-Tate, Hewlett-Packard, and Xerox have reorganized their graphics business units and laid down substantial investments in presentation products and services, trying to persuade business to invest in more "influential" presentations.

Hewlett-Packard research indicates that 10 to 15 million people already make business presentations on a regular basis, using around 1 billion transparencies and 600 million 35mm slides every year. "There are more presenters than people who need typeset-quality publishing," asserts Dave Erickson, market development manager for HP's new desktop presentations group. "It's a market poised to explode."

"Presentation graphics is already a major market, slightly larger than desktop publishing," declares

William Coggshall, president of market research firm Desktop Presentations. "The business started with a vengeance in early 1986, and we've seen a couple of years of solid products and solid growth."

Vendors generally expect to see the 15 percent annual growth rate of recent years climb to 30 or 35 percent—bringing the total market to \$400 million by 1991.

A chain of events has caused the market to reach critical mass. Crucially, PC users have tuned in to the more impressionistic elements of information display, thanks to the proliferation of screens offering higher resolution and greater color and to graphics environments such as *Microsoft Windows*. These environments support more capable graphics software, such as Ashton-Tate's *Draw Applause*, which taps the snappy VGA standard.

Similarly, laser printers have improved output quality, while plotters and innovative printers like the HP PaintJet have added color to the equation.

In concert, these products let PC owners create paper charts, transparencies, and slides at their desks with quicker turnaround and greater security than they can expect from art departments or outside service bureaus. As a result, by 1990 microcomputer companies are expected to gain 25 percent (up from the current 5 percent) of the estimated \$6 billion in annual graphics hard copy revenues now captured mostly

by graphic artists and service bureaus.

Ashton-Tate hopes to grab its share with an overnight service that turns a graphics file sent by modem into a color slide, overhead transparency, or color or black-and-white print. HP emphasizes both applications and innovative printers. Xerox is pushing into graphics software to support its *Ventura Publisher* by purchasing marketing rights to three PC versions of Macintosh graphics packages from Cricket Software.

Even computer chains, traditionally underwhelmed by graphics products, are getting into the act. "Key dealers like Entre and Businessland are a lot more excited about graphics than they were a year ago," says Tess Reynolds, group product manager for graphics at Software Publishing. And ComputerLand has launched a prominent ad campaign for its desktop presentation bundles. —Mike Hogan

Leading Graphics Packages Become Complete Tool Kits

Expanding Role Seen for PC Slide Services

Until the last year or two, presentation graphics was considered a mainstream application the way *y* is a vowel—only sometimes. Vendors, none of whom dominated the market, concentrated on three distinct product types—word charting, data-driven charting, and drawing.

Today the market is still split six ways from Sunday, but graphics is slipping into the mainstream. And developers increasingly combine the three major functions into integrated packages whose features differ little from one another's.

"The features battles have become a little less interesting," comments Tim Davenport, director of Lotus's graphics prod-

ucts division, whose *Freelance Plus* led the way. Now the key question is how seamlessly the software combines activities, he says.

"We'll be competing on ease of use and on helping the user raise graphics to a high level," agrees Richard Dym, senior product manager at Ashton-Tate. At the same time, Dym acknowledges, "the graphics capability in integrated products like *Excel* and *Quattro* is getting better and better."

Packages also may take a cue from Microsoft's *PowerPoint* for the Macintosh, which focuses on all the tasks that face a presenter—producing paper

(continues)

we never stop
asking

[illegible]

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Graphics

(continued)

handouts, transparencies or slides, and other visual support. Additionally, key accessory functions, like spelling checkers and ways to export files to desktop publishing packages, are rapidly being built in.

Overwhelmingly, the most common output is black and white—on paper or overhead transparencies. But color's role is growing, as devices like Hewlett-Packard's PaintJet arrive. John Fitzpatrick, graphics product manager at Microsoft, points toward thermal color printers. "Once the price gets down to \$3000 or below, you can really justify that printer in a work-group situation. You'll get brilliant transparencies and color printouts."



JONATHAN LEVINE/ONYX

Powerful packages will emphasize ease of use, predicts Ashton-Tate's Richard Dym.

Outside service bureaus that quickly generate slides from graphics files already make a strong case for creating presentations on PCs. Savings over traditional procedures are dramatic if overhead costs are

assessed realistically, says Desktop Presentations president William Coggschall. "People typically are paying more than \$100 per slide, but they think it's just 50 cents. My out-of-pocket cost is \$15 per slide. They're beautiful, they take 15 minutes of my time, and I have 24-hour turnaround."

On the software front, the grand slow march toward graphics interfaces continues. Robert Romney, president of Zenographics, describes advantages that *Windows* gives his firm's *Pixie*. "With *Freelance* or *Harvard Graphics*, you fill in a form with bar values and titles and so forth, and then you switch to look at the chart. In *Pixie* the chart is the form, and you get instant updates all the time. We can't make it simpler."

Coggschall points out, though, that "the top five

best-sellers are not *Windows* programs." And developers have their eyes on OS/2's Presentation Manager, which will build on much more robust underpinnings.

Given all the choices, experts underline the need to try before you buy—testing a complete mix of software and hardware on a sample presentation. "With graphics, the needs are so specific," says Software Publishing's Tess Reynolds. "The differences in output can be humongous, and there's no other way to tell." Several vendors help out by offering free or inexpensive trial disks.

"If you're told that you have to have a certain type of computer or visual interface, you're being misled," adds Lotus's Davenport. "You can do it with a CGA or a VGA, an Epson printer or a LaserJet." —E. B.

Cassoni Goes Standard for AT&T's Computers

Revamped Strategy Pays Off

Vittorio Cassoni is building a platform out of industry standards, inviting people to climb on, and selling the view.

Cassoni is the latest point man for AT&T's lumbering advance into the computer business. When he took over two years ago, AT&T gave him responsibility for product development but withheld command of sales and marketing. He faced out-of-control ex-

penses and warehouses full of slow-selling equipment. Moreover, he was an outsider imported from AT&T's ally Olivetti.

Since then Cassoni has replaced nearly the entire product line, trimmed employment by one-fifth to 6000, cut expenses by 35 percent, and persuaded headquarters to move him out of the phone system division and give him his own dedicated sales staff.



AT&T's Vittorio Cassoni expects profits in 1989.

And he's building a vision of corporate computing that's welcomed by competitors and customers alike.

His pitch begins with open-architecture standards. Customers "don't care about the chip and hardly care about the operating system," he insists, "except that the operating system may lock them out. Everybody has paid lip service to open systems; no one has been offering them."

Open systems in AT&T lingo means UNIX. Although owned by AT&T, UNIX is the closest approximation to a lingua franca among operating systems. AT&T has been making steady progress toward the consolidation of UNIX standards, and (continues)

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CD ROM: Chicken or Egg?

Waiting for Another VisiCalc

Microsoft gave a CD ROM party not too long ago, and about 1600 people came, all hoping to find out when CD ROM will take off. Most went home without an answer.

CD ROM holds obvious promise, jamming half a gigabyte of storage on a single disk and merging text, graphics, and (soon) interleaved audio and full-motion video. But it faces a classic chicken-or-egg dilemma. There aren't enough CD ROM players installed to entice developers to offer the broad-based applications that would boost hardware sales and justify the sub-\$500 prices that would make player sales skyrocket.

Industry participants bemoan the lack of a CD ROM counterpart to *VisiCalc*, which caused an ex-

plosion in microcomputer sales. But, as Microsoft chairman Bill Gates remarks, it costs a cool \$1 million to develop a decent multimedia commercial application, and only about 50,000 drives are installed.

So far, the medium has been used primarily as a vehicle to disseminate vertical and archival data bases. There, at least, both the risks and customer needs are well known because users already buy paper or film alternatives. The leading example is Lotus's pricey *One Source* financial data base.

Applications for a broader audience are only trickling out. The two most promising of this

A screenshot of the Microsoft Stat Pack software interface. The window title is "Agricultural Statistics, 1985 (Search)". Below the title bar is a menu bar with "File", "View", "Search", "Database", "Options", "Print", "Programs", and "Help". The main area displays a table titled "Table 605.—Per capita consumption of major food commodities (weight), United States, 1977-82 (110)". The table has columns for the commodity name and years 1977, 1978, 1979, 1980, 1981, and 1982. The data is presented in pounds.

Commodity	1977	1978	1979	1980	1981	1982
Meats	152.3	146.5	144.8	147.7	145.1	139.3
Beef	51.8	57.2	70.0	76.5	77.1	77.2
Veal	3.2	2.4	1.7	1.5	1.5	1.7
Lamb and mutton	1.7	1.5	1.5	1.5	1.6	1.7
Pork	58.5	58.3	58.8	73.5	69.3	62.7
Fish (edible weight)	12.7	13.4	13.0	12.8	12.9	12.3
Canned	4.6	5.8	4.8	4.5	4.8	4.3
Fresh and frozen	7.7	8.1	7.8	8.8	7.8	7.7
Cured	.4	.3	.4	.3	.3	.3
Poultry products:						
Eggs	34.8	34.6	35.3	34.6	33.8	33.4
Chicken	44.1	45.7	50.6	50.1	51.7	53.1

Microsoft's Stat Pack is among the handful of CD ROM applications with broad appeal.

year's crop are Microsoft's *Small Business Consultant* and *Stat Pack*, the first a compendium of 220 U.S. government publications on running a small business, and the second a compilation of government business-oriented data bases.

Industry analyst Linda Helgerson, publisher of the *CD Data Report*, figures that only one commercial drive maker and one commercial disk (continues)

Cassoni

(continued)

the National Bureau of Standards is working (with AT&T's approval) on a nonproprietary version called Posix, but other vendors worry that this approximation may not be close enough.

Last October AT&T made a deal with workstation supplier Sun Microsystems, under which AT&T will create a UNIX version for Sun's powerful Reduced Instruction Set Computer (RISC) chip technology. The two firms are licensing both offerings to other suppliers

with considerable success. Still, some vendors complain that AT&T and Sun will exploit UNIX unfairly—a fear Cassoni takes great pains to allay.

But if the operating system is generic and the chip architecture widely licensed, how will AT&T make any money? Cassoni implies broadly that the payoff will come in networking and related services. Information movement and management is, after all, at the heart of AT&T's larger corporate strategy.

PCs represent one key component of that strategy, and AT&T has quietly remapped its approach on this front. The giant's first entries were completely compatible with IBM software, but hardware incompatibilities limited their acceptance. That problem has been fixed in the Work Group System line, built by Olivetti, which appeared last year.

These competent, conventional machines range up to the 20-MHz, 80386-based Model 6386E, which can run DOS applications under UNIX, treat PCs as UNIX terminals, or act as a net-

work server on AT&T's new 10-megabit Starlan. In this last role, it performs much like AT&T's existing minicomputers and future RISC offerings—linking PCs much as individual telephones are connected, through a central switch.

Cassoni's overall strategy has reached out and touched some major customers, among them McDonald's, Hyatt Hotels, Chrysler, and Blue Cross. He expects his group to finally begin turning a profit next year. —Daniel J. Rosenbaum

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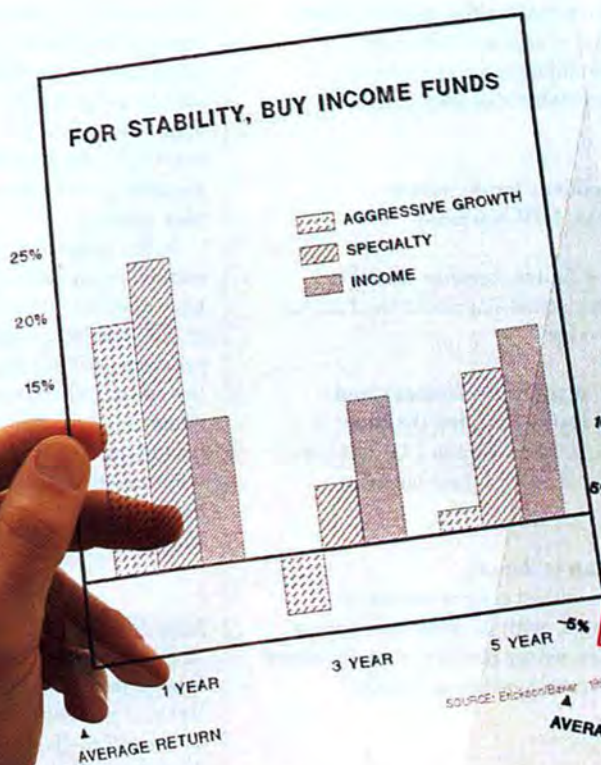
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Mac Attack

(continued)

Many believe that Apple is unleashing the lawyers in a last-ditch attempt to preserve a technical edge. The IBM world has always offered equivalent or better graphics hardware (as Zenographics president Robert Romney points out, "On the Mac side, they're just beginning to understand what color is all about"). But now software environments also may be reaching parity with the Mac. In fact, both OS/2 (with its true multitasking) and *NewWave* (with its application integration features) promise abilities the Mac can't yet match.

NewWave puts an object-management framework on top of *Windows* that's designed to simplify use and boost integration among applications. From a technical point of view, the framework builds and links objects; these can integrate data (for example, a worksheet) with appropriate application software (for example, a spreadsheet module). From a user's point of view, you move a mouse, click on an icon, and go to work.

That's familiar ground for Mac users, but what excites people at *NewWave* demos are the additional ways objects can be linked to create powerful, easy-to-use tools. *NewWave* "agents" (shown in an Eliot Ness-style icon) go far beyond keyboard macros, providing powerful command logic and the ability to work across applications. "You can drive existing applications from

the agents interface and put an expert system in front of the applications," Frankenberg says. You can also establish automatic hot links between applications. This smooth integration promises even stronger benefits on networks than on individual PCs.

The first *NewWave* applications will appear before year-end, so the potential advantages will soon get real-world tests—unless Apple ob-

tains a restraining order against HP. One of the lawsuit's many ironies, though, is that Apple has been more successful than HP in generating publicity for *NewWave*. "A number of developers have decided to go with us in part because of Apple's public expression of concern," Frankenberg notes. "They think that if Apple's willing to take this big a gamble, it must really be important." —E. B.

A FEW MINUTES WITH...

Jim Manzi, Lotus chairman:

"One company's solution is another company's problem."

Nat Goldhaber, Tops founder:

"In a work group, you want the individuals themselves to control how they work in the system, not rely on a network administrator or system manager. We need to give power to the individual within the work group. Don't put an artificial layer on your computing that you never would accept in your work!"

Mark Eisner, vice chairman, Softbridge Microsystems:

"We focus on mission-critical areas, and those are normally in sales. Executive information systems are pretty and nice, but in many industries they don't make much difference."

Curtis Crawford, vice president for personal-computer-related products, IBM National Distribution Division:

"I hesitate to talk about the future, because we have found that as soon as you say something about the future, someone claims to have it today."

Michael Maples, director of software strategy and business evaluation, IBM Entry Systems Division:

"Within the next three years, 90 percent of PCs will have communications as an integral part of their business functions."

Mark Zachmann, chairman of Z-Soft:

"In a year, *Windows* will be either gone or ubiquitous. But the Presentation Manager, with its multitasking and extended memory, is a much better platform than *Windows* ever will be. It makes *Windows* look like a mistake."

CD ROM

(continued)

maker are making a profit. Link Resources predicts that the gross industry product will expand from \$85 million last year to \$2.25 billion by 1991. But Link sees a relatively flat 1988, with a 153 percent spurt next year.

Tom Lopez, Microsoft's vice president for CD ROM, is cheered that both Egghead Software and Tandy recently announced plans to distribute CD ROM players. Prior to this, Amdek had conducted the only significant retail distribution, selling Hitachi drives with *Bookshelf*. All agree that computer retail stores are the most likely avenues for delivering CD ROM to the public.

This year's CD ROM conference drew twice as many exhibitors as the previous show. Many companies, like Dataware of Greenwich, Connecticut, showed development tools that enable large organizations to build their own applications on a PC—seemingly the avenue of greatest growth for this year and next.

In the meantime, commercial developers who have been investing heavily in CD ROM for three years are still haunted by the specter of the video game industry. They're hoping another *VisiCalc* will come along soon to bust that ghost. —Mike Hogan

Mike Hogan is PC World's news editor; Daniel J. Rosenbaum, a regular PC World contributor, has been writing about AT&T since 1981. ●

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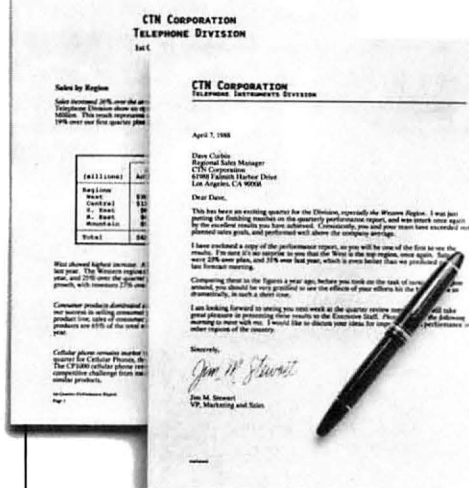
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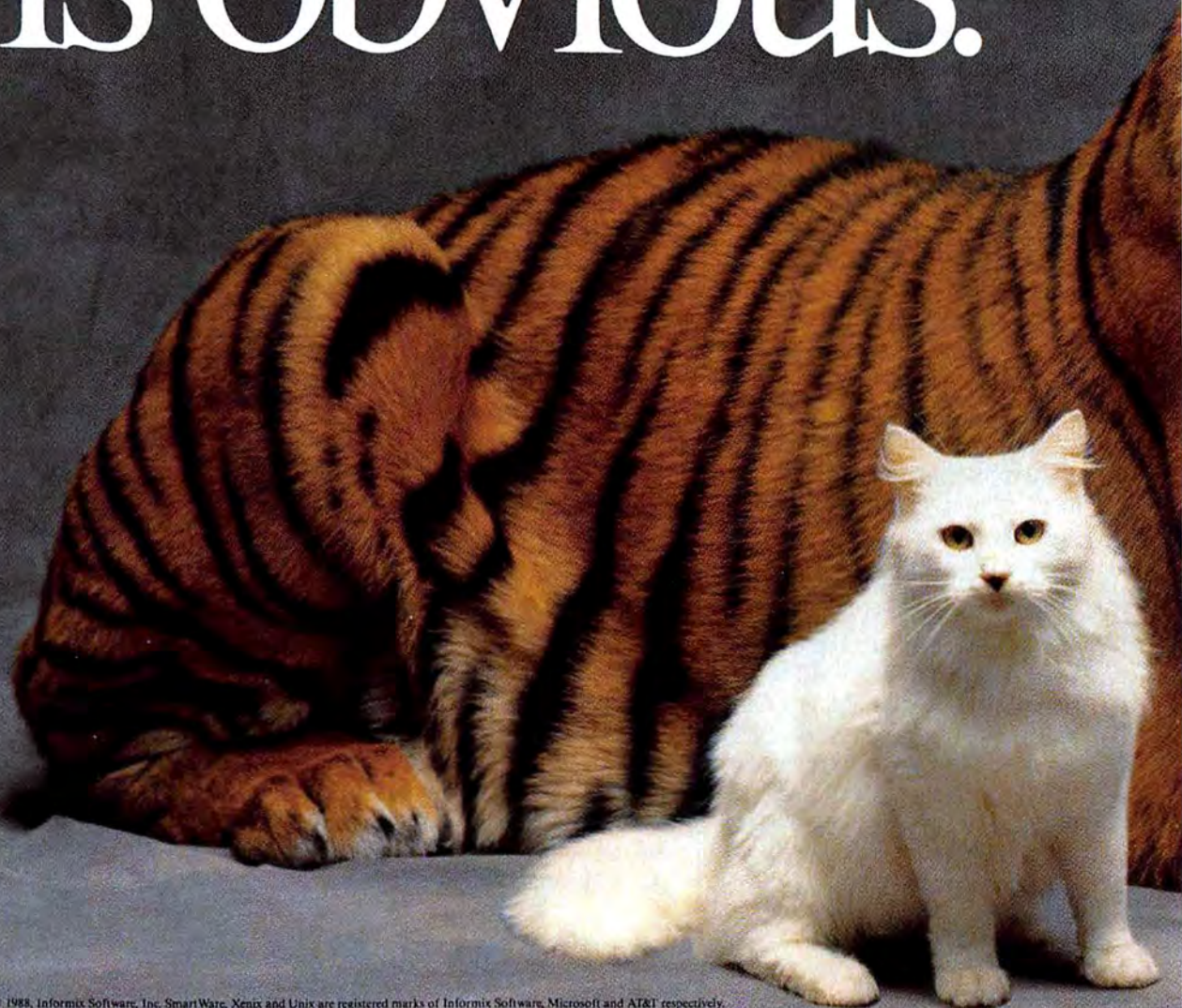
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Bombshells From Dell

Buying into cutting-edge technology doesn't have to be an expensive crapshoot.

**Eric
Knorr**

Three Dell PCs—two of them 20-MHz screamers—offer Compaq-like support and performance for mail-order prices.

Once just another clone maker, Dell Computer (formerly PC's Limited) now claims to be the seventh largest domestic PC manufacturer, a distinction due in part to excellent customer service and a cadre of hotshot system designers. Dell's ace in the hole, however, has been close cooperation with Chips and Technologies, an ambitious chip maker with innovative, low-cost VLSI chipsets for everything from PC compatibles to 80386 machines to graphics boards.

Dell's recent product announcement demonstrates just how profitable a well-chosen alliance can

PC World Previews are informal assessments of products that at press time were still in the development stage. Complete reviews—including features evaluations and performance testing—will appear only after a product is officially released.



STEVEN PUMPHREY

Dell's 8088-based System 100 (left) and 80386-based System 310 (center) are star performers, but the 20-MHz, 80286-based System 220 gets top billing.

be. The company's show-stopping System 220, which centers on a spanking new Chips and Technologies chipset, stands as the industry's first 20-MHz 80286 machine—at a time when 16-MHz 80286 computers are only beginning to appear. Flanking this surprise offering are two other strong players from Dell: the System 310, a 20-MHz no-wait-

state 80386 machine that uses Intel's 82385 cache controller and may well be the fastest PC available; and the System 100, a budget-priced, 9.54-MHz 8088 machine with a Tandy-esque integrated keyboard. All were scheduled to ship in late April.

Good Things in a Small Package

The System 220 seems guaranteed to attract the most attention. Though

PC World's informal tests reveal that the box is a bit faster than the 16-MHz Compaq Deskpro 386, the System 220 has more going for it than mere speed. Taking the PS/2 trend toward system integration a step further, the System 220's motherboard harbors a VGA, a floppy disk controller, a

hard disk interface, one parallel and two serial ports, and sockets for up to 8MB of RAM. The fully loaded motherboard, along with space for only one hard and two floppy 3½-inch drives, gives the System 220 a footprint slightly smaller than that of the PS/2 Model 30. With 1MB of RAM, a 40MB hard disk, and a VGA monitor, this sleek contender goes for \$2699.

Even with all the built-in goodies, some users may find the System 220's Model 50—like tally of three 8/16-bit slots inadequate; more likely, they'll balk at the machine's inability to take 5¼-inch drives.

In other ways, however, the system is quite accommodating: The built-in hard disk interface handles drives of up to 100MB, while a proprietary slot holds an 8MB memory expansion board. That gives you a total RAM capacity of 16MB—without touching any of the three standard slots.

Cache-Rich on a Budget

While the System 220 has the most moxie, the 80386-based System 310 is the top performer. The System 310's memory-caching scheme mirrors that of the Compaq Deskpro 386/20; both systems use the 82385, which controls a 32K cache of 35ns static RAM and arbitrates conflicts between separate memory and I/O buses (see "Deskpro Pushes the Limit," *PCW*, February 1988). The key

difference between Compaq and Dell memory architectures shows up in main memory, where the System 310 uses interleaving to speed data transfer to and from the cache (a scheme that requires at least 2MB of RAM). According to preliminary *PC World* tests, the System 310 enjoys a very slight edge over the Deskpro 386/20. (As with the System 220, a forthcoming, in-depth review of the System 310 will feature a full battery of NSTL benchmarks.)

Bargain hunters will be happy to hear that with 1MB of RAM, a VGA monitor, and a 40MB hard disk, the System 310 costs only \$4000, about half the price of its Deskpro 386/20 rival. And the System 310's expansion potential far exceeds the System 220's. The System 310 has eight slots, support for up to 16MB of 32-bit RAM—and yes, bays for 5¼-inch drives. The system accommodates up to five half-height storage devices.

The System 310 integrates the VGA, the floppy disk controller, and one parallel and two serial ports into the motherboard to keep all but one slot free. This serverlike capacity is complemented by the high-performance ESDI drives that come with every System 310 configuration. Moreover, Dell's top-of-the-line system, which includes an

18ms 322MB hard disk, provides plenty of room for shared programs and data; with a monochrome monitor, this configuration comes in below \$7000.

Bottom-End Bundle

Last and definitely least is the 9.54-MHz, 8088-based System 100, Dell's answer to the Tandy HX. Here you're stuck with 3½-inch floppy drives again, and no space for a hard drive unless you fill one of the three 8-bit slots with a hard disk card.

(Dell will gladly sell you a Plus Development 20MB Hardcard for \$500.) The System 100's floppy controller plus one serial and one parallel port are built in, but the graphics aren't, so you need to devote another slot to a video board. The best news is the price: With 640K, one 3½-inch floppy drive, and a monochrome monitor and adapter, the unit will set you back only \$800—at least \$200 below a comparable HX.

Normally Dell charges extra for its own version of DOS (and bundled software), but with the System 100 you get the \$120 package free. The bundle includes Dell MS-DOS 3.30, the *Microsoft Works* integrated package, disk-caching software, a DOS shell, and other utilities. For its 80286 and 80386 machines, Dell now also sells its own version of OS/2 for \$325.

Like all but one member of Dell's line, the Sys-

tem 220 and the System 310 come with a year's on-site support from Honeywell Bull—though you must be within 100 miles of a Honeywell Bull office. (The System 100 doesn't include free on-site service, but you'd be crazy not to pay the 50 bucks.) In addition, you get free phone support and slick diagnostics software, saving you and Dell as many repair visits as possible. An extended on-site service contract costs \$250 a year.

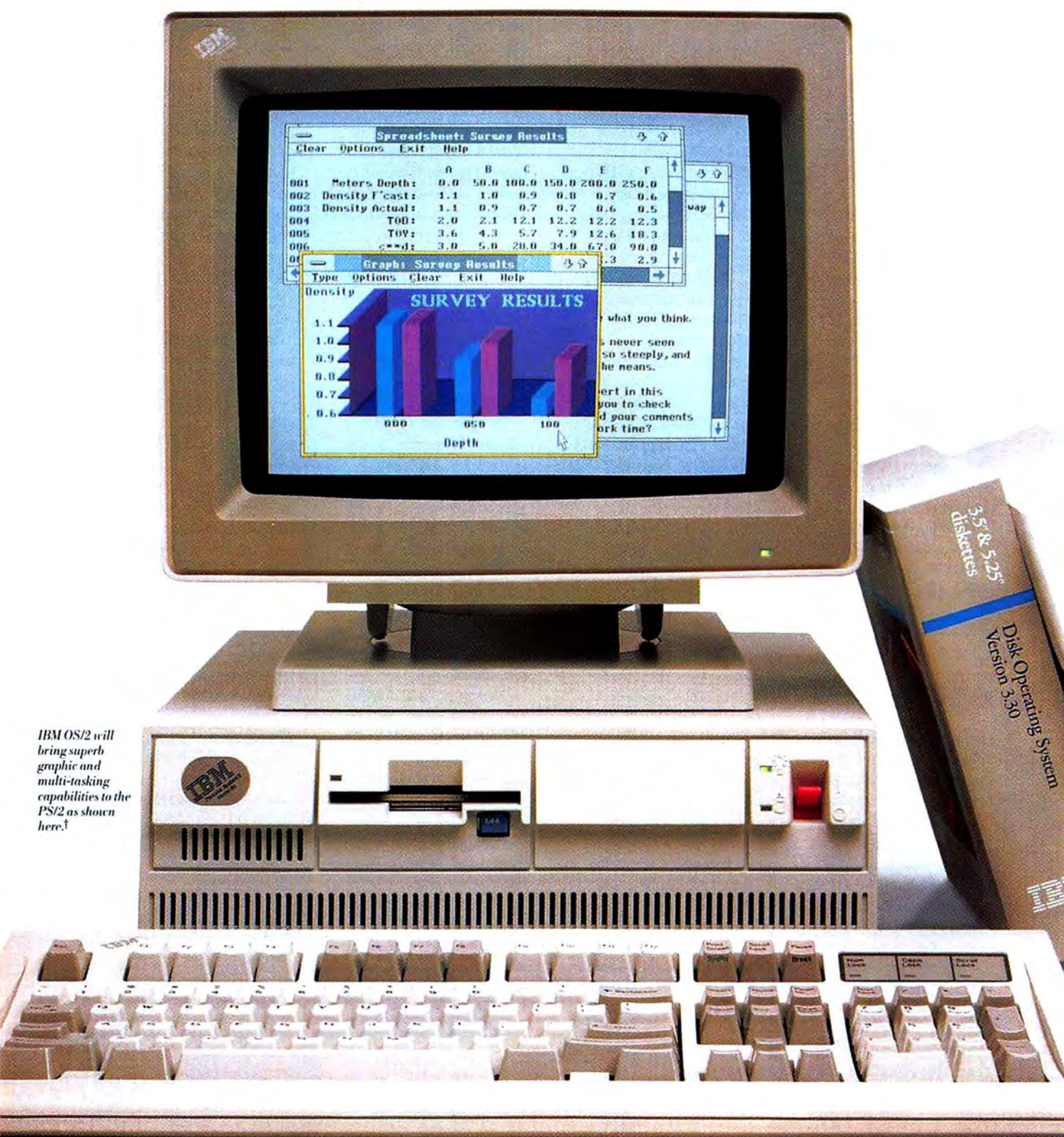
No company is guaranteed to stay in business, but Dell seems likely to be around to fulfill its service obligations. The company's staff and profits have grown rapidly over the past couple of years, and Dell is making significant inroads in the corporate market. The Systems 310 and 100—and particularly the 220—should help the company continue to meet users' enduring appetite for high performance, low cost, and convenience. ●

Eric Knorr is a senior editor for PC World.

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The Bigger Picture

*Based on performance test results published in the April, 1987 and January, 1988 issues of PC Digest, comparing the PS/2 Models 30, 50, 60 and 80 to the IBM PC XT, running Lotus 1-2-3 and DisplayWrite 4. †This simulated screen shown was developed using the IBM Storyboard Plus program. IBM, Personal System/2 and PS/2 are registered trademarks; PC XT, Operating System/2, OS/2, Micro Channel and DisplayWrite are trademarks of IBM Corporation. Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation. © IBM 1988.

3 + Open

The first major OS/2 network product is about to appear.

3 + Open's support for server-intensive applications—

plus boosted speed and new security features—

should ensure that LANs will never be the same.

**Michael
Goodwin**

This summer users will finally get their hands on 3Com's *3 + Open*, the first local area network operating system designed to take advantage of OS/2. *3 + Open* will be the first shrink-wrapped implementation of OS/2 *LAN Manager*—a project on which 3Com and Microsoft have collaborated for well over a year. *LAN Manager* will be sold only to network suppliers, who will add the necessary hardware drivers and other amenities.

Although a number of vendors will offer their own versions of *LAN Manager* (Hewlett-Packard and Digital Communications Associates have already announced theirs), 3Com's will be first out of the gate. Within a few months, the company will follow its initial release with OS/2 versions of its popular network utilities, like *Mail* and *Route*. Macintosh connectivity will be added in 1989.

Up until now, Novell's *Netware*, with its menu-driven utilities and proprietary operating system, has made 3Com's *3Share3* software, with its 640K DOS limit, seem relatively backward. *3 + Open* will provide powerful equivalents for *Netware*'s most attractive features, such as log-on scripts and convenient administration utilities. Better yet, these features will be unusually easy to use, thanks to pulldown menus, mouse support, and context-sensitive help—none of which is currently available from *Netware*.

New Capabilities, New Power

OS/2's 16MB memory space, multitasking, and multithreading capabilities will enable *3 + Open* to deliver features unavailable from any existing PC LAN. 3Com claims that you will notice a significant improvement in performance, thanks to OS/2's ability to handle each net-

work connection as a separate task. What's more, DOS-based workstations will be able to hook up to OS/2 applications running on the server. On current DOS networks, computing takes place in the workstation; if you download *dBASE* from an 80386 server to an 8088 workstation, it runs at 8088 speed. With *3 + Open* you will be able to use low-cost 8088 DOS workstations to run an OS/2 data base manager, for instance, on the server at server speed.

Printing and telecommunications should also be improved. At present, networks permit only one printer per queue. With *3 + Open* each queue can be routed to multiple printers; if a printer is busy or out of paper, your print job can be shifted automatically to the next available machine. Modems can be pooled in the same way.

3 + Open will improve other kinds of communica-

tion. When the administrator logs on in the morning, he or she may find a message that a hard disk is nearly full or a printer is out of paper. Attempted security violations and I/O errors will be recorded automatically in one of several error logs.

OS/2 LAN Administration: A New Ball Game

3 + Open is designed to make network administration faster and easier. Pulldown menus (and lots of help screens) should simplify all the standard network tasks—adding users, writing log-on scripts, checking print queues, assigning passwords, backing up the system, and so on.

A number of brand-new features will allow LAN security to be fine-tuned with unprecedented discrimination. Currently, most LANs let you assign common security rights to groups of users—a department, say, or a work group—but no variations are permitted within the group; using *3 + Open*'s menu-driven security system, you will be able to withhold certain rights from individuals within those groups, such as temporary workers. While current LANs allow access rights to be assigned for subdirectories only, with *3 + Open* you will be able to control access to individual files. Furthermore, it will be possible to set an audit trail to keep track of how many users access a given

file, who they are, and how long they use it.

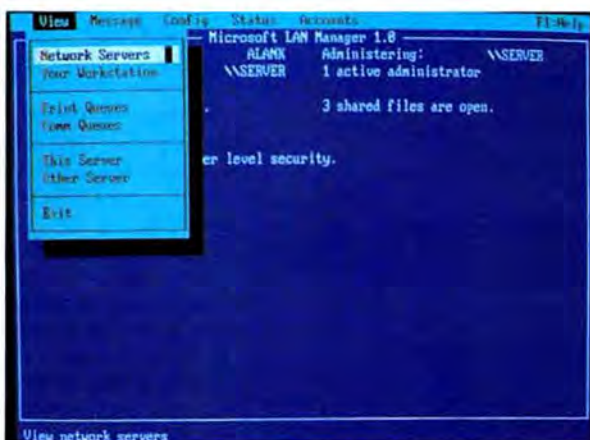
Another new LAN capability will permit you to set a time window during which printers, modems, and other peripherals will be available across the network; when the window is closed, the peripherals won't work. An OS/2 command-line utility will also permit some tasks (like server backups) to be scheduled for automatic execution.

Best of all (especially for those 2 a.m. emergencies), you will be able to perform network administration tasks via telephone from your home. Call in via modem, log on, and your home computer will become a full-powered network workstation.

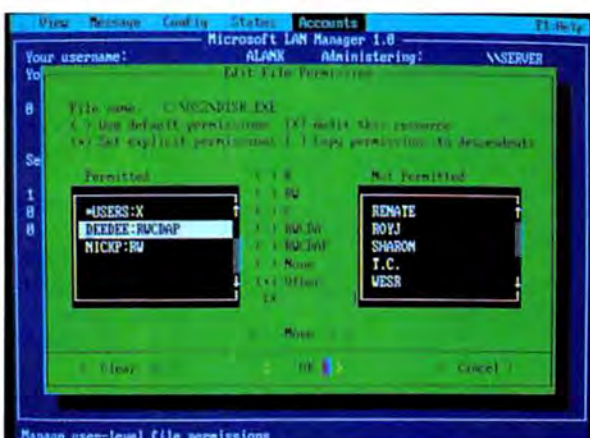
A Tale of Two Servers

Not all the news is good. Since OS/2-compatible versions of 3Com's value-added services (such as *Mail*, *Route*, *Remote*, and *Tape Backup*) will not be available until late in the year, to use them in the meantime you will need a separate DOS server. Furthermore, 3Com customers who now attach Macintoshes to their networks (or plan to) may balk at waiting a year or more for *LAN Manager* to provide Mac connectivity.

Even so, it seems likely that time will solve these problems—and the real winners will be network users. For several years (every one of which has



From the pulldown View menu administrators can identify servers, printers, disks, and peripherals.



Using the Accounts menu, you can control access rights to individual files—not just subdirectories.

been touted as the Year of the LAN, and wasn't), competing claims and conflicting approaches have mired the LAN marketplace in confusion. Now, with the appearance of new network operating environments that will combine the best features of the current market leaders with OS/2 power, it may soon be possible for LAN users to get down to serious business. ●

Michael Goodwin is an associate editor for PC World.

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PRODUCT OUTLOOK

107 PRODUCT OUTLOOK

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MicroFrame 386

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112 BRIEFLY NOTED

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116 UPDATE

Symphony 2.0

Sophisticated and popular from birth, *Symphony* gets a better word processor, four add-ins, and faster recalculation.

Multiplan 4.0

Now in versions for OS/2 Standard Edition as well as DOS, *Multiplan* orchestrates eight worksheets at once and adds data base and math functions.

PageMaker 3.0

PC and Macintosh publishers alike can now take on long documents with the help of 20 templates that make page design simple.

Guide 2.0

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Microsoft OS/2 Languages

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Beyond Fax

A Reasonable Facsimile/Modem Combo

Work groups do not run on words alone. Sometimes you want to share pictures, spreadsheets, or programs. While modems let you swap files with far-flung co-workers, and some 2 million facsimile machines exchange images, a new communications product goes one step further.

Microlink's Beyond Fax board not only sends voice, data, pictures, and even programs over a single phone line but lets you interactively edit those files in real time with a distant colleague. It's especially useful for graphics applications, and it includes a basic CAD program in addition to a text editor.

Once connected with a work-group member in the next office or across the country, you can both see and make changes to graphics or text in the same file and have them appear on each other's machines. Transmission to another computer or a fax machine is as simple as pointing and clicking on the appropriate command in the feature boxes that line each side of the screen. Transmission management software lets you decide the order of voice, data, and graphics transmissions, and Beyond Fax can transfer .IMG files from popular scanners.

A combination 9600-bps asynchronous modem

and fax board, Beyond Fax has several automatic features to ensure successful transmission and help reduce costs. It compresses and decompresses data to reduce both transmission time and line charges. You also can have Beyond Fax send and receive fax or electronic mail transmissions overnight during off-peak transmission hours.

You send data files or fax messages at speeds of 9600 bps using the CCITT V.32 transmission specifications or at 2400 bps in the Hayes instruction set, with automatic error-recovery and speed-fall-back protocols to ensure reliable transmission. In the event of telephone line interference, Beyond Fax reduces transmission speed from its normal

9600-bps rate to as low as 2400 bps in fax mode and 1200 in modem mode. An interrupted transmission is automatically re-sent.

Beyond Fax gives you a variety of telephone management facilities—from an 80-name directory to a clock/timer for keeping track of telephone charges in a file for later printing. Hot keys activate a pop-up multifunction calculator, daily diary, and calendar.

Beyond Fax, which retails for \$1286, takes one full-length, 8-bit slot and has no DIP switches to set or jumpers to connect. Microlink Industries, 4064 McConnell Dr., Burnaby, British Columbia, V5A 3A8 Canada; 800/663-8012, 604/420-0366.



Beyond Fax lets you interactively edit text or graphics with a distant co-worker and then send the result over a phone line just by pointing to the appropriate command on screen.

ARC 6500, ARC 7000

Background Backup

Prudence dictates frequent backups of your hard disk. But who wants to spend 20 minutes or more several times a week watching a PC swap files? Anyway, hard disk disaster seems a remote possibility—remote, that is, until the day a friend loans you a program that mugs your machine, or a temporary worker tries to format a floppy by typing *Format* while logged on to drive C:.

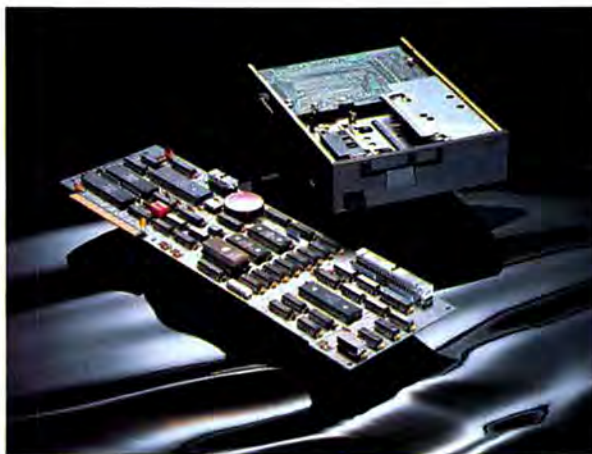
A tedious backup session is no longer your only alternative to data roulette, thanks to two backup products from Digital Storage. Digital is selling both an intelligent tape controller and an internal tape subsystem that do the job automatically while you work.

The ARC 6500 controller ships with Digital's *NonStop* memory-resident software, which drives tape backups in background mode. *NonStop*'s 7K terminate-and-stay-resident kernel initiates an incremental backup of changed data every time your computer writes to disk. It stamps each write transaction with time and date and provides a transaction catalog from which you can locate any individual file by those and other parameters. The ARC 6500's 224K tape cache and coprocessor prevent the backup from tying up your CPU.

In addition to background backup, you can perform the usual file-by-file save, retrieve, and catalog applications with the ARC 6500 controller. You can work from the DOS command line or through a friendlier menu interface.

The new internal tape subsystem, the ARC 7000, is equipped with the controller, *NonStop* software, and a Teac 60MB tape drive; it retails for \$995.

Digital will market the \$595 software-equipped ARC 6500 card, which requires a full-length 8-bit slot inside the PC, to those who already own any of the more popular 1/4-inch cartridge tape drives under the QIC-02 standard. The company also will provide its *NonStop* software free to existing customers of its ARC 8000 and ARC 9000 external drives. Requirements include DOS 3.00 or a later version and 384K. Digital Storage Systems, 1234 Sherman Dr., Longmont, CO 80501; 800/225-3953, 303/449-9684.



Digital Storage's intelligent ARC 6500 tape controller or ARC 7000 internal tape subsystem will automatically back up your hard disk while you keep working.

LaserPlotter, MatrixPlotter, JetPlotter, DeskPlotter

Lingua Graphica

Maybe you're a CAD/CAM user who wants a fast draft before spending an hour in front of the departmental plotter. Maybe you're a business graphics user whose two or three plots a month don't justify spending \$1200 to \$1800 for a plotter of your own. Maybe you just want a program that will print graphics without requiring you to start up your graphics application. You can get all of that and more with a utility from Insight Development Corporation that makes a humble printer generate near plotter quality output.

The program is built around a kernel that translates the high-resolution vector images of HPGL (Hewlett-Packard's plotter language standard) into lingo a printer can understand. Insight Development has tailored the program for laser, ink jet, and dot matrix printers and sells

the versions as *LaserPlotter*, *JetPlotter* and *DeskPlotter*, and *MatrixPlotter*, respectively.

Of course, vector graphics often produces better output than its raster counterpart, and it's hard for a printer to match a plotter's 1000-dpi resolution. But it's difficult to distinguish resolution differences beyond the 300 dpi of a laser or 360 dpi of an ink jet or 24-pin dot matrix. And the *Plotter* suite gives you output fast.

A laser printer using this utility gives you black-and-white graphs four times faster than a plotter, while a dot matrix or ink jet is three times as quick. An HP PaintJet or a Toshiba P351C produces color output more than three times faster than your plotter. Additionally, the *Plotter* quartet speeds ordinary printing of graphic material by working twice as fast as the drivers built into most graphics packages.

Plotter can control the width or gray scale of a line or area and can magnify or reduce the size of a hard copy image—capabilities beyond the reach of most graphics programs. Similarly, you can set your printer to print a file unattended, even without use of the program that originally created it, as well as print reversed images for blueprints. Complicated or full-size plots also are within reach.

Using *Plotter* is straightforward; you need only pick your configuration from the pop-up menu. All versions support all graphics resolutions of printers and are compatible with most

popular PC graphics programs.

LaserPlotter sells for \$150 and drives the controllers for all HP laser printers and compatibles as well as those from Canon, Xerox, and QMS. *MatrixPlotter*, compatible with Epson's and Toshiba's entire lines, is \$99. For the same price, *JetPlotter* drives all HP and compatible ink jets (except the new DeskJet, which requires *DeskPlotter* for \$129). Requirements include 128K and DOS 2.00 or a later version. Insight Development Corp., 1024 Country Club Dr., Moraga, CA 94556; 415/376-9451.

AdLANtes

No Workstation Is an Island

From the DOS perspective, UNIX looks like another continent altogether, but vendors are charting new routes between the two operating systems.

Veteran multiuser system vendor Altos, for instance, has developed a local area network solution called the Advanced Local Area Network Telecommunications System (AdLANtes). This provides a transparent bridge for DOS-based PCs to the UNIX environment, including Altos's own installed base of more than 800,000 UNIX-based workstations.

Tie your workstation to AdLANtes, and you can take advantage of the more sophisticated data base options and greater storage capabilities of the



Coming from Lotus.®

UNIX environment without giving up your favorite PC productivity programs. You can also reach up and pluck data off corporate mainframes with greater facility, according to Altos, because AdLANtes provides a bridge that is both cheaper and more effective than DOS-based LAN gateways.

You can toggle between UNIX and DOS interfaces, gaining easy access to all programs and files in either environment and to the peripherals of the Altos host. But you don't have to go face-to-face with unvarnished UNIX. You can move the data back and forth between DOS and UNIX applications running concurrently in the on-screen windows of the Altos PC Applications Executive (APEX), a superset of *Microsoft Windows*. Your PC workstation runs its native DOS; a copy of UNIX need only be on the file server for every workstation to take advantage of it. You can buy a two-user APEX license for \$395 or an eight-user license for \$795.

The system's backbone is the Advanced Communications Processor Attachment (ACPA), an 80286-based board on the Altos host that offers a gateway into the Altos multiple-terminal environment, LAN connectivity through its built-in Ethernet adapter, and two synchronous ports for simultaneous wide area network (WAN) connectivity. The \$2490 ACPA, which has memory buffers for uninterrupted operation, can support a combination of up to 64 asynchronous terminals and Ethernet workstations,

and two simultaneous X.25 or 3270/SNA sessions on a wide area network.

You connect to the AdLANtes system through ACPA/PC, a \$495 Ethernet adapter, which resides in a single 8-bit or 8/16-bit slot of a classic PC running DOS 3.30 or a later version. You also need an \$800 AdLANtes/DOS Server, which lets you view, copy, create, modify, execute, rename, and move any of the UNIX host files, sharing them with nodes anywhere on the local network. AdLANtes/Remote File Sharing (RFS) software extends that capability to other RFS-equipped wide area networks for \$800. Altos Computer Systems, 2641 Orchard Pkwy., San Jose, CA 95134; 408/946-6700.

Your Personal Investment Manager

The PC as Tycoon

Over the years, Wall Street wags have professed everything from dart boards to women's hemlines as ways to predict the swings of a fickle market. Entertaining, perhaps, but when it's time to put your own hard-earned greenbacks down, you want a better method to handicap the possibilities. That, of course, means grappling with a dizzying array of P/E ratios, book values, and Kondratieff cycles.

Sylvia Porter's *Your Personal Investment Manager* leverages the

PC to help you make sense out of that numerical mishmash. Not only does it help you record and organize your portfolio for easier analysis, its telecommunications module also gives you an electronic doorway into voluminous financial data bases and up-to-the-minute stock quotes from suppliers like Dow Jones.

Your Personal Investment Manager provides direction for both a value-oriented approach and technical analysis of stocks. You have the tools to analyze a company's balance sheet, income statement, and commonly used business ratios as well as major market indicators for buy/sell decisions.

Manage your own portfolio by generating detailed reports such as a list of your current stock holdings showing the number of shares of each that you hold, each stock's total cost and current value, your unrealized gain or loss, and the percentage of your portfolio's total value that each stock represents. Then step back from the numbers and create a chart to show

this percentage for each of your stocks and a standard x-y plot to trace high, low, and closing prices over time.

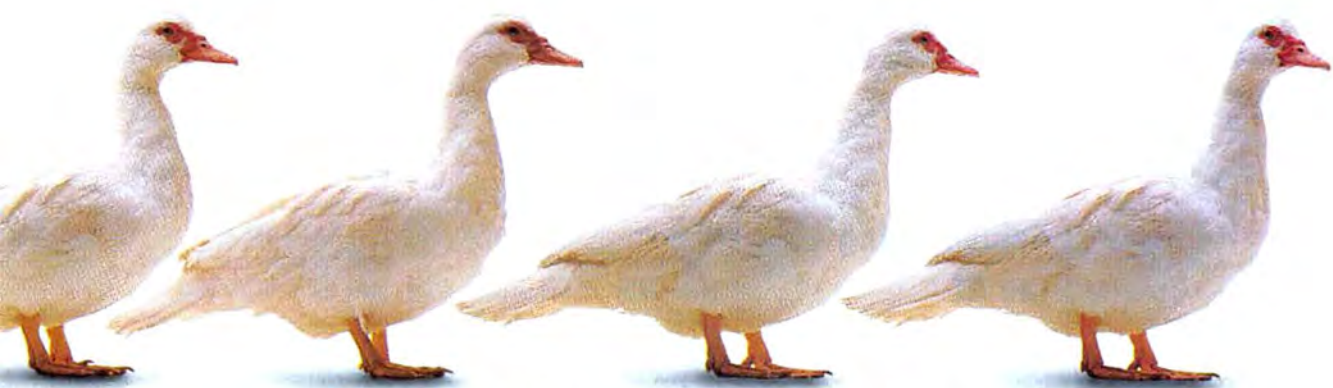
Moreover, you can generate an interest-and-dividend report by stock showing the amount of interest received and how much is subject to federal, state, and local taxes.

Your Personal Investment Manager alerts you to investment deadlines and the goals that you've set for yourself by flashing a note on your computer screen when it's time for action. It incorporates the *Sideways* utility for printing wide documents and another for importing and exporting Lotus and ASCII files.

Your Personal Investment Manager carries a suggested list price of \$149.95. If you register, you get unlimited free technical support. Requirements include DOS 2.00 or a later version, 512K of memory, 700K of storage, and a CGA or higher resolution graphics card. Timeworks, 444 Lake Cook Rd., Deerfield, IL 60015; 312/948-9200.

PORTFOLIO: NICK				Trade History			
SYMBOL	TYPE	LAST PRICE	UPDATED	FREQ	AMOUNT	RECORD	PAYABLE
AAFL	S	43.75	06/17/87	q		18/12/87	11/01/87
SYMBOL	TYPE	T/	TRANS DATE	NUMBER OF QUANTITY	PRICE	COMM/ FEES	TOTAL COST
AAFL	S	B	06/15/87	100	41.50	50	4200.00
				100			
AAFL	S	B	06/15/87	100	41.25	50	4175.00
				100			
AAFL	S	H	06/15/87	-100	41.75	50	-4125.00
				-100			

Sylvia Porter's *Your Personal Investment Manager* helps you record and organize your stock portfolio and perform value-oriented and technical analysis.



Coming from Lotus.

Delta-Manager, Flash-In, Graph-Mania

1-2-3 Stretch

Software developers often must sacrifice the specific for the general in order to make their products useful to the broadest possible audience. But with so many 1-2-3 devotees, add-in developers can provide many of the specialized features on your wish list. PC Publishing, which filled a gap last year with its *Deja* connection to *dBASE* files, is back again with several add-ins that help round out the baseline 1-2-3 product.

Delta-Manager saves budget-forecasting time by letting you specify an error margin in a cell—for example, a value plus or minus a percentage—and accurately reflect that error margin in all dependent cells. Thus you can perform worst-case, best-case, and intermediate-case analyses without setting up a separate worksheet for each. You also can display the error margin in a 1-2-3 graph, either as an interval or as a shaded area. *Delta-Manager* retails for \$129.95.

If you're like most 1-2-3 users, you've accumulated a number of worksheets and need a way to quickly locate data and move it between them. *Flash-In* gives you a global way to search for labels, numbers, and formulas across all worksheets on a disk and copy located items to your current worksheet. You view the remote worksheets in a window. You can also view several worksheets simultaneous-

ly and perform cut-and-paste operations among them using the standard Lotus /Copy command. *Flash-In* sells for \$99.95.

Graph-Mania lets you loosen up the standard 1-2-3 screen display, compressing or expanding the number of rows and columns you want displayed. Additionally, you can open up a window in your worksheet and view a graph in it, watching your graph change in real time as you change values in your worksheet. *Graph-Mania* retails for \$79.95.

Each program requires DOS 2.00 or a later version and 35K of memory. PC Publishing, 1801 Avenue of the Stars #800, Los Angeles, CA 90067; 213/556-3630.

MicroFrame 386

Rejuvenating the AT

Silicon's cheaper than iron," say engineers, meaning that micro chips are cheaper to replace than the steel cabinets, power supplies, and disk drives that surround

them. So why buy all that hardware again when it's time to upgrade to a faster computer? With Monolithic Systems' MicroFrame 386, maybe you won't have to.

This easily installed upgrade replaces your AT's motherboard with one containing either a 16- or 20-MHz 80386 processor and 1MB to 8MB of 32-bit, zero-wait-state memory. Six 8/16-bit and two 8-bit expansion slots, an on-board clock/calendar, and a socket for an 80387 math coprocessor come standard. Also included is the AMI-386 BIOS from American Megatrends.

The MicroFrame 386's setup program lets you quickly change wait states or bus speeds to accommodate older and slower I/O boards and tinker with memory maps. A menu-driven configuration routine helps even the technically unsophisticated user zip through the procedure.

The MicroFrame 386 has holes for a standard AT mount but, being the size of an XT motherboard, it can also upgrade some XT compatibles or ATs with small footprints.

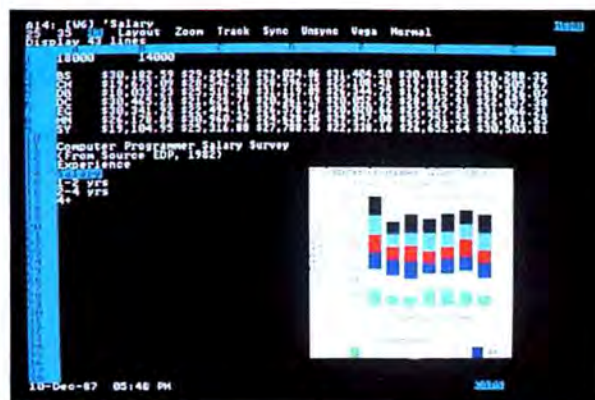
You'll pay \$2340 for a MicroFrame 386 with 1MB of memory and a 16-MHz CPU, and \$2920 for 1MB of memory and a 20-MHz CPU; 2MB, 4MB, and 8MB versions with either clock speed also are available. Monolithic Systems Corp., 84 Inverness Circle E, Englewood, CO 80112; 303/790-7400.

BRIEFLY NOTED

Time Line 3.0

With a view toward eventually offering a whole spectrum of project managers, Symantec has created a more sophisticated version of its *Time Line* package. *Time Line* version 3.0 is designed to exploit the new generation of more powerful processors and expanded or extended memory. To make the new release easier to use and more powerful, Symantec gave it an outline interface reminiscent of *ThinkTank*. This front end lets you view as much or as little detail as you wish in your Gantt charts and makes it easier to add or delete a project's tasks.

The outlining capability adds perspective to your PERT charts by letting you open and close whatever portions you choose. You can toggle between the PERT summary view and more detailed views of the schedule with a few keystrokes. In general, version 3.0's PERT capabilities are much enhanced over the elemen-



Graph-Mania enables you to compress or expand the number of 1-2-3 worksheet rows and columns displayed and look at your graph without leaving your worksheet.



Coming from Lotus.



Time Line 3.0 sports an outline interface reminiscent of Symantec's ThinkTank, letting you view as much or as little detail as you wish in Gantt and other charts.

tary capabilities of *Time Line* version 2.0, and its Gantt chart views are now completely user definable.

Time Line 3.0 supports full multiple-project management in a single schedule. That's facilitated by automatic resource-driven scheduling, in which additional resources are applied to tasks that must meet a given deadline. The package also handles resource leveling—automatic adjustment of task completion dates to acknowledge resource limitations. Unlimited undo/redo capabilities let you test assumptions with alternative scenarios and then step forward or backward through a whole schedule.

Additionally, *Time Line 3.0* provides the noting capability of Symantec's *Note-It* product. Context-sensitive notes can be attached to any portion of a project, and they are supplemented by a context-free scratch pad where more extensive memos can be penned with outlining. *Time Line*

3.0 supports LIM 4.0 boards and requires DOS 2.0 or a later version, 640K of memory, and a hard disk. It sells for \$595. Version 2.0 will continue to be sold for \$495. Symantec Corp., 505-B San Marin Dr., Novato, CA 94945-1310; 415/898-1919.

3 + Mail 1.3, 3 + Mail for Macintosh

3Com has introduced two versions of *3 + Mail* software that let you send electronic mail between IBM PCs, Macintoshes, and other dissimilar workstations across dissimilar local area networks. *3 + Mail 1.3* for PCs and *3 + Mail for Macintosh* enable you to send and receive mail across Ethernet, Token-Ring, and AppleTalk networks—either locally or to remote locations—with no special effort on either end.

Both products, which function as services on 3Com's *3 +* network operating system, enable you

to create multiple file folders (called mailboxes in the Macintosh environment) for your mail and retrieve messages by subject, date, or author.

3 + Mail 1.3 for PCs also lets you sort and search your mail by notation, text string, or message number.

Both break the *3 + Mail* 110-message limit, enabling you to keep an unlimited number of messages in your mailbox as well as transfer up to 25 file attachments with each message. 3Com's Mail Minder window on your screen automatically signals the arrival of new mail. A registered mail option notifies you of the time and date that the mail you sent is received.

The naming service on both *3 + Mail 1.3* for PCs and *3 + Mail for Macintosh* lets you check name spellings and mailing group memberships and simplifies the creation of multiple addresses. Batch processing helps expedite mailbox management functions such as printing and deleting as well as sending batches of messages across wide area networks with a single call.

Pulldown menus simplify the use of both *3 + Mail 1.3* for PCs and *3 + Mail for Macintosh*, and both programs have gateways to other E-mail systems including MCI Mail, DEC All-in-One, IBM PROFS, and Wang Office.

3 + Mail 1.3 and *3 + Mail for Macintosh* cost \$595 each for a five-

user license or \$1190 each for unlimited use. 3Com Corp., 3165 Kifer Rd., Santa Clara, CA 95052; 408/562-6400.

ZoomText

Algorithmic Implementations has unveiled a RAM-resident utility that magnifies text from two to eight times. *ZoomText* works with most character-based software, including word processors, spreadsheets, data bases, and communications products. *ZoomText* aids the visually impaired and reduces eyestrain and fatigue for those working with densely populated screens. In addition, *ZoomText's* three built-in fonts enable you to vary character thickness and spacing.

The package supports all character attributes on a monochrome monitor, including inverse video, high intensity, blinking, and underlining. It also supports all foreground and background colors on color monitors. *ZoomText's* pop-up menu permits you to select zooming modes, magnification, font styles, and window commands. You can split the screen horizontally or vertically to open a magnified window for detail work and an unmagnified window that shows normal-size text for reference. Text can be scrolled in any direction in the magnified window using the cursor keys, and the unmagnified text will scroll correspondingly. *ZoomText*, which sells for \$495, requires 50K, DOS 2.00 or a later version,



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and an EGA or compatible graphics controller. Algorithmic Implementations, 1156 Springdale Rd., Atlanta, GA 30306; 404/233-7065.

Touch and Go, Touch and Go Plus

Quantic Software has two variations on the theme of automating a job everyone dislikes: expense reporting. A spreadsheet-based product with automatic totaling and recalculating, *Touch and Go* is particularly suited to small companies without standardized reporting documentation already in place.

Each expense report has a five-line header for your name and that of your company, and 30 customizable rows available

for expense categories. *Touch and Go* prints out a week's worth of expenses on a single 8½-by-11-inch sheet, but you can append up to seven pages of remarks. The program comes with a year's supply of expense envelopes for travel receipts and their explanations. The multiuser version, *Touch and Go Plus*, lets a secretary produce expense reports for several employees using information from their travel envelopes. Both versions of *Touch and Go* automatically update the current balance on advances and reimbursements for each employee.

The single-user version of *Touch and Go* is \$99. *Touch and Go Plus* is \$149 for up to ten employees. Both are available on 5¼-inch or 3½-inch disks. A box of 50 *Touch and Go* expense envelopes sells for \$7.50. Quantic Corp., 44 Friendly Dr., Smithtown, NY 11787; 516/361-3322.

COMMAND	COM	25387	3-17-87	12:00p	COMMAND	COM	25387
ANSI	SYS	1678	3-17-87	12:00p	ANSI	SYS	167
COUNTRY	SYS	11285	3-17-87	12:00p	COUNTRY	SYS	1128
DISPLAY	SYS	11290	3-17-87	12:00p	DISPLAY	SYS	1129
DRIVER	SYS	1196	3-17-87	12:00p	DRIVER	SYS	119
FASTOPEN	EXE	3919	3-17-87	12:00p	FASTOPEN	EXE	391
FDISK	COM	48216	3-18-8		FDISK	COM	4821
FORMAT	COM	11616	3-18-8		FORMAT	COM	1161
KEYB	COM	9856	3-17-8		KEYB	COM	985
KEYBOARD	SYS	19766	3-17-8		KEYBOARD	SYS	1976
MODE	COM	15487	3-17-8		MODE	COM	1548
NLSFUNC	EXE	3868	3-17-8		NLSFUNC	EXE	386
PRINTER	SYS	13598	3-17-8		PRINTER	SYS	1359
REPLACE	EXE	11775	3-17-8		REPLACE	EXE	1177
SELECT	COM	4163	3-17-8		SELECT	COM	416
SYS	COM	4766	3-17-8		SYS	COM	476
VDISK	SYS	3455	3-17-8		VDISK	SYS	345
XCOPY	EXE	11247	3-17-8		XCOPY	EXE	1124
EGA	CPI	49865	3-18-8		EGA	CPI	4986
LCD	CPI	18752	3-17-8		LCD	CPI	1875
4281	CPI	17889	3-18-87	12:00p	4281	CPI	1788
5282	CPI	459	3-17-87	12:00p	5282	CPI	459

Zoomtext magnifies text from two to eight times, splitting your screen horizontally or vertically with a magnified window for detail work and an unmagnified window for reference.

UPDATE

Symphony 2.0

A new version of Lotus Development's *Symphony* five-function integrated program includes an upgraded word processor that does automatic word wrap and paragraph reformatting. It also has a store-and-paste facility for making multiple copies of text blocks as well as speed keys to expedite such functions as inserting, deleting, and moving blocks.

Symphony release 2.0, which combines word processing with data base management, spreadsheet, graphics, and communications, is bundled with four add-ins previously sold separately. An outliner works with the word processor to help organize ideas into numbered headings and subheadings. A spelling checker features an 80,000-word dictionary and room for up to six personal dictionaries. Two lesser add-ins include a file-locking utility and emulation for Digital Equipment Corporation's VT-100 terminals. *Symphony's* spreadsheet gains speed from minimal recalc, in which only worksheet cells affected by changes are recalculated. The data base now supports up to 256 fields in its data entry forms.

Symphony 2.0, which is not copy protected, requires DOS 2.00 or a later version and 640K. It retails for \$695. Upgrades

from release 1.1 and release 1.2 cost \$95; from release 1.0 the price is \$150. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617/577-8500.

Multiplan 4.0

Microsoft has updated its *Multiplan* spreadsheet to exploit the multitasking and extended memory capability of OS/2 Standard Edition 1.0. *Multiplan 4.0* runs in OS/2 protected mode, enabling you to build worksheets of up to 7MB using virtual memory swapping between RAM and disk. You can open up to eight worksheets at once and perform functions in all of them, stepping sequentially through different worksheets with a touch of the <F1> key and moving data between them with the Copy From command.

Microsoft also is offering an upgraded DOS release, although it will lack the virtual memory capabilities of the OS/2 version. Both versions include new data base functions, additional math functions and formulas, enhanced character formatting, and expanded printer support.

Multiplan 4.0 is file compatible with Microsoft's *Excel* spreadsheet and has improved compat-

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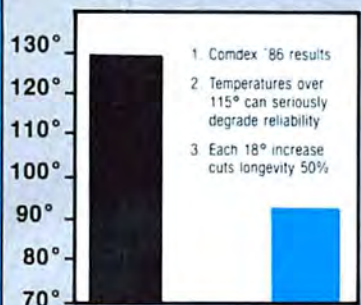


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- system runs 30°-45° cooler
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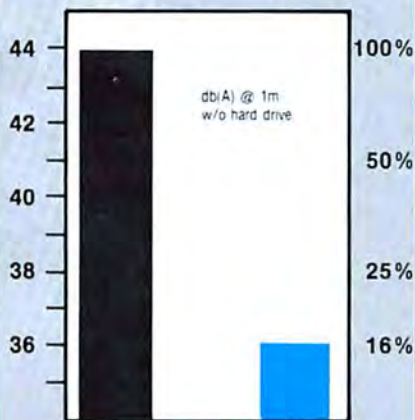


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ibility with Lotus's 1-2-3. Requirements for the DOS version are 384K and DOS 2.00 or a later version. The OS/2 version requires 1.2MB of memory and a hard disk. *Multiplan 4.0* retails for \$195, with upgrades from previous versions available for \$50. Microsoft Corp., 16011 N.E. 36th Way, Redmond, WA 98073-9717; 206/882-8080.

PageMaker 3.0

Aldus Corporation is shipping release 3.0 of its *PageMaker* desktop publishing software for both the PC and Macintosh environments. To tackle long documents, it now automatically flows text through successive pages, updates text source files with selected word processors, and lets you format text with style sheets of your own design. You can wrap text around both regularly and irregularly shaped *PageMaker 3.0* graphics and better control their color, bright-

ness, and contrast, and you can create special effects. The program ships with 20 ready-made page-design templates for reports, newsletters, fliers, and other documents.

PageMaker 3.0 requires an IBM PC AT or compatible with 640K of RAM, a 20MB hard disk, and an EGA or VGA graphics adapter. Also required are DOS 3.00 or a later version and *Microsoft Windows 2.0* or a later version. It retails for \$795. Aldus Corp., 411 First Ave. S #200, Seattle, WA 98104; 206/622-5500.

Guide 2.0

Owl International has enhanced its hypertext engine so that the dynamic links in hypertext documents are safe from changes by anyone but their creator. *Guide 2.0* has been separated into a \$275 *Guide 2.0* authoring/reading tool and a less-expensive *Guide Reader* sold in multiple copies. *Guide Reader* is available in a 3-pack for \$200, a

5-pack for \$300, and a 10-pack for \$500.

The *Guide 2.0* authoring tool establishes multimedia links among different text strings, numbers, charts, audio, video, and graphics across an unlimited number of files.

Guide Reader can be used only to browse hypertext documents, but you can do so in nonsequential fashion, reading only portions that are of interest.

Guide is most commonly used for technical documentation, automated maintenance systems, computer-based training, education, information delivery systems, and context-sensitive help systems. For example, a corporate author might create a service manual integrating PC files with input from a CD ROM or videodisk player for links between text, audio, and full-motion video. Owl Int'l, 14218 N.E. 21st St., Bellevue, WA 98007; 206/747-3203.

ArchiveXL

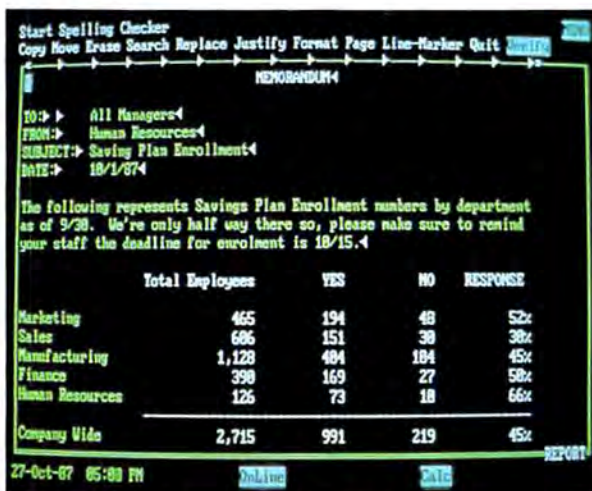
Archive Corporation is shipping the IBM PS/2 version of its ¼-inch 40MB ArchiveXL cartridge tape drives. Archive is offering both internal and external versions of the ArchiveXL backup tape drives for PS/2 Models 50, 60, and 80, and the external drive is compatible with the PS/2 Model 30. All employ the QIC-40 data interchange standard, a 3½-inch form factor, and QICStream utility software, with features such as unattended backup, selective file backup and restore, and compatibility with Novell networks. In-

ternal drives sell for \$499, external drives for \$798. Archive Corp., 1650 Sunflower Ave., Costa Mesa, CA 92626; 714/641-0279.

Microsoft OS/2 Languages

Hoping for an early development of OS/2 applications, Microsoft Corporation has begun shipping OS/2 versions of its five most popular development languages. The \$150 Microsoft Macro Assembler version 5.1, the \$295 BASIC Compiler version 6.0, the \$450 FORTRAN Optimizing Compiler version 4.1, and the \$300 Pascal Compiler version 4.0 all are available. The \$450 C Optimizing Compiler version 5.1 and \$350 Microsoft Programmer's Toolkit with reference documentation and special development utilities were scheduled for delivery at the end of April.

The languages allow the development of both DOS real mode and OS/2 protected mode applications—in fact, applications developed under DOS, OS/2, or Xenix using these products now can run under any of the three operating systems. The language products are all equipped with the Microsoft Editor—a reconfigurable, multile, multiwindow text editor—and a new version of CodeView, which now can debug both DOS and OS/2 multithreaded applications. Microsoft Corp., 16011 N.E. 36th Way, Redmond, WA 98073-9717; 206/882-8080. ●



Lotus Development's five-function integrated program, *Symphony*, has acquired four bundled add-ins, including an outliner and a spelling checker.

Can anyone outperform the dazzling
AT&T 6386 WorkGroup System?



Unleash the full power of the 80386 chip.



NO OTHER PC CAN DO MORE FOR YOUR BUSINESS
THAN THE AT&T 6386 WORKGROUP SYSTEM.

Compare the AT&T 6386 WorkGroup System to alternative PCs; you'll find it unleashes the full power of the 80386 chip.

In fact, it's one of the most powerful personal computers on the market today.

Its true 32-bit architecture lets you perform real multi-tasking and it supports multiple users with simultaneous data access.

But there's much more to the AT&T 6386 WGS than the powerful features that make it a superior computer today.

The 6386 WGS is part of a family of AT&T computers that share an open architecture and interface called the AT&T Application Operating Environment.

It's a simple, powerful idea.

The AOE embraces AT&T's approach to industry-standard operating systems, languages, database management, graphics, networking, and more.

Through AOE, AT&T is committed to openness and true connectivity.

So, no matter what exciting new

opportunities the software industry provides, the AT&T 6386 WGS is ready for them.

And your investment in AT&T computer equipment will remain safe and sound.

Read on.



To help protect your current software investment we offer a machine that can run in all major operating environments including MS*-DOS, Windows/386, OS/2, UNIX System V, and Simul-Task 386.

Rapid changes in today's software world mean your computer must be ready for anything that comes along.

And it must be able to run all of your existing DOS software: word processing, spreadsheets, databases, forecasting packages, and so on.



The powerful 80386 chip in the AT&T 6386 WorkGroup System works with Windows/386 so you can multi-task DOS applications simultaneously – the number of applications is limited only by your expandable RAM capacity.

As OS/2 applications emerge, your 6386 WGS will be ready to run them.

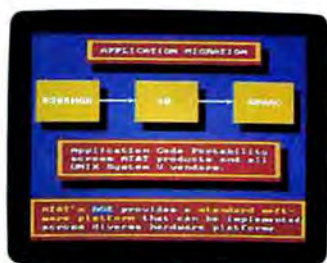
Plus you get the power of UNIX* System V; make the 80386 chip fly as you run powerful multi-tasking UNIX System applications, while Simul-Task 386 lets you concurrently run your DOS applications in their own windows.

And your 6386 WGS can serve up to 32 connected terminals in a multi-user environment.

Take advantage of PC enhancements when opportunities arise.

Running out of expansion slots in your computer is a major headache.

And since the industry promises even more exciting and powerful plug-in boards tomorrow, the problem is just going to get worse.



So, in addition to providing for more memory, the 32-bit path lets you plan ahead now for high-performance boards in the future.

The 6386E WGS has an unprecedented 10 expansion slots: four 32-bit paths, four 16-bit slots, and two 8-bit slots. (8 and 16-bit boards can be used in the 32-bit slots.)

The 6386 WGS offers seven slots: three 32-bit, two 16-bit, and two 8-bit.

No other 386 computer series gives you more expandability.

Add up to 5 magnetic peripherals inside the machine.

The AT&T 6386 WGS lets you add up to five mass-storage peripherals including tape drive – *right in the machine*. Why clutter up your desk with outboard units?

Keep on using your current media by choosing inboard 3½-inch with a 5¼-inch disk drive option.

Why waste time converting all of your 5¼-inch diskettes just to accommodate a machine that forces you to use 3½-inch diskettes?



Run at up to 20-megahertz clock speed.

The 6386E WGS flies with its 20-megahertz clock speed (16 or 20 megahertz for the 6386 WGS).

Choose from four industry-standard graphics protocols: EGA, CGA, MDA, and AT&T.

The 6386 WGS series supports virtually every graphics display device on the market.

Get total compatibility with existing XT and AT computers.

The AT&T 6386 WorkGroup System is totally hardware-compatible with the IBM® XT and AT.

Virtually all the plug-in boards designed for earlier 8086 and 80286 machines will work in the AT&T 6386 machines.

Expand RAM as needed.

As new operating systems emerge, you need all the RAM you can get.

Today's new operating systems and applications are significantly more memory-hungry.

FEATURE	AT&T 6386 WGS	AT&T 6386E WGS
PROCESSOR	80386	80386
CLOCK SPEED	16/20MHZ	20MHZ
RAM (STANDARD)	1MB	2MB
5.25" DISKETTE	1.2MB 360KB	1.2MB 360KB
3.5" DISKETTE	1.44MB	1.44MB
TOTAL INTERNAL DEVICES	3 1/2HT + 1 FULL	3 1/2HT + 2 FULL
TOTAL HARD DISK CAPACITY	435MB	600MB
STREAMING TAPE BACKUP	40, 60 OR 125MB	40, 60 OR 125MB
EXPANSION SLOTS	7	10

More RAM lets you run multi-tasking and multi-user applications much more quickly. You avoid wasting time in unnecessary disk access, because the 6386 WGS lets you expand RAM as your needs increase.

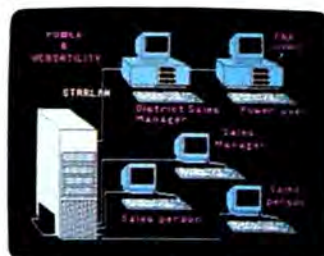
Plan for the future by entering the AT&T Application Operating Environment.

If you're running PC applications today and find that you need to enlarge your workgroup sometime in the future, you won't have to build an applications library from scratch.

The AT&T AOE lets you port your UNIX System V software essentially unchanged to departmental size minis (including AT&T's 3B computer family & RISC based machines) and mainframes, so you can start running powerful 386-based applications now, without fear for tomorrow.

At the same time you can build a fully networked PC workgroup.

The 6386 WGS is compatible with a wide range of peripherals, including AT&T's laser, letter-quality, dot-matrix, and line printers; plotters; and high-performance display terminals.



A single AT&T STARLAN Network can link from 2 to over 100 PCs, which means individuals in your workgroup can share printers, access the same data, and send messages.

AT&T's modular architecture and twisted-pair wiring make it easy for you to add stations as needed.

How to protect your freedom of choice.

To avoid buying the wrong machine, take a close look at the AT&T 6386 WorkGroup System. For more information on the 6386 WGS, the AT&T STARLAN Network, AT&T printers and terminals, and the Applications Operating Environment, call your AT&T Account Executive, Authorized AT&T Reseller, or dial 1 800 247-1212. AT&T can arrange for you to examine the 6386 WorkGroup System, the STARLAN Network, and other components you'll need to build a productive workgroup. Either at a facility near you or by special arrangement at your business location.

From equipment to networking, from computers to communication, AT&T is the right choice.

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With PC Paintbrush +, you can also capture B/W or gray-scale images with a scanner and then add your own creative flair – such as color.

If you have Microsoft® Windows, get PC Paintbrush for Windows or PC Paintbrush + for Windows. Both let you take full advantage of multi-window, multi-task applications.

The next generation.

Publisher's Paintbrush™ opens new frontiers of graphic support for desktop publishing. Now you can edit a laser printer page dot by dot and produce flawless 300-dpi, WYGIWY (What You Get Is What You Expect) images – even full color images. Zoom in for pixel-precise editing. Or zoom out for on-screen editing of the entire image. Produce text with small, large or huge characters. Adjust leading, kerning, character width, type sizes, italic slant, and text slope. Export your images to the leading desktop publishing packages. Get all this plus instant scanner support.

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N.e.w.s

ZSoft Announces New Windows Products

PC Paintbrush® and PC Paintbrush +, ZSoft's best-selling freehand graphics paint programs are now also available as applications running under Microsoft® Windows Operating Environment.

PC Paintbrush for Windows offers all the features of the industry-standard PC Paintbrush program, including cut-and-paste, freehand draw, flood fill, lines, circles, boxes, text, and more. PC Paintbrush + for Windows has all the capabilities of PC Paintbrush for Windows and adds image scanner support.

PC Paintbrush for Windows is available immediately from ZSoft. PC Paintbrush + for Windows is scheduled for release in August.

Both products run in any color and monochrome graphics modes supported by Windows.

Pictures created with the two Windows products are completely compatible with all of the DOS versions of ZSoft's graphics packages, including Publisher's Paintbrush.

IBM PS/2 Fully Supported

The entire line of ZSoft's freehand graphics software: PC Paintbrush, PC Paintbrush +, and Publisher's Paintbrush now feature full support for IBM's new Personal System/2 line of microcomputers.

The PS/2 Model 80 is supported in both its 640x480 2-color and 320x200 256-color modes. The Model 50 and Model 60 are also supported in 640x480 4 and 16-color modes.

Publisher's Paintbrush supports the new EISA display adapters for the models 50, 60, and 80 in 640x480 256-color and 1024x768 256-color modes!

The PS/2's graphic modes are of special interest to desktop publishers. The 640x480 resolution modes produce square pixels on the screen. When the pictures are printed on a 300 dpi printer such as a laser printer, "What You See Is What You Get", round circles on the screen are really round circles on the printout too.

PC Paintbrush, PC Paintbrush +, and Publisher's Paintbrush are all available on either 3.5" or standard 5.25" diskettes. Give us a call if you need to upgrade your current version or would like more information.

ZSoft Corporation can be reached by phone at (404) 980-1950, or by mail at 1950 Spectrum Circle Suite A-405, Marietta, Georgia 30067.

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A system for creating and editing logos and typefaces. This program supports PostScript compatible fonts and printer bitmapped fonts.

Complete IBM Personal System/2 Graphics Support



Publisher's Paintbrush, our top-of-the-line product, has it all: zoom-out editing... scanner support... superior typography... and speed. You'll need 2MB of RAM to edit an 8 1/2 x 11 page.



PC Paintbrush + reduces your memory requirements to 512K by trading off zoom-out editing and some typographic features. Like Publisher's Paintbrush, it supports gray-scale and B/W image scanners.



Both PC Paintbrush and PC Paintbrush + are now available as Windows applications. They have all the features of our DOS products and the ability to "communicate" seamlessly with other Windows applications.



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Match Wits With PC World:

Answers and Winners



January is a time when most people watch football, take down the Christmas lights, or make yet another round of hasty resolutions. But several thousand *PC World* readers spent at least part of the new year tackling a tough quiz compiled by the editors of *PC World* for our special fifth anniversary issue.

Why the overwhelming response? Well, those who mailed in their answer sheets had the chance to win an entire set of Turbo languages from Borland International (Turbo Basic, Pascal, C, and Prolog), plus a Turbo Toolbox of their choice. We also suspect that PC users just can't turn down a tough challenge.

From the mass of challengers arose ten readers who know what's what with the PC. None got a perfect score—the two top entrants missed three apiece—but then again, our quiz wasn't perfect either. Although many questions were intentionally tricky, we failed to list the correct answer to Question 1 ("Who developed the first electronic digital computer?"). Hats off to John Hoffman of Boone, Iowa, and Robert Rohrbough of Omaha, Nebraska, who reminded us that the Atanasoff-Berry Computer wins this honor—a distinction upheld by the federal courts. For their diligence and willingness to show us up, the editors have humbly awarded Messrs. Boone and Rohrbough free one-year subscriptions to *PC World*. We must also note an editing gaffe: The DOS prompt shown in Question 25 should have read

Wed 9-30-1987

17:01:32>

Our apologies for the errors.

And now, the "Match Wits" Top Ten. The top scorers were David Hall of Damascus, Maryland, and Klaus Krause of Santa Clara, California. Mr. Hall is a senior systems analyst who manages modeling and systems software development for United Technologies and has written programs in just about every language except C. Mr. Krause is a technical writer and editor for SRI International who also fills the role of unofficial PC guru. The other eight winners, in descending order, were Mohammad Dadashzadeh, Daryl Asplund, Evan Eickmeyer, Brad Levy, John P. Ende, Brian Quandt, Pete G. Girard, and Andrew Lee. Not surprisingly, the winners are highly experienced computer users—the group includes professional programmers, an MIS professor, electrical engineering and physics students, and a few dedicated hackers—and most plan on tackling Turbo C first. Our thanks to everyone who participated and to Borland International for supplying the software.

To check your answers, consult the "Match Wits" answer sheet printed on the following page.

**Thousands entered our
brain-busting
advanced users' quiz,
but only ten
made it into the
winners' circle.
For the answers—and
the winners—read on.**

Robert Luhn

But if you're curious about some of the trickier questions, pull out your January issue and ponder the following:

Question 10:

Many readers thought the correct answer was 16,384 bytes, since the CGA adapter is equipped with 16K of RAM. But the correct answer is 16,000 bytes; the remaining 384 bytes aren't used for display. Remember that in medium-resolution, four-color mode, 2 bits are devoted to every pixel; the screen is composed of 200 lines of 320 pixels each, for a total of 64,000 pixels. Thus, the total number of bits needed is 128,000. To find the number of bytes, divide that figure by 8, and voilà—the answer is 16,000 bytes.

Question 19:

A tricky question. *Baud* indicates the number of line state changes taking place per second, with each state representing one or more bits (see the explanation of Question 44). Strictly speaking, the RS-232C specification limits the port to a little more than 19,200 bits per second (bps). Therefore, using one bit per state, the RS-232C's maximum baud rate is equal to its nominal maximum bps rate. File transfer programs like *Lap-Link* can push data out the port at far greater speeds by driving the UART chip (which "packages" data for transmission) faster than the RS-232C's design provides for. (Of course, *Lap-Link* must control both sides of the communication.) Other serial ports, such as the RS-422 found in the Apple Macintosh, can transmit data at rates of up to 10 million bps.

Question 26:

When you telecommunicate a .WKS file, you must use an 8-data-bit setting. Why? Because .WKS files contain numeric values and other data

composed of 8-bit bytes. Although you can transmit a .PRN file (generated from the worksheet) or an ASCII file (created by a third-party conversion utility) using a 7-bit setting, neither is a .WKS file.

Question 27:

.COM files always execute before .BAT files. In fact, if you typed ZIP.BAT (instead of ZIP), ZIP.COM would still execute first.

Question 36:

A question for dedicated *Star-Dot-Star* readers. The *dBASE III Plus* manual notes that the INKEY() function returns a value only for <F1>; in fact, the other function keys and <Shift>-, <Alt>-, and <Ctrl>-function key combinations return values ranging from -1 to 113. Check *Star-Dot-Star* in the October 1987 issue for details.

Question 37:

Another tricky question. EMS and EEMS boards both rely on a 16K "window"; EMS boards use 4 contiguous windows, while EEMS boards use from 4 to 64 contiguous 16K windows.

Question 44:

A trickier question. As defined in the *Encyclopedia of Computer Science* (Van Nostrand Reinhold, New York, 1976), a baud "is a unit of signaling speed that refers to the number of times the state of a line changes per second. By contrast, a bit is the smallest unit of information....The baud rate is equal to the bit rate only if each state represents one bit of information." However, in most modems, each state usually represents several bits of data. Virtually all 1200-bps modems in the United States operate at 600 baud, but they generate four different states, each representing two bits of information. Thus, transmitting 600 2-bit states per second yields 1200 bits per second.

Question 46:

Dig into the source code listing for the EGA's BIOS ROM (found in that entertaining tome, *IBM Enhanced Graphics Adapter*), and you'll see all the alphanumeric (text) and graphics modes laid bare. Note, too, that no monitor currently on the market supports all of the EGA's modes. ●

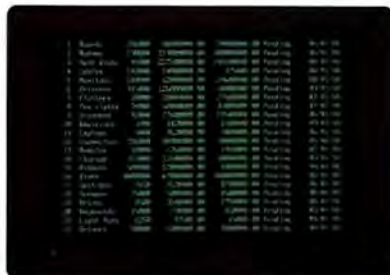
Robert Luhn is a senior editor for PC World.



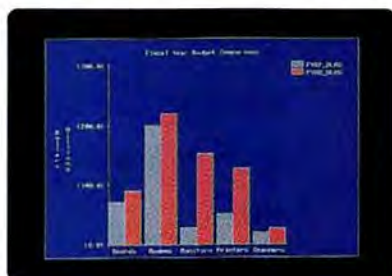
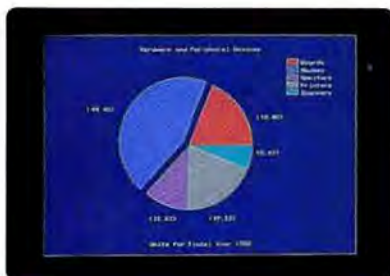
Answers

1.	n/a	9.	a	32.	a	42.	b
2.	c	10.	b	33.	b	43.	c
3.	a	11.	a	19.	b	25.	b
4.	d	12.	b	20.	a	26.	d
5.	b	13.	a	21.	b	27.	c
6.	b	14.	a	22.	c	28.	d
7.	b	15.	b	23.	c	29.	c
8.	a	16.	a	24.	b	30.	d
		17.	b			31.	a
		18.	d				
						34.	b
						35.	a
						36.	b
						37.	a
						38.	c
						39.	a
						40.	d
						41.	b
						44.	d
						45.	b
						46.	c
						47.	c
						48.	c
						49.	d
						50.	c

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New dBXL Diamond Release™, the *complete* dBASE III Plus work-alike database. \$199.00

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Because with dBXL, you can build 6 different kinds of full-color charts and graphs from your data. Including pie charts. Bar charts. Line charts. Even linear regressions, for sophisticated statistical analysis.

And once you've created these graphs, you can save them in your data files, or print them in a report. Either way, they're sure to get noticed a lot more than the usual words and numbers.

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Like windows. With dBXL, you don't just draw boxes around your data. Instead, you can build and display up to 99 real windows, so you can add pop-up help screens and menu bars to applications. Or look at more than one database at a time.

For fast data searches, there's also a feature your ear will notice.

It's called SOUNDEX. And it lets you look for data by how it sounds, rather than how it's spelled. So if you want to

find the "Jonson" file, you can type "Johnson." Or "Jonsin." And any record that sounds close pops up on the screen. Quick.

Speaking of quick, dBXL is now faster than ever. For faster indexing. Faster sorts. And faster programs. And it supports expanded memory systems such as Intel's Above™ Board, for indexing your larger data files—faster.

In case you hadn't noticed, dBXL retails for \$199, or about \$500 less than dBASE III Plus.

The new dBXL Diamond Release. With features for novices and programmers alike, it's the dBASE III Plus SuperClone that everyone's sure to notice. If you'd like to find out more, visit your software store or computer retailer.

Or call us at (415) 254-0900.

And see why you could spend a lot more on a database—and end up with a lot less.



dBXL™
WORDTECH SYSTEMS

LAN Servers for Less

You don't have to spend big money for a dedicated network file server.

A fast, low-priced 386 PC will perform just as well—if not better.

If the prospect of slow performance has kept you from installing a local area network (LAN) at your office, you should know that Intel's high-speed 80386 processor is having a major impact on file server performance. Tests show that 80386 machines handle network reads and writes about twice as fast as 286-based machines—even when running software designed for 80286 PCs.

Several major vendors have already released "dedicated" (and expensive) 80386 network servers, but since any PC with a large hard disk will work as a file server, it's worth asking whether buying a dedicated network engine has any real advantage. What's the least you can spend and still get top network performance?

To find out, *PC World* staged the first in a planned series of server speed trials. Four 80386 computers were benchmarked by National Software Testing Laboratories

(NSTL): one bargain-basement PC (the Blackship 386), one midprice machine (the Dell 386¹⁶), one high-end computer from a major vendor (Compaq's 16-MHz 386 Deskpro), and one dedicated network server (Novell's Server 386A). All the machines were set up in a standard configuration, with 4MB of 32-bit RAM and approximately 40MB of hard disk storage (the minimal configuration for small networks).

The good news: All four machines scored very nearly the same—and happily, price seems largely unrelated to speed. One of the lower-priced machines, the Dell, scored top numbers, while the other inexpensive PC, the Blackship, placed nearly as high. The bad news (at least for Novell): Novell's dedicated server placed dead last.

The servers were tested on one of the most common office setups: an 11-station Ethernet bus network running Novell's *Netware 286a* version 2.0 operating system. A Novell PO600A network board was installed in the server; Novell NE1000 boards were used in the workstations. Subsequent *PC*

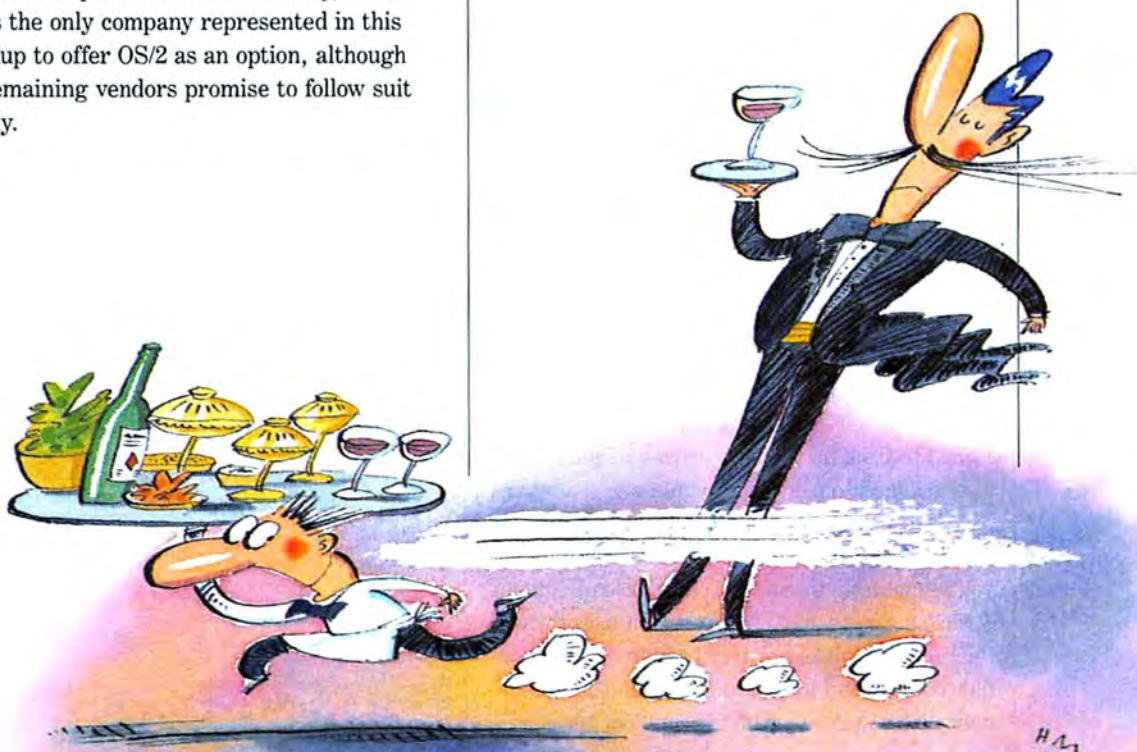
**Michael
Goodwin**

World roundups will look at 20-MHz PCs (since the newly released version of *Netware 286*—2.1—now supports that speed), different servers (the PS/2 Model 80, the Deskpro 386/20, and 3Com's 3S/400), different topologies (such as Token-Ring), and different software (like 3Com's forthcoming OS/2-based network operating system, *3 + Open*).

For those with an eye to the future who view *Netware 286* as an interim solution, a server's ability to run OS/2 is crucial. Network operating systems such as *3 + Open* and IBM's *OS/2 LAN Server* promise to revolutionize LAN performance. Currently, Compaq is the only company represented in this roundup to offer OS/2 as an option, although the remaining vendors promise to follow suit shortly.

Novell Server 386A

If you were expecting Novell's dedicated 80386 network server to be specially designed for LAN performance, you're in for a shock. In fact, the Server 386A seems to be little more than a standard 16-MHz, one-wait-state 80386 PC. Its only concessions to networking are two optional devices: a tape backup unit, and a disk coprocessor board designed to control up to eight external SCSI



All four machines scored very nearly the same—and happily, price seems largely unrelated to speed.

drives. The tape backup unit can be used only with the 386A, but you can install the disk coprocessor board on any IBM-compatible PC.

As the performance charts show, the 386A did quite poorly. All four machines scored so closely on the CPU-intensive *Paradox* test that the differences are negligible, but for what it's worth, the 386A tied for last with an average .77 transactions per second (tps). More significantly, it also ran last in the *Smart Series* tests (which combine computing performance with disk access), with a total execution time of 368.4 seconds.

The 386A comes with either 1MB or 4MB of 32-bit dynamic RAM on the motherboard, one 1.2MB floppy drive, monochrome graphics, and either a 42MB or an 80MB hard disk. The 4MB RAM/42MB hard disk model costs \$8990; the 4MB RAM/80MB hard disk version is \$9690. The optional 60MB tape backup unit adds \$2995 to the price.

Although the tape backup unit is expensive, it is also one of the 386A's most attractive features. Most third-party tape units designed to go into the server require you to back up *Netware*'s nonstandard security files to floppy disks in a separate, and tedious, operation. Novell's proprietary tape unit is designed to back up the entire system, security files included, quickly and painlessly.

Novell's optional disk coprocessor board (\$495) is also very attractive, especially if you're planning to run Novell's System Fault Tolerant version of *Netware*, which uses disk mirroring to make a safety backup of all your files on a second hard disk. The semi-intelligent disk coprocessor board controls up to

eight external SCSI drives and uses an Intel 80188 to maximize disk access speed and free the CPU for other duties.

Although the motherboard has two 32-bit slots—and Santa Clara Systems, Novell's hardware division, is hard at work developing memory expansion boards to fill them—as of press time the boards were not ready. Their absence sets an effective 4MB ceiling for 32-bit memory, which is very low for a server. Standard 16-bit memory boards can be used, but at a significant sacrifice in performance.

Six additional motherboard slots are provided—five 8/16-bit slots and one 8-bit slot—two of which are used to hold the floppy/hard disk controller and the monochrome video adapter. Device bays provide space for one full-height drive and two half-height drives. Two serial ports and one parallel port are built into the motherboard and do not require a slot.

The 386A's strongest draw is its optional (and pricey) tape backup unit, which can save the LAN administrator many hours of backup time. Its main drawbacks are lack of 32-bit memory expansion, relatively slow speed, and high cost. It's a poor partner for Novell's excellent software.

NSTL BENCHMARK TESTING

The exclusive test facility for *PC World*, **National Software Testing Laboratories (NSTL)**, is an independent organization that specializes in evaluating personal computer hardware and software. A recognized pioneer in state-of-the-art test design, NSTL believes that the most useful benchmark tests measure how well products perform when executing typical business tasks. NSTL testers follow detailed test plans that simulate normal operating conditions. A controlled testing methodology ensures objective, accurate, and consistent results and gives consumers a sound basis for making purchase decisions. NSTL publishes its test results in *Software Digest Ratings Report*® and *PC Digest*.™ Neither publication accepts advertising. NSTL is located in Philadelphia, Pennsylvania.

NSTL TEST REPORT

LAN Servers

Dell's 386¹⁶ holds the lead in seven out of eight tests. Novell's 386A places last or next to last in seven out of eight.

Smart Series LAN—data base only

1 station, heavy usage

Dell 386 ¹⁶		58.9
Compaq 386		59.6
Novell 386A		59.6
Blackship 386		59.9

5 stations, heavy usage

Dell 386 ¹⁶		69.1
Compaq 386		71.4
Blackship 386		71.6
Novell 386A		73.1

10 stations, heavy usage

Dell 386 ¹⁶		91.4
Blackship 386		99.2
Novell 386A		100.1
Compaq 386		100.6

seconds 0 20 40 60 80 100

Smart Series LAN—data base, spreadsheet, and word processing

10 stations, light usage

Dell 386 ¹⁶		60.3
Compaq 386		61.6
Novell 386A		61.6
Blackship 386		61.8

10 stations, heavy usage

Dell 386 ¹⁶		70.0
Blackship 386		72.0
Compaq 386		72.3
Novell 386A		74.0

seconds 0 15 30 45 60 75

All performance tests were conducted using Novell's Advanced Netware 286 version 2.1 on a 16-MHz Compaq 386 with 4MB of RAM. Eleven workstations were used, all 8-MHz IBM PC ATs with 640K of RAM. Ethernet LAN hardware was employed—the server used the NP-600 Network Interface Card (NIC), and the workstations were equipped with the NE-1000 NIC.

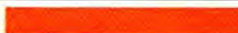
NSTL used a modified version of TP1, a standard developed out of a real-world situation in which a retail bank wanted to create a system with 10 million accounts, 10,000 tellers, and 1000 branches. The standard unit of transaction selected was debit-credit.

Transaction processing

1 station

Dell 386 ¹⁶		0.79
Compaq 386		0.78
Blackship 386		0.77
Novell 386A		0.77

5 stations

Compaq 386		0.90
Blackship 386		0.87
Dell 386 ¹⁶		0.87
Novell 386A		0.84

10 stations

Dell 386 ¹⁶		0.70
Novell 386A		0.69
Compaq 386		0.68
Blackship 386		0.67

transactions per second 0 .2 .4 .6 .8 1.0

For the performance tests involving one workstation, the transactions-per-second (tps) rating was calculated by using the formula $tps = \text{Total Transactions} / (\text{End Time} - \text{Begin Time})$.

For multiple workstations, the same method of calculating tps was used, except that End Time refers to the last time all workstations were active concurrently.

The Smart Series LAN performance tests consisted of light and heavy system-load simulations in three major software applications: data base management, spreadsheets, and word processing.

Smart Series LAN—data base only (1, 5, and 10 stations, heavy usage)

The data base management subset of the Smart Series LAN performance tests was run on a single station simulating heavy usage, or almost constant system access. The same test was repeated on 5- and 10-station test-beds.

Smart Series LAN—data base, spreadsheet, and word processing (10 stations, light and heavy usage)

The data base, spreadsheet, and word processing subsets of the Smart Series LAN performance tests were run on 4, 3, and 3 stations, respectively, simulating light usage. The tests were repeated simulating heavy usage.

Transaction processing (1, 5, and 10 stations)

The TP1 benchmark was run using Paradox. In the first test, a single station performed 200 transactions. For the 5-station test-bed, each station processed 40 transactions; in the 10-station test-bed, each station handled 20 transactions.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

FEATURES EVALUATION

LAN Server Roundup

Four 80386 computers vie for top honors as network servers.

	Novell Server 386A	Blackship 386	Dell Model 300	Compaq Deskpro 386 Model 40
● Yes ○ No ◐ Deficient				
Standard features				
Price ¹	\$8990	\$3769	\$4796	\$8650
CPU	80386	80386	80386	80386
Clock speed	16 MHz	16 MHz	16 MHz	16 MHz
Parallel ports	1	1	2	1
Serial ports	2	1	1	1
Memory capacity				
32-bit RAM				
Amount shipped with basic unit	1MB	1MB	1MB	1MB
Maximum installable	4MB	10MB	6MB	10MB
Expandability				
32-bit expansion slots	2	1	1	1
8/16-bit expansion slots	5	5	5	4
8-bit expansion slots	1	2	2	3
Maximum number of half-height drives	4	5	5	4
120MB or larger hard disk available from maker	○	●	●	○
Ergonomic design				
Reset button	○	●	○	○
Front-panel on/off switch	○	○	○	○
Front-panel keyboard socket	○	○	○	●
ROM-based setup software	○	○	○	○
Compact footprint	○	○	○	○
Complete documentation	●	○	●	●

¹ Price listed is for LAN configuration noted in text: 4MB of 32-bit RAM, 40MB (or equivalent) hard drive, monochrome display and monitor.

Blackship 386

The bargain-basement Blackship 386, a 16-MHz PC based on a Micronics motherboard, was one of the highest-rated entries in *PC World's* recent 386 roundup (see "Surprise! Cheap 386s Deliver," *PCW*, February 1988). Despite its low-end price tag (\$3769 in the standard server configuration), its network performance proves that cheap doesn't have to mean slow.

The Blackship 386 comes with 1MB or 2MB of fast, 32-bit static-column RAM on a proprietary memory board in the machine's single 32-bit slot. To that board, you can add a 2MB, 4MB, or 8MB piggyback module; the last brings the Blackship to its maximum, a healthy 10MB of 32-bit RAM. In addition, the motherboard holds two 8-bit and five 8/16-bit expansion slots, three of which hold the monochrome video adapter with parallel port, the floppy/hard disk controller, and the parallel/dual-serial I/O card.

The computer can be ordered with a variety of hard disk options—everything from a low-end 44MB drive to a 122MB unit. The cabinet has room for one full-height drive and three half-height drives, which should provide sufficient disk capacity for all but the largest network applications.

Documentation is barely adequate, but this deficiency is balanced by the Blackship 386's unusually strong field support and warranty policy. In addition to providing an industry-standard one-year limited warranty on products, parts, and labor, Blackship guarantees that systems returned to the factory for warranty service will be repaired within 24 hours or a replacement system will be issued. If you can narrow your problem to a part, Blackship will mail you a replacement overnight.

In NSTL's *Paradox* tests, the Blackship tied with the Novell 386A. It did much better on the *Smart Series* tests, earning second place with a total elapsed time of 364.5 seconds—a mere 15 seconds behind the top-rated Dell 386¹⁶.

On the other hand, please note that picking up those 15 seconds will cost you over \$1000—enough money to buy an 8086 PC! The price difference between the Blackship (\$3769) and the Dell Model 300 (\$4796) is exactly \$1027. The Blackship's combination of decent performance and ultralow price makes it a very strong candidate.

Dell 386¹⁶ or Model 300

This midprice 16-MHz PC was one of the fastest desktop PCs on the market when it was released late in 1987—until 20-MHz machines left it behind. The Dell (formerly PC's Limited) 386¹⁶ uses fast static RAM, allowing its 80386 processor to run flat out at 16 MHz with no wait states.

With an excellent motherboard of Dell's own design, a 28ms Magnetic Peripherals hard disk, a controller that handles two hard and two floppy disks, and enough bays to accommodate five half-height drives (or two full-height drives and one half-height drive), the Dell 386¹⁶ has all the makings of a dandy network server.

EXECUTIVE SUMMARY

Blackship 386

80386 server



The Blackship 386 is the lowest-priced server in the survey, offering relatively strong performance, plus a comfortable 10MB maximum of 32-bit memory. You can find faster servers, but if

price is your highest priority, this is the server for you.

Memory capacity			●		
Expandability	●				
Ergonomic design			●		
Performance			●		
Overall value	●				
	EXCELLENT	GOOD	FAIR	POOR	

EXECUTIVE SUMMARY

Dell 386¹⁶ or Model 300

80386 server

Top speed, moderate price, and a great warranty make the Dell 386¹⁶ (or Model 300) an excellent choice. Its only drawback is its low 6MB 32-bit memory limit, which makes it less attractive for large networks.

Memory capacity			●		
Expandability	●				
Ergonomic design				●	
Performance	●				
Overall value	●				
	EXCELLENT	GOOD	FAIR	POOR	

In fact, NSTL's tests demonstrate that the 386¹⁶ is extremely swift. In the *Paradox* benchmark, it tied for first place with an average .79 tps. And it won the *Smart Series* tests hands down, blazing into first place with a combined execution time of 349.7 seconds.

A proprietary memory board provides 1MB of 32-bit RAM; adding 256K memory modules brings 32-bit RAM to a relatively unimpressive maximum of 6MB. There are five 8/16-bit and two 8-bit expansion slots. Three are used to hold the monochrome video adapter with parallel port, the floppy/hard disk controller, and the parallel/dual-serial I/O card.

Dell offers an unusually attractive warranty deal with the computer: You get a full year's on-site support from Honeywell Bull at no extra cost. This deal is guaranteed to bring a smile to the lips of the sternest network administrator.

As *PC World* went to press, Dell announced that it was replacing the 386¹⁶ with the Model 300—an identical machine except

Finding a relatively inexpensive machine that outperforms a high-priced unit is always a treat; finding two is twice as nice.

for slightly different floppy disk options, EGA capability, and a lower price. This is good news, because the Dell 386¹⁶ was the fastest server tested, and at \$4796 the Model 300 would have been the second cheapest in the roundup. High performance, reasonable price, and an outstanding warranty make this machine a front-runner in the network race.

Compaq Deskpro 386 Model 40

This 16-MHz powerhouse was the first 386 PC marketed by a major manufacturer. It seems relatively sedate compared to the Deskpro 386/20 (Novell had no 20-MHz driver when the tests were run; see "Deskpro

Pushes the Limit," *PCW*, February 1988, for a review of the Deskpro 386/20), but its rock-solid construction and Compaq quality make it a tempting choice as a heavy-duty server. On the other hand, its \$8650 price tag (in the standard network configuration) is fairly high—and its performance in a network environment is less than dazzling.

The Deskpro 386 tied for first in the *Paradox* test with an average .79 tps, but it placed a poor third in the more revealing *Smart Series* set, scoring a combined execution time of 365.5 seconds.

Only 1MB of 32-bit static RAM is provided on the proprietary Compaq memory expansion board, but you can add up to 9MB of additional 32-bit static RAM for a comfortable 10MB total.

The Deskpro 386 currently offers only one hard disk option: a 30ms half-height 40MB drive. If you need greater disk capacity (as you will for large networks), you must turn to third-party drives. Altogether, the case accommodates four half-height or two full-height devices, which ought to be sufficient for most network applications. Expansion slots include one 32-bit slot (that holds the memory board), three 8-bit slots, and four 8/16-bit slots (one of which holds the floppy/hard disk/tape backup controller). Like all the servers reviewed here, the parallel/serial I/O card can go in any 8- or 8/16-bit slot.

As usual, Compaq's documentation is outstanding. The machine comes with a limited one-year warranty on parts and labor and, of course, the intangible asset of Compaq quality. As the old proverb states, good things are not cheap. At \$8650 this is not a cheap machine, especially given its less than breathtaking performance. But you can be fairly sure that Compaq will still be around if you run into problems.

Serving the LAN Community

With so many kinds of LANs available, it's dangerous to generalize from a single set of test results. Nonetheless, one thing seems clear: In the world of *Netware*, paying for a

EXECUTIVE SUMMARY

Compaq Deskpro 386 (16 MHz)

80386 server

The Compaq Deskpro 386 offers both reliability and a comfortable 10MB 32-bit memory ceiling, which make it a good choice for larger networks. But its performance is not outstanding, and its price is fairly high.

Memory capacity	EXCELLENT	GOOD	FAIR	POOR
Expandability			●	
Ergonomic design			●	
Performance			●	
Overall value			●	

EXECUTIVE SUMMARY

Novell Server 386A

80386 server

The "dedicated" Server 386A is little more than a vanilla 386 PC, with only 4MB of 32-bit RAM and no memory expansion currently available. It scores near the bottom of the performance tests and near the top of the price range. Despite its capable add-on tape backup unit, it is not recommended.

Memory capacity				●
Expandability			●	
Ergonomic design				●
Performance			●	
Overall value				●
	EXCELLENT	GOOD	FAIR	POOR

"dedicated" file server is a waste of money.

Neither Novell's sluggish Server 386A nor the poky Compaq Deskpro 386 offers the power to justify its high cost. On the other hand, both the Dell 386¹⁶ and the Blackship 386A deliver remarkably strong performance at bargain prices. Finding a relatively inexpensive machine that outperforms a high-priced unit is always a treat; finding two is twice as nice.

It's important to remember that these test results are limited strictly to *Netware 286a* running at 16 MHz on a relatively small bus network. As LAN operating systems optimized for the 80386, 20-MHz computers, and OS/2 become available, we can expect server performance to leave current benchmarks in the dust. ●

Michael Goodwin is an associate editor for PC World.

WHERE TO BUY

Blackship 386

Blackship Trading Co.
385 Oyster Point Blvd. #10
South San Francisco, CA 94080
800/431-6249, 800/654-7955 California, 415/952-1994

List price: with 4MB 32-bit RAM, 101-key keyboard, two parallel and two serial ports, 1.2MB Teac floppy disk drive, 44MB Seagate ST-4053 hard disk, Western Digital controller, Hercules-compatible monochrome graphics adapter, monochrome monitor, and one-year warranty \$3769

Accessories: 77MB Miniscribe 6085 hard disk \$990, 80MB Seagate ST-4096 hard disk \$860, 122MB Seagate ST-4144 RLL hard disk \$1060; 1MB expansion static-column RAM \$330; 2MB 32-bit static-column memory piggyback module \$731.50, 4MB version \$2128, 8MB version \$4164

Compaq Deskpro 386

Compaq Computer Corp.
20555 FM 149
Houston, TX 77070

800/231-0900, 713/370-0670

List price: Model 40 with 4MB 32-bit RAM, 1.2MB floppy disk drive, 40MB hard disk with integrated controller, one serial and one parallel port, monochrome graphics adapter, and monochrome monitor \$8650

Accessories: 1MB to 2MB 32-bit memory expansion board \$699, 1MB memory upgrade kit \$499; 4MB to 8MB 32-bit memory piggyback module with 4MB installed \$2199, 4MB memory upgrade kit \$1099; MS-DOS version 3.30 \$120

Dell Model 386¹⁶ or Model 300

Dell Computer Corp.
1611 Headway Circle
Austin, TX 78754
800/426-5150

List price: Model 300 with 4MB RAM, 1.2MB floppy disk drive, 28ms 40MB hard disk, monochrome graphics adapter, monochrome monitor, 101-key keyboard, two parallel and two serial ports,

one-year on-site support \$4796; with 70MB hard disk \$5196; with 150MB hard disk and ESDI controller \$6496

Accessories: each additional 1MB RAM \$499, Dell Enhanced MS-DOS 3.30 \$120

Novell Server 386A

Santa Clara Systems
1610 Berryessa Rd.
San Jose, CA 95133
408/729-6700

List price: with 4MB 32-bit RAM, keyboard, one parallel and two serial ports, 1.2MB floppy disk drive, 42MB hard disk, disk controller, monochrome graphics adapter, monochrome monitor, and one-year parts-and-labor warranty \$8990; with 80MB hard disk \$9690

Accessories: 60MB tape backup unit \$2995, disk coprocessor board \$495

For more information, see Products Featured in This Issue.

Share the Wealth!

**Multuser data bases are the
best reason to invest in a LAN.**

**PC World checks out the network
approach of three popular data
bases: Advanced Revelation,
Paradox 2.01, and R:base for DOS.**

A multuser data base can boost productivity, but getting there won't be cheap—or easy. Implementation takes time and can cost plenty. Moreover, because of the abundance of LAN hardware variables, even the best-tuned multuser data base has more ways to crash than its stand-alone cousin. So why risk the data spaghetti and downtime that can occur when LANs go bad? The answer's simple: Multuser data bases consolidate valuable resources.

Market leaders *Advanced Revelation*, *Paradox*, and *R:base for DOS* all come in capable multuser versions. Like any multuser data base, their most important benefit is enabling many users to tap into the same pool of data at the same time. With a well-tuned multuser data base up and running, you don't have to rely on a "sneaker net" to share files, or wait days or weeks for MIS to fulfill your report requests. What's more, the data you see on screen is current—a terrific advantage for, among others, salespeople, analysts in a work group, and users of order entry and inventory systems.

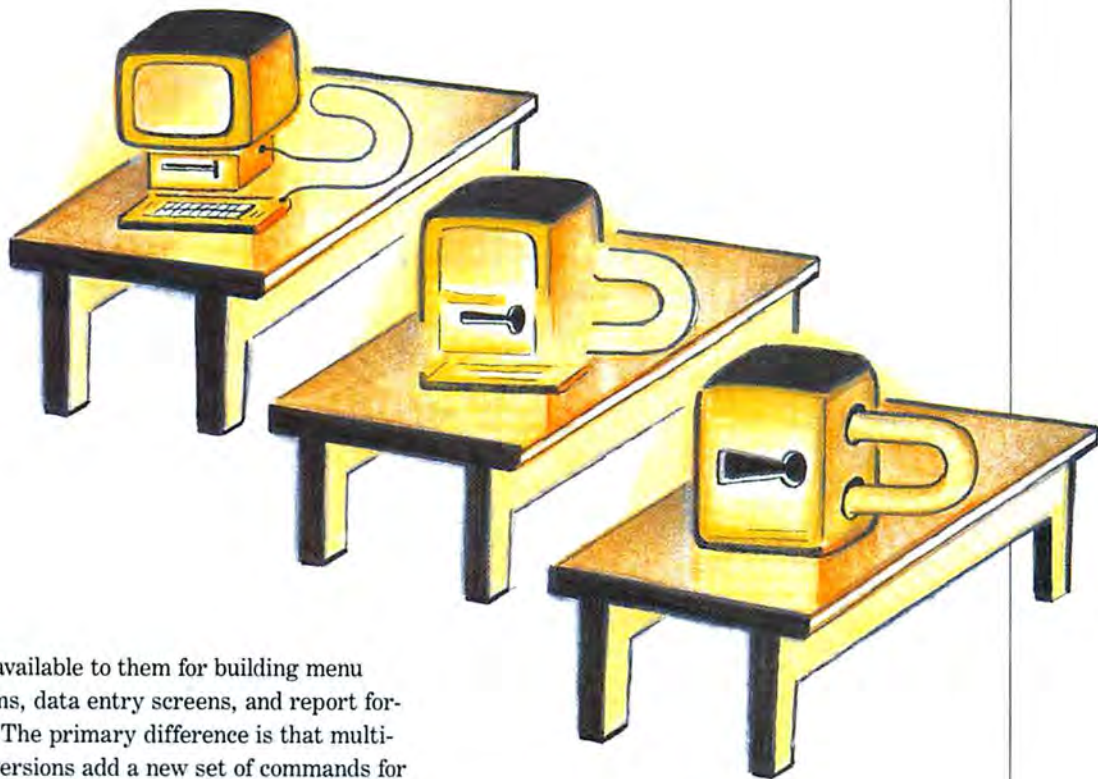
**Hal Chapel
and
Marlene Nesary**

The most significant differences among the three programs reviewed here lie in their tools for protecting data, developing applications, and maximizing LAN performance. A multuser data base adds only a handful of commands, but they must be wielded cannily. Because programming for a multuser environment is typically much more difficult than for a single-user setting, you need an experienced developer to implement these tools.

The Right Tools for the Job

The LAN versions of *Advanced Revelation*, *Paradox*, and *R:base for DOS* all require a file server with a hard disk. For each, shared data files *must* reside on the server. Program files usually reside on the file server too, though they (and private user files) may be installed on workstations to reduce traffic. Actual data processing always occurs on the local workstation.

Like most multuser products, these three relational heavyweights maintain the same user interfaces as their stand-alone versions. Such parameters as field, file, and record sizes remain intact in each program; application developers have the same set of func-



tions available to them for building menu systems, data entry screens, and report formats. The primary difference is that multi-user versions add a new set of commands for locking and securing data.

Cosmos's *Revelation* has long enjoyed a reputation as the developer's favorite multi-user data base. Sophisticated programming and data integrity tools and a fully implemented data dictionary provide the basis for fast application development and easy maintenance of complex systems. Variable length and multivalued fields increase *Revelation*'s flexibility. Recently, Cosmos added a powerful application generator and a new, state-of-the-art file storage system to the program and renamed it *Advanced Revelation*. Of the three programs, it is the best suited for serious application development.

Advanced Revelation offers many ways to optimize speed for particular LAN implementations. For instance, developers can specify the size of data blocks sent between

nodes and the file server, making the flow of traffic as efficient as possible. And developers can choose between two types of storage for data and program files to enhance data retrieval performance.

All this customizing potential has branded *Advanced Revelation* as obscure and difficult to learn. The application generator and a new window-driven interface make *Advanced Revelation* much more hospitable than its predecessor, but the documentation still assumes a programmer will be installing the package, and this complex program needs one if you want to tap its full power.

Wrestling with its difficulties, however, can really pay off for those with heavy-duty transaction processing needs. *Advanced Revelation* handles more transactions per second than either of the other programs, and its performance holds steady even as the number of nodes increases.

NSTL TEST REPORT

LAN Data Bases

Advanced Revelation does the best on sheer transaction throughput, but Paradox 2.01 and R:base for DOS are better query tools.

Transaction processing without an index

1 station

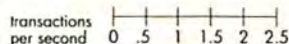
R:base		0.78
Revelation		0.74
Paradox		0.65

5 stations

Revelation		2.30
Paradox		0.83
R:base		0.53

10 stations¹

Revelation		2.40
Paradox		0.63



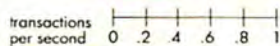
Transaction processing with an index

0 records—5 stations

Revelation		0.88
Paradox		0.51
R:base		0.50

1000 records—5 stations

Revelation		0.88
R:base		0.48
Paradox		0.44



¹ R:base cannot run this benchmark because its lock queue accommodates a limited number of users.

Group record searches with an index

1 station

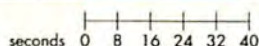
Paradox		6
R:base		13
Revelation		36

3 stations

Paradox		7
R:base		13
Revelation		38

3 stations

Paradox		7
R:base		14
Revelation		38



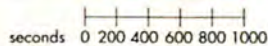
Group record searches without an index

1 station

Paradox		332
R:base		341
Revelation		4303

3 stations

R:base		365
Paradox		371
Revelation		4919



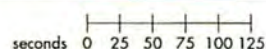
Subtotal 100 groups

1 station

R:base		10
Paradox		13
Revelation		113

3 stations

R:base		11
Paradox		13
Revelation		116



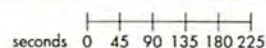
Two-file joins

1 station

Paradox		52
R:base		130
Revelation		210

3 stations

Paradox		53
R:base		132
Revelation		211



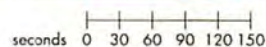
Four-file joins

1 station

Paradox		68
R:base		120
Revelation		142

3 stations

Paradox		70
R:base		132
Revelation		143



All performance tests were conducted using Novell's Advanced Netware 286 version 2.1 on a 16-MHz Compaq 386 with 4MB of RAM. Eleven workstations were used, all 8-MHz IBM PC ATs with 640K of RAM. Ethernet LAN hardware was employed—the server used the NP-600 Network Interface Card (NIC), and the workstations were equipped with the NE-1000 NIC. All tests were conducted using Advanced Revelation, Paradox 2.01, and R:base for DOS.

NSTL used a modified version of TP1, a standard developed out of a real-world situation in which a retail bank wanted to create a system with 10 million accounts, 10,000 tellers, and 1000 branches. The standard unit of transaction selected was debit-credit.

For the performance tests involving one workstation, the transactions-per-second (tps) rating was calculated by using the formula $tps = \text{Total Transactions} \div (\text{End Time} - \text{Begin Time})$.

For multiple workstations, the same method of calculating tps was used, except that End Time refers to the last time all workstations were active concurrently.

Transaction processing without an index (1, 5, and 10 stations)

The TP1 benchmark was run with 250 transactions. In the first test, a single station performed all 250 transactions. For the 5-station test-bed, each station processed 50 transactions; in the 10-station test-bed, each station handled 25 transactions.

Transaction processing with an index (5 stations)

The TP1 benchmark was run with 50 transactions per station for a total of 250 transactions. Tests were run with no records in the history file at the beginning of processing; then the same tests were run with 1000 records in the history file. The difference between these two sets of benchmarks is that in the latter the history file was indexed on 4 fields. Therefore an update of the index was required for each appended record. Compare those results to the previous set's to gauge the effect of updating the index during transaction processing.

Group record searches with an index (1, 3, and 3 stations)

From the center of a 50,000-record file, 100 records were selected on an indexed field using relational operators to set selection limits. To test for any cache effect that might occur, the first two benchmarks assigned each station the same set of records to retrieve. After selection, the records were sorted in ascending order and printed to a null printer. The third test followed the same procedure, except that each station was assigned a different set of records to retrieve; this was done to eliminate the effect of caching.

Group record searches without an index (1 and 3 stations)

From a 50,000-record subset of the account file, 1000 records were selected on a nonindexed field using relational operators (greater-than, less-than, and equal signs) to set selection limits. Selected records were then sorted in ascending order and printed to a null printer.

Subtotal 100 groups (1 and 3 stations)

From the teller file, 100 groups of 10 records each were selected to create a 1000-record subset. The records were grouped and sorted on the branch ID field in ascending order. The teller's balance field was subtotalled for each branch or group, and the results printed to a null printer.

Two-file joins (1 and 3 stations)

The 1000-record teller file and a 100-record subset of the branch file were joined to provide a list of teller and branch names ordered by teller and branch ID fields. Results were routed to a null printer.

Four-file joins (1 and 3 stations)

The 50,000-record account file, the 1000-record teller file, the 100-record branch file, and a 250-record version of the history file were joined. All the history file fields were selected along with some nonindexed fields from the account, teller, and branch files. These were selected using three sets of relational operators.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

Ansa's *Paradox* began as a stand-alone data base, wowing users with its intuitive interface and powerful query facility. The network version is a recent development, and Ansa designers have loaded it with slick data-locking and data-integrity features.

In stand-alone or LAN form, *Paradox* offers all the relational punch of *dBASE* or *R:base* and, with its Lotus-like menus and graphic interface, is much easier to use. In *Paradox*'s Query-by-Example, for instance, you fill in one form on one screen to activate a query, while in *R:base*'s Prompt-by-Example you piece together a query from a sequence of menu choices—not difficult, just not as elegant.

Optimized for ad hoc querying and reporting, *Paradox* can be a real screamer in multifile operations on a LAN. It bogs down in heavy transactional applications like accounting, becoming much less efficient than either *Advanced Revelation* or *R:base for DOS* and slowing dramatically as the load increases.

Paradox's speed depends to a large extent on the location of user directories. For queries and reports, *Paradox* collects data and sends it to the requesting user's private directory for processing. If all private directories are installed on the file server, traffic quickly approaches gridlock. The best way to augment the program's performance is to invest in a hard disk for each workstation and install private directories there. Though costly, this solution may be worthwhile where users do a lot of off-the-cuff analysis involving data from several files.

Paradox also offers a full, elegant set of resources for sharing records. Nice touches include being able to view updates as they are performed by other users and to identify which users have locks on data you've requested. These features add to the program's polish and ease of use but exact a price in performance.

Microrim's *R:base* is second only to *dBASE* in sales, but perhaps it tries harder. The latest *R:base* includes 20 new commands based on Structured Query Language (SQL) and a much more complete set of statistical

FEATURES EVALUATION

Network Data Bases

For large-capacity applications, try Advanced Revelation. Paradox sports the best data locks.

- Yes
○ No
◐ Deficient

Setup and installation

	Paradox 2.01	Advanced Revelation	R:base for DOS
Install utility	●	●	●
LAN administration tools	●	●	●
LAN documentation	●	●	●
Hard disk space		3.5MB	2.5MB 4MB
Number of users in LAN pack		6	4 3

Password and access schemes

File protection	●	●	●
Record protection	●	●	●
Field protection	●	○	●
Data encryption	●	●	●

Data-locking features

File locking—explicit	●	●	●
Auto-coordinated file lock	●	○	●
Record locking—explicit	●	●	○
Auto-record lock	●	●	●
View previously locked records	●	●	●
Auto-refresh updated records	●	○	○

Development tools

Inform who has data lock	●	○	●
Data dictionary	○	●	○

Development tools

Select data packet size	○	●	○
Application generator	●	●	●
Programming language	●	●	●

Capacity

Reads/writes .DIF	●	○	●
Reads/writes ASCII	●	●	●
EMS support	●	○	●
Run-time module	●	●	●
Variable-length fields	○	●	○
Multivalued fields	○	●	○
File size	unlimited	unlimited	unlimited
Records per file	2 billion	unlimited	unlimited
Fields per record	255	32,000	400
Characters per record	4000	64,000	4092
Tables per data base	unlimited	unlimited	80
Forms per file	unlimited	unlimited	unlimited
Screens per form	15	RAM limit	5
Indexes per file	255	unlimited	400
Fields per index	255	unlimited	1
Files per join	RAM limit	300	5

functions than *dBASE III Plus*, *Advanced Revelation*, or *Paradox*. Released late last year, *R:base for DOS* has also been completely rewritten in C for speedier performance.

Moreover, Microrim packs extra value in *R:base for DOS* by including a new run-time capability called the Developer's Express. The Express module's pseudocompiler makes

program code execute faster and lets developers protect and distribute their *R:base for DOS* applications more easily.

The most timely and, at first glance, impressive enhancement in *R:base for DOS* is its SQL capability. This powerful language is on every major data base vendor's agenda these days, but Microrim is one of the first old guard PC companies to implement it. Users already trained in the mainframe-based language will find Microrim's SQL

easy to learn, yet old *R:base* users needn't step into the future until they're ready. *System V*'s full command set is still available with the upgrade, so users can be insulated from SQL if they choose.

But why ignore the language of the future? SQL promises more than standardization of important functions across data bases. *R:base for DOS*'s implementation of Grant and Revoke commands, for instance, yields refined control over data base security. In addition, the Create, Insert, and Select commands offer an extremely concise means of building and modifying data base tables.

The only drawback is that *R:base for DOS*'s SQL is incomplete. You can't perform nested SQL queries with Microrim's version. A key SQL command that permits global locking of records—Select Update—is missing. And the really powerful protectors of data integrity in a transaction system, SQL's Commit and Rollback commands, aren't available in Microrim's implementation.

Though each of the packages has its failings, all three provide good error-trapping tools—much-needed insurance against data spaghetti. While *Paradox* uses an efficient programming method called *procedural branching* to handle errors, *Advanced Revelation* relies on straightforward IF...THEN...ELSE logic. *R:base for DOS* is a bit more cumbersome at error trapping, requiring an explicitly set error variable whose value must be repeatedly tested. Developers will be pleased, though, with *R:base*'s excellent system for accessing shared peripherals such as printers.

Network Installation

If you think the usual data base installation procedure is gnarly, stay away from the multiuser version. On a LAN, you must coordinate three layers of software: the data base program, the network software, and DOS. Depending on your choices, the software may need more or less tweaking to ensure that interactions between the layers work smoothly.

EXECUTIVE SUMMARY

R:base for DOS

Multiuser data base

Early to the market with SQL commands, *R:base for DOS* also provides a fine array of math and statistical functions and a good balance of querying and transactional performance. Its data-locking schemes permit a lot of shared access but can drag down performance in some multifile operations. For *System V* users, the upgrade is a smooth one. Others may gripe about the omission of important SQL commands.

Setup and installation			●	
Password and access schemes		●		
Data-locking features		●		
Development tools		●		
Performance			●	
Overall value		●		

EXCELLENT

GOOD

FAIR

POOR

With real world requirements in mind, *PC World* chose a test bed that used IBM ATs and 3Com Ethernet boards running Novell's *Advanced Netware 286* as the network operating system. An experienced developer should need only a couple of hours to install each data base program on this configuration. *R:base for DOS* and *Paradox* provide specific instructions for each network supported. *Advanced Revelation*'s instructions are less helpful; they're generic, not network specific.

In addition to *Netware*, all three data bases work with several network operating systems, including IBM's *PC Network* and *PC LAN* (for the IBM PC Network and Token-Ring) networks as well as 3Com's original *EtherSeries* and its current *3 + Share*. *Paradox* is also compatible with AT&T's *Starlan*. *Advanced Revelation* adds AT&T's *Starlan*, Hewlett-Packard's *OfficeShare*, and Banyan's *Vines* networks. (Check with the vendor for other LAN hardware and software that may be supported, since companies often add new names to their lists.)

EXECUTIVE SUMMARY

Paradox 2.01

Multiuser data base

Intuitive data handling, extensive control over data locking, and an intelligent, elegant design distinguish multiuser Paradox. These niceties drag down performance, though, except in operations involving multiple files; then Paradox cooks. Expanded memory and hard disks at each node will boost transaction throughput—an expensive solution to everyday traffic, but one that may be worthwhile if ease of use and querying power are your top two requirements.

Setup and installation		●		
Password and access schemes	●			
Data-locking features	●			
Development tools		●		
Performance			●	
Overall value		●		
	EXCELLENT	GOOD	FAIR	POOR

If you include all the sample files and developer's tools, *Advanced Revelation's* nine disks occupy 2.5MB of disk space. Terse is the word for the program's installation instructions—though the process itself is fairly straightforward. You begin by creating a shared directory for system and data files, and granting user-access rights. Then you run the install program (this is usually done from a workstation via path statements to the file server), start up *Advanced Revelation*, and use a floppy disk to enable the multiuser mode.

Feature-rich *Paradox* also eats up disk space. Its 11 disks require 1.2MB for the program files and another 2.25MB on the file server if you install the application generator. Like *R:base for DOS*, the program adds a set of 3½-inch disks for PS/2 systems. To get up and running with *Paradox*, you create a

read-only directory containing system files and run an install program to define date formats, establish a user count, and create directories for shared files. Install the users' required private directories on individual hard disks if you've got them. Otherwise, use the file server for these, too.

R:base for DOS's nine 5¼-inch disks contain compressed files that occupy almost 4MB when installed on the file server; since the program needs at least 400K of RAM to operate, the manufacturer recommends that each workstation have 640K available. Once *R:base for DOS* has been installed with the Network Administrator Disk, three, six, or an unlimited number of users (depending on the version you purchased) may run the program concurrently.

As with *Paradox*, you can reduce traffic in an *R:base* LAN by installing hard disks at local workstations and copying program files there. This enhances system performance but increases maintenance time, because workstation program files as well as server program files must be updated each time a new user or piece of equipment is added to the system.

Such cautions point to a hidden cost in maintaining a multiuser data base: paying for the time and expertise of a system administrator who understands how to add new printers or users, who performs regular backups, and who, after the initial development phase, assigns passwords and access rights.

Passwords and Access Schemes

Passwords and file access schemes are the first line of defense for a multiuser data base. They help protect the data against unauthorized use, but they can also affect data base integrity; the more cavalier you are about access rights, the more unnecessary traffic results. A durable, protected, and stable multiuser system exploits these security tools to the maximum—at both the network software and application levels.

Typically, tools in the network software provide the ability to control individual access rights to data and program directories, with specific rights grantable for reading,

writing, and deleting files as well as for searching a directory and creating subdirectories. Additionally, individual files may be flagged as shareable, nonshareable, read only, or read/write.

Each of the three packages contains a useful set of tools for ensuring system security. Since *Advanced Revelation's* user interface relies on windows for much of its querying, viewing, and reporting activity, they serve as the program's basic "protection unit." Anyone creating a data entry window or menu with *Advanced Revelation* can define its authorized users.

Paradox assigns passwords and access rights via its ubiquitous tables. Although every table—and hence, every query, report, file, and record—created in *Paradox* can theoretically be assigned a unique password, Ansa engineers realized this practice would

generate a monstrous list. Their solution was to build a batch file system called the Protection Generator. This menu-driven routine prompts you to list the tables and access levels for each user. You can also create table passwords, user passwords, and finally, login scripts that execute each time a user loads *Paradox*.

R:base for DOS has two separate systems for implementing data security. With Read-Modify routines—intact from previous versions—a developer or system administrator assigns passwords that govern a user's right to modify data base structure and view or modify a given table.

Based on SQL commands, *R:base for DOS's* new Grant-Revoke system offers more precise security definition. In addition to assigning table and field access rights, the developer or administrator can designate rights to specific tasks such as updating and deleting tables and inserting new rows or records.

Although this level of refinement can be a boon when many users perform quite different tasks on the same system, it also requires a fair amount of upkeep when new users are added to the system. Moreover, Grant-Revoke powers apply only to data bases created under the new version, not to older data files.

Data Locks

While password schemes control data security, file- and record-locking routines ensure data integrity—a much more complex issue. Programmed into a multiuser package, some locks kick in automatically whenever certain operations—such as changing the data base structure—are performed; developers and end users are stuck with these. Other locking mechanisms are more plastic. A user can open a file with a command that allows concurrent access, for instance, or one that denies it. To maximize both data integrity and user access, a developer should create routines that specifically initiate or restrict data locks, including those that users theoretically control.

Oddly, *Advanced Revelation* never automatically locks an entire file—though it gives a developer the tools to create all the locks

EXECUTIVE SUMMARY

Advanced Revelation

Multiuser data base

The *Advanced Revelation* LAN version isn't as pretty as *Paradox* and lacks the latter's explicit data-locking schemes, but for text-intensive applications it can't be beat. Able to maintain processing power as more users are brought into the network, the program is painfully slow on multifile operations. If you possess a fair amount of data structure savvy, though, system development can be very fast. Moreover, *Advanced Revelation's* dynamic structure makes it the easiest of the three to maintain.

Setup and installation		●		
Password and access schemes	●			
Data-locking features		●		
Development tools	●			
Performance		●		
Overall value		●		
	EXCELLENT	GOOD	FAIR	POOR

Optimized for ad hoc querying and reporting, Paradox can be a real screamer in multifile operations on a LAN.

Paradox explicitly supplies. Because of its so-called linear hashing architecture, *Advanced Revelation* treats files not as single data objects but as a number of protected groups of records. For operations that would tie up a full file in *R:base* or *Paradox*—such as inserting a new record after record number 10—*Revelation* ties up only a small group of records for just a few computer clock ticks. This unique file structure allows for some background processing and generally fast, stable performance even as the number of nodes increases—benefits the other products don't provide.

At the record level, *Advanced Revelation* automatically defaults to a lock that gives exclusive write privileges for a record to the first user who retrieves it. A message goes out to other users who request that record, but *Advanced Revelation* won't identify who initiated the lock. Thus, if someone locks a record you need, you're stuck with calling the usual suspects or taking a stroll around the LAN territory.

Paradox's data integrity features are state of the art, providing full and flexible control in contentious situations. Central to *Paradox's* data integrity is the separate file it maintains—*paradox2.net*—that tracks all files and records in use at every node in the network, including information about the kind of locks in force. This master file enables developers to create screen messages that inform users not only when a record is locked but who locked it—a real time-saver in the thick of daily operations. However, as the number of users increases, maintaining this file contributes to *Paradox's* sluggish performance.

Paradox supplies five kinds of data locks, each of which can (but shouldn't) be initiated by users. The first four apply to the table or file level and consist of an exclusive lock that prevents other access, a write lock that lets other users view data but not change it, a prevent lock that bars other users from initiating full or write locks, and a prevent full lock that allows maximum concurrent access.

Paradox's fifth lock controls access to specific records, allowing one user to modify a record at the same time others are viewing it. To make sure viewers of a record have the most current data, *Paradox* automatically refreshes their screens with the updated information—a slick solution. However, this auto-refresh function clogs network traffic, as each workstation constantly checks the file server for updates. *Paradox* wisely allows the frequency of this auto-refresh function to be set to any time interval from 1 second to 24 hours.

One more clever touch in the *Paradox* locking scheme: When the program uses automatic locks during operations that could compete for data tables, it applies the weakest possible lock. Thus, when performing a table COPY command, the program places only a write lock on the table, allowing others to view table data during the copy operation. The effect is to minimize waiting time and to maximize user access to data.

Like *Paradox*, *R:base for DOS* is pretty slick about automatically performing the least restrictive lock for the shortest period of time for any given command. When locks are restrictive, *R:base* puts users who request the locked resource in a queue, canceling the request after a specified wait. The default wait time is 4 seconds, but *R:base* allows you to set any wait period up to 4½ hours.

R:base for DOS boasts other refined data-locking features. For instance, it permits two users to update the same row (or record) in a table as long as both aren't after the same field. Neither *Advanced Revelation* nor *Paradox* allows two users to retrieve the same record for purposes of modification—although they can share a record if one modifies and the other only views.

R:base for DOS doesn't explicitly lock records. Instead, it mediates simultaneous rec-

ord updates via *concurrency control*. If two users have retrieved the same record, the first to save changes takes priority. The second user will be warned that changes have been made (and by whom) and may then choose whether to accept or overwrite the first user's changes.

Concurrency control maximizes shared access to records while still ensuring data integrity. But performance suffers as *R:base for DOS* constantly checks for conflicts in record values. Moreover, since the SQL command Select Update was not included, *R:base for DOS* has no way to perform global record updates that span several files. Achieving respectable speed in this kind of multiuser operation involves some tortured code work.

The Bottom Line

DOS isn't the ideal environment for multiuser applications, and multiuser OS/2 data bases are in the wings at Ansa, Microrim, and elsewhere. Ashton-Tate has finally announced *dBASE IV*; hopefully it will improve on *dBASE III Plus*'s primitive data-locking scheme and provide another viable option for the LAN-minded.

But for users wanting DOS-LAN solutions now, these three packages provide data-handling depth and mature multiuser capability. *Advanced Revelation*'s flexible file structure and sophisticated optimizing tools permit fast yet complex system development. Though not much of a query tool, it's the top

performer in heavily transactional environments like accounting, holding steady even as the node load increases. Moreover, it's the best choice for text-intensive applications such as personnel management because of its variable-length and multivalued fields.

Much more approachable than the other two, *Paradox* is intuitive, elegantly put together, and offers state-of-the-art data-locking schemes. Clearly optimized as a querying tool, its performance in transactional applications is slow and weak. Buy it if your LAN users do a lot of ad hoc analysis of data and if you have a generous hardware budget.

R:base for DOS has some real strengths as a data base. It offers a great set of math functions and a carefully preserved upgrade path from the previous version into the language of the future, SQL. Beyond that, it turns up second place in most querying and transactional tests. If your application is a mix of both tasks, *R:base for DOS* may provide the best balance.

No matter which multiuser data base you choose, what you're buying is a set of raw tools—not a working application. In the end, the performance you get will depend to a large extent on how astutely your developer has applied those tools to your situation. ●

Hal Chapel is a Northern California consultant specializing in LAN data base development. Marlene Nesary is an assistant editor at PC World.

WHERE TO BUY

Advanced Revelation

Cosmos, Inc.
19530 Pacific Hwy. S
Seattle, WA 98188
206/643-9898

List price: \$950 for single-user version, \$495 for each additional four users

Requirements: 512K per file server and workstation, 640K and math coprocessor recommended per file server and workstation; hard disk for file server; DOS 3.10 or later version; runs under IBM Token-Ring, IBM PC LAN, Novell Advanced Network, HP OfficeShare, 3Com 3+Share, AT&T Starlan, Banyan Vines

Paradox 2.01

Ansa Software
1301 Shoreway Rd. #221
Belmont, CA 94002
415/595-4469

List price: \$995 for six-user network package

Requirements: 640K per file server and workstation, hard disk recommended per file server and workstation, DOS 3.10 or later version; runs under 3Com 3+Share 1.0, 1.1, or later version; Novell 2.0A or later version; IBM Token-Ring; PC Network 1.12; Torus Tap-estry 1.4 or later version; AT&T Starlan; any system compatible with DOS 3.10 or later version

R:base for DOS

Microrim
P.O. Box 97022
Redmond, WA 98073-9722
206/885-2000

List price: \$725 for up to three users, \$995 for six users, \$2695 for unlimited users

Requirements: 1MB on file server and 640K per workstation, hard disk recommended per file server and workstation, DOS 3.10 or later version; runs under IBM PC Network and Token-Ring, Novell Advanced Network 2.0 or later version, 3Com 3+Share, Ungermann-Bass Net 1

For more information, see Products Featured in This Issue.

Hard Disk Housekeepers

**Is your hard disk as messy
as a teenager's closet?**

**With the disk optimizers
reviewed here, you can put
scattered files back where
they belong.**

Look at any hard disk directory and you'll see a neat listing of dozens—or hundreds—of files. What you don't see is the extent to which those files are broken up, or how far the drive's read/write head has to scurry to pick up the pieces when you edit a file. Luckily, the disk optimizing utilities examined here—*FastTrax*, *Disk Optimizer*, *Vopt*, *DS Optimize*, *Speed Disk*, and *Unfrag*—can automatically reassemble fragmented files and lay them back down on disk in apple-pie order. Just as straightening a messy closet makes it easier to see and select clothes, optimizing a disk yields faster file access—and minimizes wear and tear on the drive's read/write heads. It also makes it easier to find and recover erased files, since the files' clusters will then lie next to each other.

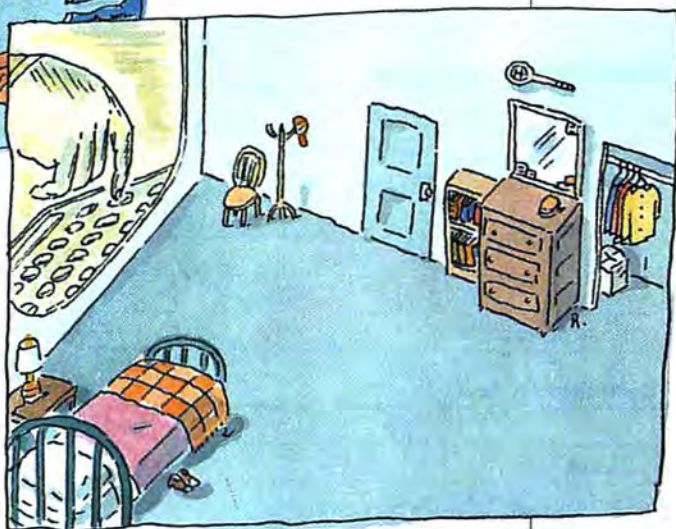
File fragmentation occurs because DOS initially saves files in contiguous sectors or multisector units called clusters. This arrangement keeps everything nice and neat—until you delete a file. Then you've got an unsightly gap. When additional data or a new file is later saved to disk, DOS packs as much as it can into the empty space, then puts the

rest in the next free cluster it finds. Although DOS keeps track of the various parts by noting their locations in its File Allocation Table (FAT), the file is now fragmented—which means that loading, editing, and saving the file will take longer. A subtler kind of fragmentation occurs when a file spans two or more sets of stacked tracks (called cylinders). Of the optimizers reviewed here, only Bridgeway Publishing's *FastTrax* fits files into the fewest possible cylinders.

Making Order Out of Chaos

When you straighten a closet, you usually pull a few things out, sort them, and put them back where they belong. Optimizers defragment files in much the same way. They copy a few clusters of data to RAM, erase the disk space they occupied, rewrite the clusters to disk in the most efficient order, and move on. For safety's sake, most optimizers temporarily copy the data to a portion of free disk space, then erase it only after verifying the reordered data. If a power failure hits, the most you could lose is one file. Optimizers also automatically exclude system and hidden files, since moving them can cripple copy-protected software. Finally, most optimizers eliminate empty subdirecto-

**Patrick
Marshall**



ries and each remaining subdirectory's deleted file entries, which often liberates several clusters of space on a badly fragmented disk.

How much optimizing boosts performance depends largely on the system and how you use it. The slower the disk's rated access time, for example, the more noticeable the improvement. If you use data base, accounting, and other disk-intensive applications, the performance improvement can be gratifying. Of course, if you load a single 1-2-3 or *dBASE* file every morning and save it every night, optimizing the disk may not make much difference. But if you spend a lot of time adding new files and killing old ones, optimizing will give the disk some extra zip. In tests conducted by National Software Testing Laboratories (NSTL), optimizing the files on a 20MB hard disk produced about a 30 percent speed pickup on a search of *dBASE* records.

Strangely enough, a fast optimization—one that pulls fragmented files together without reordering the whole disk—can actually

slow a disk down. If most of a fragmented file is at the beginning of a disk and the rest is at the end, a fast optimization may move everything to the end, significantly increasing disk access time. This is another problem that only *FastTrax* solves, since the program allows you to reserve disk space immediately following frequently edited files, leaving plenty of room for new data.

How often should you optimize? It's hard to come up with a rule of thumb, since disk use varies so widely. Fortunately, all of the reviewed optimizers graphically illustrate how fragmented a disk is, and most supply a percentage breakdown. If more than 25 percent of the files are broken up, it's usually time to clean house.

You don't have to be a power user to run a disk optimizer. If you opt for a program's default settings, all you do is type a command and a switch or two at the DOS prompt,

NSTL TEST REPORT

Disk Optimizers

By cleaning up a fragmented 20MB hard disk, the optimizers sped up a dBASE benchmark by 30 percent.

dBASE III Plus benchmark

Norton Speed Disk		1271
Mace Unfrag		1283
Disk Optimizer		1299
DS Optimize		1299
FasTrax		1328
Vopt		1831
Before optimization		1920

Optimization time

Vopt		558 ¹
DS Optimize		1043 ²
FasTrax		1098 ³
Norton Speed Disk		1254 ¹
Disk Optimizer		1423 ⁴
Mace Unfrag		2804 ⁵

seconds 0 600 1200 1800 2400 3000

¹ No options available.

² Fast mode used dBASE files placed at the top of the disk.

³ Command files used, all files prioritized, free space set.

⁴ Disk unfragmented and reordered per existing directory structure.

⁵ Disk completely reordered.

Benchmarks were performed on a 6-MHz IBM AT equipped with a 20MB Maynard hard disk with approximately 1MB of free space. One-quarter of the files were fragmented.

dBASE III Plus benchmark

To test performance gain, a dBASE III Plus benchmark was run before and after optimization. It consisted of indexing a 100K 4000-record file and generating a report using data from the 4000-record file and two 500-record files.

Optimization time

This test measures the time it took for each program to optimize the hard disk.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

press <Enter>, and sit back. *DS Optimize*, *Disk Optimizer*, and *Vopt* can even be run from menus. But if you want to specify the reordering of subdirectories, optimize individual files, and tap other advanced features, be prepared to wrestle with arcane command-line syntax. With *FasTrax* and *Disk*

Optimizer, you must take an extra step and create a special command file for the optimizer to reference as it repacks and reorders a disk.

The struggle, however, is worthwhile. The more options a package offers, the more likely you can customize optimization and squeeze the best performance from your hard disk. Thus, the NSTL test results shown here should be just one factor in your buying decision—the control an optimizer offers is equally important.

FastTrax 3.8

Optimizing Excellence

Where most optimizers simply regroup and restack files one after the other, *FastTrax* lets you specify the exact order in which files are rewritten to disk. Thus a frequently used file, such as a word processing program, can go near the beginning of the disk, while rarely used files are relegated to the end. In addition, you can assign data to consecutive clusters, group files and directories into the fewest possible cylinders, and specify what portion of a disk's free space should follow frequently updated files.

You can, of course, forgo such fine tuning and let *FastTrax* choose the file order; just type FASTTRAX at the DOS prompt, answer a few questions, and walk away. But to get the most out of the program, you must run its MakeTrax utility and create a command file that specifies file order, placement of free space, and so on. As MakeTrax lists the directories and files on the drive, you assign each a priority ranging from top to low, depending on how close to the beginning of the disk you want it. Assigning free space and selecting other functions involves wading through the program's baffling prompts, but you need do it only once.

For data analysis and data security, *FastTrax* offers the basic features and then some. Before optimizing, the program displays a disk map showing which clusters are optimized, consecutive, fragmented, or held (not movable), along with corresponding percent-

EXECUTIVE SUMMARY

FastTrax 3.8

Hard disk optimizer



FastTrax lacks a fancy interface but offers outstanding control over the optimization process. It lets you insert free space between groups of files and pick the exact order in which to rewrite files, and it's the only program that tries to arrange files so they don't fall across disk cylinders.

Capacity	●			
Fragmentation analysis	●			
Configuration/control	●			
Performance gain	●			
Overall value	●			
	EXCELLENT	GOOD	FAIR	POOR

ages. *FastTrax* also does more than simply confirm that optimized files are readable; it offers a separate Compare option to ensure that an optimized file hasn't been corrupted. Once you've optimized the disk, you can save time later by optimizing only fragmented files.

Although *FastTrax* requires more user intervention than most optimizers, it offers outstanding control. At just \$49.95—the same price as the far less powerful *Vopt*—*FastTrax* is an outstanding value.

Disk Optimizer 3.0

An Original Gets Better

Thanks to an optional menu system, novices will find *Disk Optimizer* easy to run; like *FastTrax*, its advanced features are available only to those willing to deal with switches and command files. You can't direct *Disk Optimizer* to allocate free space or order files, but you can prioritize subdirectories. *Disk Optimizer's* fragmentation display twinkles like a Christmas tree, showing fragmented files in glaring red, optimized ones in soothing green, and percentages for both.

Disk Optimizer is unique in that it automatically groups files with .EXE, .COM,

.OVL, .DRV, and .SYS extensions at the beginning of the disk, isolating them from the file-shuffling process. For even faster optimization, you can elect to reassemble only fragmented files and disable the program's Verify function. Like *FastTrax*, *Disk Optimizer* won't erase a file until it's been rewritten to disk, and it checks for bad clusters. If the clusters contain data, the optimization will stop, giving you a chance to recover the data with DOS's CHKDSK command.

Disk Optimizer offers considerable control, and the optimized drive performed well in the NSTL test. Compared to the rest of the pack, however, *Disk Optimizer* is a little harder to use, a little more expensive, and a bit slower when actually optimizing.

Vopt 2.14

Quick and Dirty

Golden Bow's *Vopt* is fast and simple but offers few options and yielded only a 5 percent speed gain in NSTL tests. Moreover, where other optimizers move a few clusters at a time, *Vopt* moves entire files, so it requires enough free space on the disk to accommo-

EXECUTIVE SUMMARY

Disk Optimizer 3.0

Hard disk optimizer

An early standard, *Disk Optimizer* boasts extensive control over optimization and improved disk analysis capability. Writing a command file gives you efficient access to a number of advanced features.

Capacity	●			
Fragmentation analysis	●			
Configuration/control		●		
Performance gain		●		
Overall value		●		
	EXCELLENT	GOOD	FAIR	POOR

date the largest file to be optimized. This can be a problem if a disk is nearly full or contains very large files.

Although *Vopt* can be run from the DOS prompt or from menus, there's little to select. It won't allow you to prioritize files or directories, nor will it reserve free space. The program can be set to automatically delete lost clusters and map out unused, unreadable ones, yet it doesn't verify the data it writes to disk. If you want verification you must turn on the DOS VERIFY command before you optimize. Once under way, however, *Vopt*'s disk map is great fun to watch: As the program moves files around, multicolored squares dance back and forth on a map display.

Vopt is inexpensive, lively, and quick, but it lacks crucial control features and plays a little too fast and loose with data. NSTL test results are also disappointing. Compared to grown-up programs like *FastTrax*, *Vopt* comes across as a precocious child.

EXECUTIVE SUMMARY

Vopt 2.14

Hard disk optimizer

Though it's the fastest at optimizing, *Vopt* offers little control and minimal speed gains. Since *Vopt* requires as much free space on the disk drive as the largest file to be optimized, it isn't a good choice for systems with full disks or very large files.

Capacity		●		
Fragmentation analysis			●	
Configuration/control				●
Performance gain			●	
Overall value			●	
	EXCELLENT	GOOD	FAIR	POOR

EXECUTIVE SUMMARY

DS Optimize 1.10c

Hard disk optimizer

DS Optimize has the best user interface of the bunch and combines disk optimizing with general disk management in one package. But don't run the program in its fast mode; you could lose everything on your disk if the lights go out.

Capacity		●		
Fragmentation analysis		●		
Configuration/control		●		
Performance gain		●		
Overall value		●		
	EXCELLENT	GOOD	FAIR	POOR

DS Optimize 1.10c

Menus and File Management

DS Optimize rates a thumbs-up in almost every category. It optimizes quickly and produces a 32 percent speedup of the *dBASE* benchmark. *DS Optimize* also has the best user interface of the bunch and combines disk optimizing and general disk management in a single \$69.95 package (see *The Software Shelf*, PCW, October 1987).

DS Optimize's opening screen shows a tree-style file-and-directory listing of the selected drive, a window that displays program settings and status, and a command line at the bottom of the screen. You can pop up a handy map showing how fragmented the disk is and even obtain an estimate of how long optimization will take.

While the menu system makes optimizing simple, *DS Optimize*'s options are somewhat limited. You can't specify file order; you can only pick which subdirectory should go first on the disk and which should go last. You can reorganize an individual directory or file, but you can't restrict the process to fragmented files.

One option is particularly risky: In fast mode, *DS Optimize* doesn't write a backup copy of files—or the FAT—while it optimizes. This means that if the optimization is interrupted, you could lose everything on the

disk. Far safer is the program's protected mode, which keeps copies of the clusters being optimized. Although *DS Optimize* doesn't verify data during optimization, it includes a separate verification utility.

DS Optimize's extensive menu system makes it a good choice for novices, and the program is particularly valuable as an inexpensive integrated optimizer and file manager. If you don't already own a program like *Xtree* or *Q-DOS II* and are satisfied with modest optimization control, it's a very good buy.

EXECUTIVE SUMMARY

Norton Utilities' Speed Disk

Hard disk optimizer

Peter Norton has added a disk optimizer to his legendary package of utilities, but it's a second banana surrounded by headliners. Found only on the \$150 Advanced Edition, Speed Disk offers good disk analysis but little optimizing control.

Capacity	●			
Fragmentation analysis		●		
Configuration/control				●
Performance gain	●			
Overall value			●	
	EXCELLENT	GOOD	FAIR	POOR

Norton's Speed Disk

Just Adequate

Peter Norton's omnibus utility package, *The Norton Utilities Advanced Edition*, includes an optimizer called Speed Disk, but it's a bare-bones utility with few controls. Still, it optimizes fairly quickly and produced the most efficient disk benchmark of the bunch.

Speed Disk's Report utility checks fragmentation of individual files, directories, or the entire disk, and supplies accompanying percentages. You can't prioritize files or directories or limit optimization to fragmented files. Once under way, Speed Disk shows

FEATURES EVALUATION

Hard Disk Optimizers Compared

FastTrax's wealth of features lets you tailor optimization.

	3.8 FastTrax	3.0 Disk Optimizer	2.14 Vopt	1.10c DS Optimize	Norton Speed Disk	Mace Unfrag
Capacity						
Maximum number of files	● ¹	● ¹	10,000	2000	● ¹	5000
Maximum number of subdirectories	● ¹	1024	500	500	● ¹	● ¹
Fragmentation analysis						
Analyze entire disk	●	●	●	●	●	●
Analyze single directories	○	○	○	●	●	○
Analyze single files	●	●	●	○	●	○
Configuration/control						
Optimize entire disk	●	●	●	●	●	●
Optimize single directories	○	○	○	●	○	○
Optimize single files	○	○	○	● ²	○	○
Optimize only fragmented files	●	●	○	○	○	●
Optimize by cylinder	●	○	○	○	○	○
Prioritize file placement	●	●	○	○	○	○
Prioritize by directory	●	●	○	○ ²	○	○
Prioritize by file extension	●	●	○	●	○	○
Insert free space	●	○	○	○	○	○
Verify optimized data	●	●	○	○ ³	●	●
Diagnosis/management utilities	●	○	●	●	●	●

● Yes ○ No ◐ Deficient

¹ Unlimited.

² Most-read and most-written directories only.

³ Separate utility included.

what it's up to with an interactive map of the disk that is neither particularly informative nor entertaining.

For \$150, *The Norton Utilities* package gives you a lot in addition to Speed Disk, but if you're shopping for just a disk optimizer, look elsewhere.

Mace Utilities' Unfrag

Slow Boat

Like Speed Disk, Paul Mace's Unfrag optimizer is just one item in a bevy of utilities, and not a fully featured one at that. Although strong on error detection, Unfrag is weak on optimizing options: You can't prioritize files or insert free space.

Running Unfrag forces you to answer an endless series of prompts, most of which are related to diagnosing the disk. While the disk is being reorganized, Unfrag displays a disk map showing the clusters that are bad, in use, or free, and those that contain hidden, system, or copy-protected files that won't be moved. Other features typically incorporated in disk optimizers are parceled out as separate utilities: The Fragchk utility quickly generates a terse fragmentation report, and Sqzd frees up disk space by removing empty subdirectories and references to each remaining subdirectory's deleted files.

Like *The Norton Utilities*, *The Mace Utilities* is a handy package to have around, but hardly worth buying for Unfrag alone.

The Optimum Choice

So which optimizer merits your dollars? Ease of use is a factor, though perhaps it's less important than usual since most users will perform full optimizations infrequently. Benchmarks don't tell the entire story, either—most of the reviewed optimizers

EXECUTIVE SUMMARY

Mace Utilities' Unfrag

Hard disk optimizer

Mace Utilities' Unfrag has an extremely terse fragmentation report and little optimizing control. You can get a quick fragmentation report from a separate utility, but you have to go through a lengthy routine to optimize.

Capacity		●		
Fragmentation analysis			●	
Configuration/control				●
Performance gain		●		
Overall value			●	
	EXCELLENT	GOOD	FAIR	POOR

boosted NSTL's *dBASE* benchmark by a healthy 30 percent. Being able to customize optimizations to fit your applications is what makes the difference. On this basis, combined with other advantages noted earlier, *FastTrax* wins hands down. It's the most fully featured optimizer around, and at \$49.95, it's the price leader. However, if you want to avoid the DOS prompt, *DS Optimize*, with its helpful menus and friendly file management, is a worthy second choice. ●

Patrick Marshall edits the Commentary Page for the Oakland Tribune.

WHERE TO BUY

Disk Optimizer 3.0

SoftLogic Solutions
1 Perimeter Rd.
Manchester, NH 03103
800/272-9900,
603/644-5555

List price: \$69.95

Requirements: 128K
(256K recommended),
DOS 2.00 or later
version
Not copy protected

DS Optimize 1.10c

Design Software
1275 W. Roosevelt Rd.
#104
West Chicago, IL 60185
312/231-4540

List price: \$69.95

Requirements: 256K,
DOS 2.00 or later
version
Not copy protected

FastTrax 3.8

Bridgeway Publishing
2165 E. Francisco Blvd.
#A1
San Rafael, CA 94912
415/485-0948

List price: \$49.95

Requirements: 192K
for hard disks up to
21MB, 256K for hard
disks up to 32MB, 384K
for hard disks larger
than 32MB; DOS 2.00
or later version
Not copy protected

Speed Disk

**The Norton Utilities
Advanced Edition**
Peter Norton Computing
2210 Wilshire Blvd. #186
Santa Monica, CA
90403

213/453-2361

List price: \$150

Requirements: 64K,
DOS 2.00 or later
version
Not copy protected

Unfrag

**The Mace Utilities
4.10**

Paul Mace Software
400 Williamson Way
Ashland, OR 97520
503/488-0224

List price: \$99

Requirements: 256K,
DOS 2.00 or later
version
Not copy protected

Vopt 2.14

Golden Bow Systems
2870 Fifth Ave. #201
San Diego, CA 92103
619/298-9349

List price: \$49.95

Requirements: 512K,
DOS 2.00 or later
version
Not copy protected

For more information,
see **Products Featured
in This Issue.**

Menus remain visible continuously to eliminate memorization.

Pop-up text editing window to enter, edit and rearrange even large blocks of text.

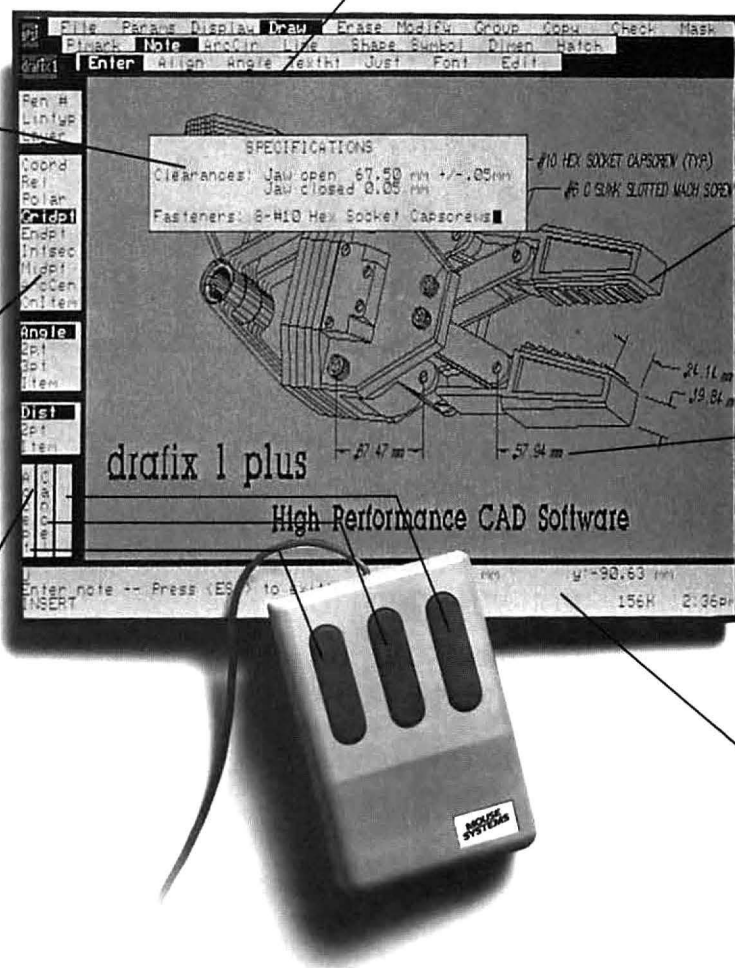
Item attributes, component and grid snaps can be selected on the fly for speed and accuracy.

Pointer prompts display current mouse or digitizer button functions for ease of use.

Powerful drawing functions include splines, arcs, cross-hatching, solid fill, parallel and perpendicular lines and many others.

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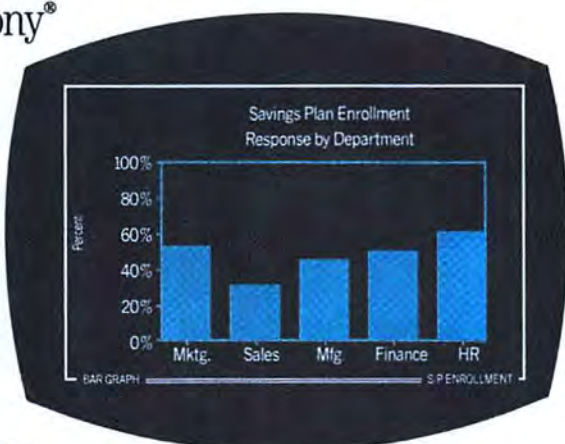
Sure your co lots of things, b

If you're like most people in business, a day doesn't go by when you don't have many balls up in the air at once.

But your PC is probably not equipped to help you with all the different aspects of your job. And if you're using the computer for more than one task, it's often annoying and time consuming jumping back and forth from one program to another.

Lotus® Symphony® is designed for busy PC users like you who need to do many different jobs on the PC.

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	Total Employees	Yes	No	Response
Marketing	465	194	48	52%
Sales	606	151	30	30%
Manufacturing	1,128	404	104	45%

Word processing. Write a document in the full-featured word processor. Even include a spreadsheet.

	Total Employees	Yes	No	Response
Marketing	465	194	48	52%
Sales	606	151	30	30%
Manufacturing	1,128	404	104	45%
Finance	390	169	27	50%
Human Resources	125	73	10	66%
Whole Company	2,715	991	219	45%

Spreadsheet. Create a table in a spreadsheet that will automatically calculate formulas, allowing for what-if analyses.

combines spreadsheet, word processing, graphics, database and communications, putting five key business tools at your finger tips. And you only have to learn

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computer can do it can it juggle?

And since Symphony is from Lotus, it's compatible with a variety of other Lotus products which means Symphony

2.0, has no copy protection and comes with many new features, including enhanced database and word processing, a spelling checker and text outliner, plus minimal recalc for faster spreadsheet performance, DCA file translation to exchange data with other programs, as well as VT100 terminal emulation.

Symphony is used by hundreds of thousands of satisfied PC users.

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Editing Record 1 of 2715
Enter 1 for YES, 2 for NO

FIRST NAME Hank LAST NAME Morrison
ADDRESS 13 Waverly Dr
Apartment 301
CITY Cambridge STATE MA ZIP 02138
PHONE 617-555-0050 DATE OF BIRTH 04-14-56

DEPARTMENT Marketing DATE OF HIRE 06-15-95 JOB GRADE 17
SALARY \$40,000 SAVINGS PLAN 1 PERCENT 10
SP ENROLLMENT

01 Oct 87 12:30 PM

Database. Store information in a powerful database that can hold over 8,000 records, with up to 256 fields.

users can share files with 1-2-3 users, for example.

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The newest version of Symphony, Release

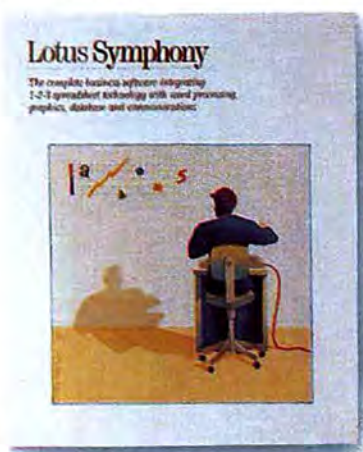
Send range to remote file
Phone Login [highlighted] File Transfer Break Settings

Ted	Graham	25 Summer St	Cambridge	MA	02138	Human Resources
Donald	Harzer	536 Orchard St	Wellesley	MA	02181	Finance
Dan	Honer	81 Timber Ln	Cambridge	MA	02138	Manufacturing
David	King	934 Country Ave	Alison	MA	02184	Manufacturing
Bill	Macquire	146 Walnut St	Worcester	MA	01600	Manufacturing
Hank	Morrison	13 Waverly Dr	Cambridge	MA	02138	Marketing
Bob	Paine	400 Elm St	Marblehead	MA	01945	Sales
Johnna	Price	65 Whitaker St	Arlington	MA	02174	Manufacturing
George	Reid	800 Centre St	Lynn	MA	01901	Manufacturing
Peter	Reilly	28 Riverbend Dr	Dedham	MA	02026	Finance
Allen	Rice	868 Manchester Dr	Dorland	MA	01778	Sales
Paul	Simmons	84 Glenwood Dr	Dover	MA	02030	Manufacturing
Steven	Sinkler	633 Wells St	Brookline	MA	02146	Manufacturing
Jason	Sayer	62 Marion Ave	Brookline	MA	02146	Human Resources
Marvin	Vaughn	502 Abbott St	Arlington	MA	02174	Marketing
John	Wright	65 Beacon St	Allston	MA	02184	Marketing

01 Oct 87 12:30 PM

Communications. Send or receive data between your PC and a mainframe, another PC or an on line information service.

Lotus Symphony 2.0



154 **Hewlett-Packard DeskJet**

LaserJet performance at a dot-matrix price—too good to be true? Perhaps, but 300-dpi resolution, near typeset quality text, and a \$995 tab bring this ink jet printer awfully close.

158 **Inboard 386/PC, Quad 386/XT**

Want to goose that PC or XT into high gear? Two full-length 80386 accelerator boards from Intel and Quadram offer matching prices but notably different performance.

162 **KB 5153**

Long on ingenuity but short on execution, this touchpad/keyboard combo aims to liberate desktop real estate from the infestation of cursor-control devices.

166 **CuRAM-2**

Take down that "Vacant" sign on your PS/2—Cumulus's Micro Channel multifunction board provides a platform for memory, a modem, and I/O ports.

Hewlett-Packard DeskJet

Ink jet printer

PROS: 300-dpi graphics resolution, excellent print quality, quiet

CONS: High cost per page, limited LaserJet emulation, too few drivers

At first glance, the Hewlett-Packard DeskJet looks like the answer to a desktop publisher's dream—assuming that he or she is dreaming about LaserJet power at a dot matrix price. At \$995, this ink jet printer is markedly cheaper than the \$2495 HP LaserJet II, yet it offers laser-density 300-dot-per-inch (dpi) output that's indistinguishable from that of a laser printer, and even limited LaserJet emulation.

As you might expect, the LaserJet dream dissolves in the cold light of a workaday Monday morning. The DeskJet takes twice as long as the LaserJet to print a page, its LaserJet emulation is problematic, and over the long haul it's a lot more expensive to operate. On the other hand, if you're in the market for an affordable desktop printer with excellent output quality and high-resolution graphics capability, the DeskJet looks a lot dreamier.

HP has answered nearly every traditional complaint about ink jet printers. The DeskJet doesn't require special paper (in fact, the manual specifically warns against it). Ink dries by the time a page drops into the paper bin, so output doesn't smear. If print is faint after the printer has been idle for a time, a priming button returns output to satisfactory darkness. The DeskJet's innovative print-head/ink cartridge combination does away with sloppy ink refills and gives you a new printhead every time you change cartridges. If you compare this machine to a \$799 ink jet like the Mannesmann-Tally, with its relatively low resolution and messy ink refills, the DeskJet looks better and better.

When printing text (as opposed to time-consuming 300-dpi graphics), the DeskJet combines reasonable speed with first-class

quality. At 25 seconds for a 250-word page in draft mode and 32 seconds in letter quality mode, its speed is comparable to that of many popular 24-pin printers—with the added benefit of near typeset quality characters. Hewlett-Packard even sells a \$75 cartridge that enables the DeskJet to emulate an Epson FX-80.

HP clearly has put a lot of thought into engineering the DeskJet. The 14-pound printer is roughly the same size as a dot matrix unit—with a second story added to house the ink jet mechanism; it ought to fit easily on any desktop. It's delightfully quiet; all you hear during printing is a barely audible *whoosh* as it sprays ink. Controls for formfeed, on-line/off-line, and so on are mounted on top for easy access. Slots for two font cartridges sit right above the controls. Switching between the built-in 12-point Courier, Courier Bold, and Courier compressed fonts and optional cartridge fonts requires the push of a button. The font cartridges even have indicator lights to show which one is in use.

Paper handling is elegant. The sole paper bin holds 100 sheets of letter-size paper and extends to accommodate legal-size sheets. The DeskJet's manual envelope feed is incorporated into the top of the paper tray cover, so you can print envelopes without removing the paper. The DeskJet offers a dozen optional font cartridges. With the addition of a \$150 RAM cartridge, it will also accept downloadable fonts. However, for these optional fonts to work properly, your applications need a DeskJet driver. And as of this writing, DeskJet drivers were available for only five programs: *Framework II*, *1-2-3*, *Microsoft Word*, *WordPerfect*, and *WordStar 2000*. To use the printer with any other program, you must use LaserJet II emulation—and that can lead to problems.

As long as you stick to the DeskJet's built-in 10- and 12-point Courier typefaces, LaserJet emulation performs like a champ. But if

you want proportional spacing or larger or smaller type, it's another story. As is true of quite a few LaserJet clones, the width of the characters in some of the DeskJet's optional fonts differs from that of the LaserJet fonts. If you try to use these DeskJet fonts with a LaserJet driver, the spacing will be wrong, justified lines will come out badly ragged, and characters will be squeezed together.

Printing DTP graphics on the DeskJet with a LaserJet driver is also hit or miss. With many programs, including *Harvard Presentation Graphics*, *GEM Graph*, and *35mm Express*, the LaserJet driver works fine. In other applications, graphics printouts are problematic. *Windows 1.03* applications such as *PageMaker* print a graphic perfectly if it's alone on a page—but if text precedes it, the graphic doesn't print at all. HP is cur-

Hewlett-Packard's \$995 300-dpi DeskJet produces text output that approaches typeset quality.



ROSE HODGES

NSTL TEST REPORT

Hewlett-Packard DeskJet Printer

HP's DeskJet ink jet printer is no speed demon, taking about five times as long as a LaserJet II to print a page.

Draft mode

LaserJet Series II	91.0
Epson EX-800	284.4
DeskJet (Epson emulation)	409.0
DeskJet (LaserJet emulation)	445.0

NLQ mode

LaserJet Series II	91.0
DeskJet (Epson emulation)	528.0
DeskJet (LaserJet emulation)	542.0
Epson EX-800	844.4

Graphics printing

Epson EX-800	223.3
LaserJet Series II	319.3
DeskJet (Epson emulation) ¹	763.0

seconds 0 200 400 600 800 1000

¹ No driver was available to support the DeskJet in LaserJet emulation for graphics printing.

All tests were printed from an 8-MHz IBM AT Model 339 with a 30MB hard disk. The LaserJet Series II is a laser printer. The Epson EX-800 is a dot matrix printer. This benchmark shows how the DeskJet compares to the two kinds of printers. All tests measured the time from initiating the printing until the last letter of the document was printed or until the last page of the document scrolled out of the printer.

Draft and NLQ modes

These benchmarks timed the printing of a document in draft and NLQ print modes, respectively. A 10-page, 50-line-per-page document, consisting of 8-line paragraphs separated by a blank line, was sent to the printer using XyWrite III.

Graphics printing

This benchmark timed the printing of a 4-page *Ventura Publisher* document consisting of a scanned photo, a line drawing, a raster graphics image, and text in different typefaces and sizes.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

rently working on drivers for *Windows 2.0* and *AutoCAD*, and Aldus reports that a *PageMaker* driver will be ready soon. However, a Xerox spokesperson reported "no plans" for a *Ventura Publisher* driver.

Compatibility aside, how much money will you really save by buying a DeskJet instead of a LaserJet II? The DeskJet's list price is a cool \$1500 less than the LaserJet II's. But when you consider the cost of ink/printhead cartridges (\$20 every 375 double-spaced pages of text), you will discover that printing one double-spaced page of text on the DeskJet costs about 5 cents. The LaserJet prints the same page for about 3 cents. That means that over the DeskJet's estimated 60,000-page life, you'll spend about \$3000 on operating expenses; the comparable figure for the LaserJet is only \$1800. This wipes out all but \$300 of the price break.

When you factor in the extra time you'll spend waiting for the DeskJet to produce 300-dpi output, the notion of using it for deadline-sensitive desktop publishing seems a bit risky. A 64K bit-mapped graphic that prints in 1½ minutes on a LaserJet takes no less than 3½ minutes on the DeskJet.

Nonetheless, the DeskJet is a true breakthrough machine—for the right application. Its combination ink/printhead cartridge is a great idea, and its 300-dpi capability is an ink jet industry first. If you're looking for a quiet, reasonably fast alternative to a dot matrix printer, with very high quality output—and you don't mind waiting for slow 300-dpi graphics printouts—it may be just the thing. —Kevin Strehlo

WHERE TO BUY

DeskJet

Hewlett-Packard
Vancouver Division
P.O. Box C-006
Vancouver, WA 98668
800/538-8787

List price: \$995

Accessories: ink/printhead cartridge \$20, Epson FX-80 emulation cartridge \$75, font cartridges \$75 each, 128K RAM cartridge \$150, Times Roman/Helvetica soft font \$95

For more information, see **Products Featured in This Issue**.



Unretouched Screen Images

Buy The One On The Left And You'll Have To Put It Where The Sun Don't Shine.



The monitor on the right, however, can be placed anywhere you like. Even in direct sunlight. It's the new *Flat Technology Monitor* from Zenith Data Systems—winner of *PC Magazine's* coveted "Technical Excellence Award" in the hardware category for 1987.

You Have To See Zenith To Believe It

So clear. So precise. So lifelike. It's the only monitor with a completely flat screen. A breakthrough that has redefined monitor quality forever. Industry experts are already convinced. And once you see it in person, you'll be a believer, too.

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Our Flat Technology Monitor has an impressive 14-inch display. And even though it's bigger, it's 50% brighter than conventional CRT's and it has 70% greater contrast. So you get colors with greater depth and definition that make your reports, charts and graphs come alive like never before.

The Flat Technology Monitor is virtually glare-free. So you can work longer without the usual headaches

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You also get full compatibility with the high resolution VGA Video generated by IBM's new PS/2® computers. And with Zenith's Z-449 or other VGA-class video cards, you can enjoy CGA, MDA, Hercules and EGA graphics as well.

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Obviously, a mere picture can't do justice to our new Flat Technology Monitor. It demands a face-to-face evaluation. For a hands-on demonstration, call today for the name of your nearest authorized Zenith Data Systems dealer—the Flat Technology Monitor is available in quantities right now.

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systems**

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80386 accelerator board

PROS: Fast performance, excellent disk caching software, superb documentation

CONS: Low 32-bit RAM capacity

Quad 386/XT

80386 accelerator board

PROS: High 32-bit RAM capacity, support for Weitek 1167 coprocessor

CONS: Mediocre performance, no disk caching software, confusing documentation

Stuffing an 80386 accelerator board into an IBM PC or XT is a lot like slapping a supercharger and exhaust headers on your family sedan; it isn't exactly the same as having a new Maserati, but you can lay some awesome tracks when the light turns green. Two new 80386 accelerators, the Inboard 386/PC from Intel and the Quad 386/XT from Quadram, offer interesting contrasts. Both cost \$995—but deliver sharply differing value. On the whole, the Inboard is a far more attractive buy.

Adding an 80386 accelerator to a PC or XT involves several technical compromises. Intel's 80386 CPU processes data in 32-bit segments. Trying to mash this bit stream through the PC's 8-bit data bus is like trying to maintain freeway speed when a crowded superhighway suddenly narrows to a two-lane country road. Placing 32-bit RAM on the accelerator board breaks the memory bottleneck, but disk I/O still has to squeeze through the PC's 8-bit bus.

Both the Inboard and the Quad come with 1MB of 32-bit on-board RAM—and share a number of other characteristics as well. Both full-length expansion boards hold 16-MHz 80386 chips certified for error-free 32-bit math (enabling you to run *Windows/386*, among other programs). Both are designed for IBM PCs, XTs, and 8088-equipped compatibles; neither works with 8086-based PCs such as the AT&T 6300 or Compaq Deskpro.

Both support the Intel 80387 math coprocessor and require 130-watt (or greater) power supplies. Both include installation and diagnostic software, a utility to toggle processing speed between 4.77 and 16 MHz from the keyboard, and LIM 4.0 expanded memory drivers. Both are "OS/2 capable," but neither comes with a working version of OS/2 as we go to press.

The boards also share straightforward installation. Simply slip one board into an 8-bit slot, replace the 8088 CPU on the motherboard with a cable leading to the accelerator board, and run the supplied configuration software. No jumpers or DIP switches on the board need be set.

Beyond these similarities, however, lie significant differences. For starters, you can add up to 8MB of 32-bit RAM to the Quad (via an optional memory module) to reach a 9MB limit. The Inboard currently allows only 2MB of expansion RAM for a fairly low 3MB memory ceiling.

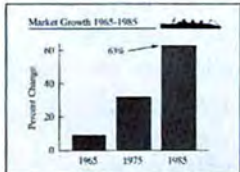
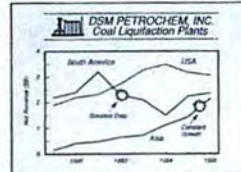
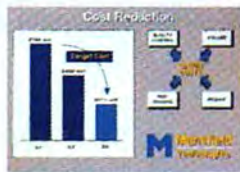
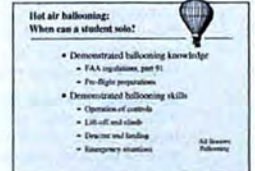
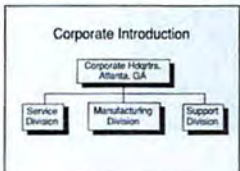
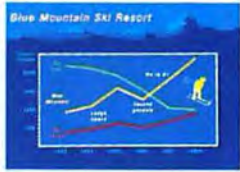
The Inboard 386 allows users to disable all the 8-bit RAM on the motherboard if they wish; that tactic generally improves performance significantly, since all processing then takes place in the 32-bit environment.

The Quad takes a less desirable approach. Instead of disabling 8-bit memory, it uses that memory to load programs; a device driver then moves them up into on-board 32-bit memory. This scheme delivers similar loading and computing speed but with one major disadvantage: Unless you have a full 640K of 8-bit RAM, some programs may not load.

Another big difference between the boards: The Inboard's caching software helps compensate for the data bottleneck caused by the PC's 8-bit disk access. The Quad has no cache at all. On the other hand, the Quad provides a print spooler and a RAM disk, plus support for the less expensive 80287 math coprocessor and the Weitek chipset; the Inboard does not.

The quality of documentation for the two boards also differs greatly. The Inboard manuals are superlative, with enough clear diagrams to allow even a first-time tinkerer to install the board without a hitch. The Quad's documentation is hard to figure out—and in several instances, simply wrong. A

Of all the graphics you can create with Freelance Plus,



NSTL TEST REPORT

Inboard 386/PC and Quad 386/XT

Intel's Inboard 386/PC nearly matches an 80386 PC; Quadram's Quad 386/XT—lacking caching software—lags far behind.

WordStar Professional

PC's Limited 386	69
Compaq Deskpro 386	72
Inboard 386/PC	78
Quad 386/XT	177

dBASE III Plus

Compaq Deskpro 386	54
Inboard 386/PC	65
PC's Limited 386	122
Quad 386/XT	385

1-2-3

PC's Limited 386	20
Compaq Deskpro 386	22
Quad 386/XT	25
Inboard 386/PC	26

seconds 0 40 80 120 160 200

The Inboard 386/PC and 386/XT were installed in an IBM. Benchmarks for two 80386 machines—the Compaq Deskpro 386 Model 40 and the PC's Limited 386—are provided for comparison. The Inboard 386/PC and the Compaq Deskpro 386 were tested with disk caching, providing 192K of extended memory. The PC's Limited 386 was tested without disk caching since none is shipped with the machine.

WordStar Professional

Although disk access plays a small part in this benchmark, processing and memory access speeds are the most significant factors. The test measures the time required to perform four operations on a 15,364-word document.

dBASE III Plus

Disk access speed is the most significant factor for this benchmark. The test measures the time required to produce a report based on a three-file join, select, and sort.

1-2-3

Because no disk access is required, this benchmark depends almost entirely on the processing and memory access speeds of the systems. In this test, a 1-2-3 macro executes a series of recalculations within a 50-by-50 cell matrix.

AutoCAD

Compaq Deskpro 386	87
Inboard 386/PC	98
PC's Limited 386	129
Quad 386/XT	239

Lattice C Compiler

Compaq Deskpro 386	54
PC's Limited 386	65
Inboard 386/PC	72
Quad 386/XT	154

seconds 0 50 100 150 200 250

AutoCAD

Disk access, processing, and memory access speeds all contribute to a product's performance in this benchmark. However, the speed and type of math coprocessor used by the system are the most important factors. The test uses the sample office drawing provided with AutoCAD containing six two-dimensional and seven 3-dimensional views and measures the time required to retrieve and display the drawing, zoom in on a small detail within the drawing, zoom out to reveal the entire drawing, and print the entire drawing. All of the views are then displayed in the last step of the benchmark.

Lattice C Compiler

In this benchmark, the sequential disk access rate is the most important factor. Applications such as file managers commonly rely on this type of disk access. The test measures the time required to compile and link two 1000-line programs and is performed automatically using a DOS batch file.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

Quadram customer-support technician says that the company is rewriting its documentation to correct the errors, but that won't help current purchasers.

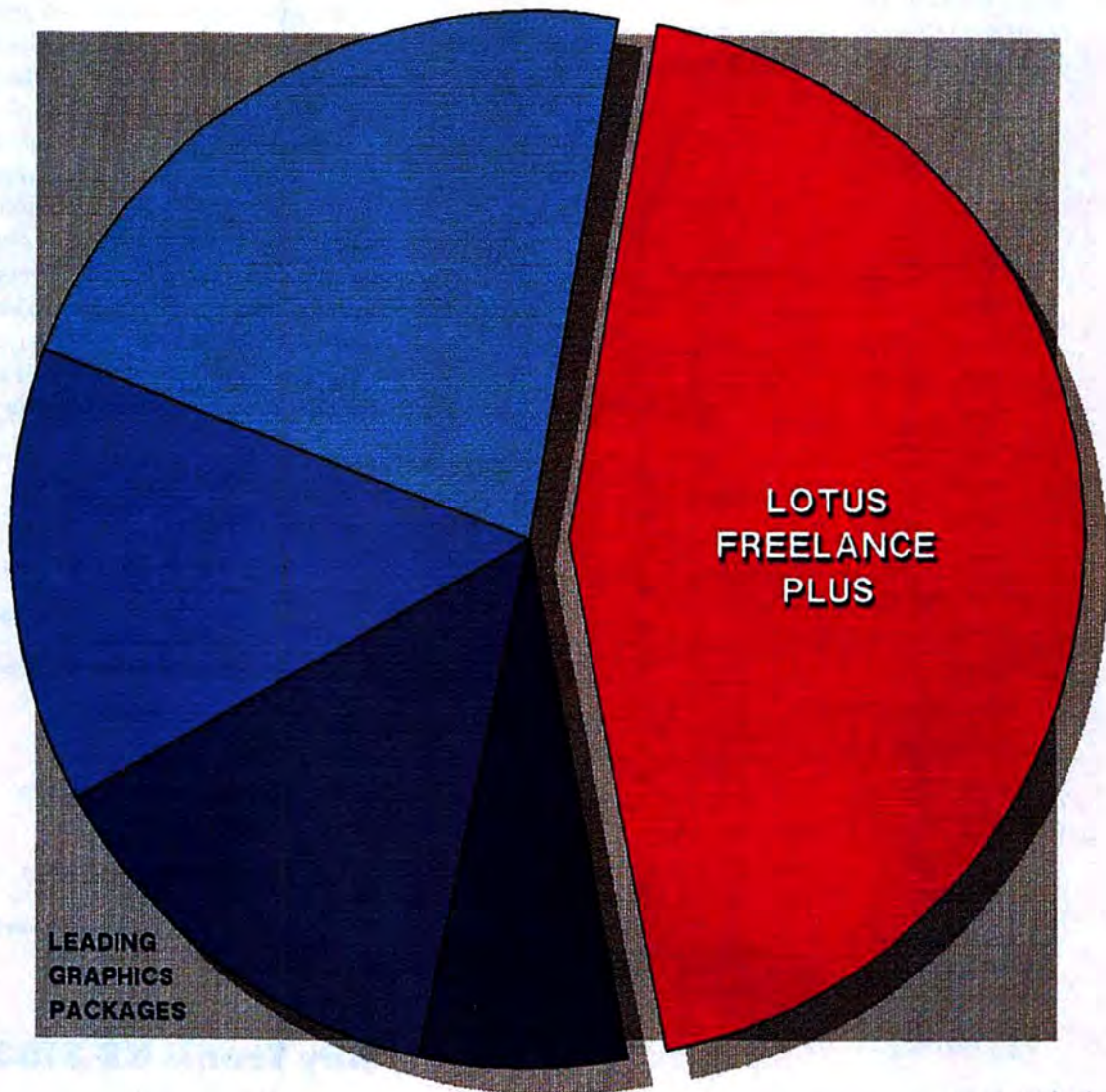
The Inboard seems very well constructed. The board tested had no last-minute wire patches, solder splashes, or nonaligning components. The Quad board was less impres-

sive; it contained numerous wire patches and a chip with two pins obviously clipped off.

Both boards were speed tested by National Software Testing Laboratories (NSTL) in an IBM PC XT. As all the tests (except the CPU-intensive 1-2-3 benchmark) show, the Inboard's cache affects performance significantly.

Before you drop \$1000 on either of these boards, you may want to consider alterna-

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Lotus Freelance Plus

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FEATURES EVALUATION

386 Accelerator Boards

Intel's Inboard 386/PC beats the Quad 386/XT on documentation and construction—but loses on RAM capacity.

	Inboard 386/PC	Quad 386/XT
Standard features		
Base price	\$995	\$995
CPU		
Type	80386	80386
Speed	4.7/16 MHz	4.7/16 MHz
Systems supported		
IBM PC	● ¹	● ¹
IBM XT	● ¹	● ¹
IBM AT	○	○
Change speed without rebooting	●	●
Change speed within application	●	●
32-bit math	●	●
Original processor retained	○	○
Utilities included		
Disk caching	●	○
RAM disk	○	●
Print spooler	○	●
LIM 4.0 drivers	●	●
Memory capacity		
32-bit RAM shipped with unit	1MB	1MB
32-bit RAM capacity	3MB	9MB
32-bit RAM on board	●	●
Expandability		
Coprorocessors supported		
80387	●	●
80287	○	●
Weitek	○	●
Ergonomic design		
Complete documentation	●	○
Installation software	●	●
Must set DIP switches	○	○

● Yes ○ No ◐ Deficient

¹ Boards are designed for 8088-based PCs only; 8086 PCs are not supported.

tives. Although an 80386 motherboard costs about \$500 more (and is a bit more trouble to install), it provides 8/16- and 32-bit expansion slots, plus the possibility of a working version of OS/2. Or, if you don't mind sacrificing some performance, you can still roughly double the speed of your PC XT with a 286 accelerator board like CompuAdd's Turbo ChargeCard for only \$295—less than one-third the price of the faster Inboard.

If you decide to go the 386 accelerator route, the Intel 386/PC is clearly superior to the Quad 386/XT—thanks to its disk cache, speed, documentation, and quality construction. Its only drawback is the cramped 3MB memory limit. If you want more 32-bit RAM (and don't mind buying third-party disk-caching software), the Quad makes an acceptable alternative. —Lewis Perdue

WHERE TO BUY

Inboard 386/PC

Intel Corp.
5200 N.E. Elam Young Pkwy.
Hillsboro, OR 97124-6497
800/538-3373, 503/629-7354
List price: \$995
Requirements: IBM PC or XT

Quad 386/XT

Quadram
One Quad Way
Norcross, GA 30093-2919
404/923-6666
List price: \$995
Requirements: IBM XT

For more information, see **Products Featured in This Issue**.

Key Tronic KB 5153

Touchpad keyboard

PROS: Good tactile response, touchpad provides passable mouse and function-key emulation, sturdy

CONS: Compatibility problems, small touchpad, expensive

As the popularity of mouse-driven applications grows, the desktop-space war grows with it. If your work area seems to be shrinking as it fills with mice, digitizing tablets, trackballs, joysticks, and other state-of-the-art input devices, you may be glad to

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Software

WORD PROCESSORS

Leading Edge W/P, W/SM Ver. 1.5	\$ 55
Microsoft Word 4.0	185
Multimate Advantage II	249
PFS: Professional Write	102
Volkswriter 3	132
Volkswriter Deluxe Plus	57
Webster New World Writer	55
Webster Spell Checker	32
Webster Thesaurus	39
Word Perfect	Call
Word Perfect Executive	Call
Word Perfect Library	Call
Wordstar Pro Pack 4.0	Call
Wordstar 2000 Plus 3.0	195

INTEGRATIVE SOFTWARE

Ability Plus	\$137
Enable 2.0	352
Framework II	309
MS Works	113
PFS: 1st Choice	76
Smart Software System	Best Price
Symphony	439

DESKTOP PUBLISHING

Newsmaster	\$ 48
Pagemaker	442
PFS: First Publisher	52
Ventura Publishing	409

GRAPHICS/MICE

Chartmaster	\$199
Diagram Master	185
Generic CAD w/Dot Plot 3.0	72
Harvard Graphics 2.1	239
In-A-Vision	259
Logimouse	65
Logimouse w/paint	87
Microsoft Buss Mouse 1.0	92
Microsoft Chart 3.0	229
Microsoft Serial Mouse 1.0	92
News Room	30
News Room Professional	42
Optimouse w/Dr. Halo III	83
PC Buss Plus Mouse (New Ver.) w/paint	83
PC Mouse (New Ver.) w/paint	83
Printmaster	29
Print Shop	32
Signmaster	132
Turbo Graphix Tool Box	38
Windows Draw!! w/clip art	159

ACCESSORIES

Copy II Option Board Deluxe	\$ 99
Masterpiece	\$ 79
Masterpiece Plus	92
MousePad by MouseTrac	9
Summasketch 12x12 Tablet Plus	359

LANGUAGES

C Compiler (Microsoft)	\$259
Fortran Compiler (Microsoft)	259
Macro Assembler (Microsoft)	86
Ryan McFarlan Cobol	339
Ryan McFarlan Fortran Cobol	539
Pascal Compiler (Microsoft)	171
Quick C	57
Quick Basic 4.0	57
Turbo C	58
Turbo Pascal 4.0	58

ACCOUNTING

Computer Associates	Call
DAC Easy Accounting	\$ 52
One Write Plus 2.0	117
Time Slips III	109

SPREADSHEETS

Cambridge Analyst	\$ 55
HAL	89
Lotus 1-2-3 Ver. 2.01	295
MS Excell	285
Multiplan 3.0	113
PFS Pro Plan	52
Quatro	109
Supercalc 4	269
Twin Classic	32
VP Planner	47

DATA BASE MANAGEMENT

Clipper	\$ 368
dBase III Plus	374
DB-XL Diamond	105
Eureka	88
Fox Base Plus 2.0	185
Genifer	188
Nutshell	75
Paradox 2.0	425
PFS: Professional File	119
Q & A	189
Quickcode Plus	138
QuickReport	138
Revelation	459
R:Base For DOS	425
Reflex	78
VP Expert	55
VP Info	55

PROJECT MANAGEMENT

Harvard Total Project Manager II	\$ 309
Microsoft Project 4.0	287
Super Project Plus	269
TimeLine 2.0	259

MONEY MANAGEMENT

Tobias Managing Your Money 4.0	\$114
Dollars & Sense w/Forecast	92

Hardware

PRINTERS

Alps	Call
All Models	Call
Citizen Printers	Call
120D	145
180D	159
MSP-40	289
MSP-45	415
MSP-50	349
MSP-55	445
Other Models	Call
Diconics	Call
150	309
300P	480
Epson Printers	Call
Hewlett-Packard	Call
Laser Jet Series II	1775
Desk Jet	779
NEC	Call
Silent Writer	1539
Other Models	Call
Everex	Call
Hayes	Call
All Model	Call
Prometheus	Call
1200B w/Software	\$ 75
Other Models	Call
US Robotics	Call
Password 1200	149
Courier 2400	299

NEC P-6, P-7, P-9 Series	Call
Okidata	Call
Panasonic	Call
1080 Model II	179
1091 Model II	198
1524	524
1595	429
Other Models	Call
Star Micronics	Call
Toshiba	Call
321/SL	485
341/SL	649
351 SX	979

DISK DRIVES

Bernoulli Box	\$ 865
10 Meg	1260
20 Meg	1605
40 Meg	1645
Beta Ext	909
Beta Int	909
Everex Tape Back-Up	Call
Seagate	Call
20 MG w/WD Controller	275
251-I	469
Teac	Call
Floppy F-55BV	79
1.2 MEG AT	89
Toshiba	Call
3.5" XT 720K	99
3.5 1.4 MB	115

BOARDS

AST Six Pack Plus	\$ 110
Other Models	Call
ATI EGA Wonder	175
VGA VIP	265
Hercules	Call
Color Card	145
Graphics Card Plus	175
Incolor	145
Intel	Call
PC 1010	200
4020	305
Inboard 386 AT w/cable	855
Inboard 386 PC	719
Plus Hardcards	Call

KEYBOARDS

Keytronics	Call
KB5151	\$ 119
KB5153	149
KB101	79

MONITORS

NEC	Call
Multisync II	\$ 599
Multisync Plus	889
Other Models	Call
Princeton Graphics Monitors	Call
Princeton Ultrasync	495
Samsung	Call
Thompson Ultrascan	519
Zenith 1490	609

Orchid	Call
Designer VGA	239
EGA	565
Paradise	Call
Autoswitch 350	130
Autoswitch 480	145
VGA Plus	239
VGA Professional	355
Video-7	Call
Vega Deluxe	189

COMPUTERS

AST	Call
Model 80	\$1505
Model 120	2099
140X	2335
Other Models	Call
NEC	Call
Multispeed	1398
PowerType	Call
Other Models	Call
Toshiba	Call
T-1000	785
T-1100 Supertwist	1370
T3120	3068
3200	3789
5100	4899
Wyse 386	2480
Zenith	Call



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The Key Tronic KB 5153 combines a full-function keyboard with touchpad mouse-emulation.

hear about Key Tronic's KB 5153 touchpad keyboard, which emulates many of the most popular pointing options without nibbling up any more of your desktop.

The \$249 KB 5153 melds an XT/AT-compatible keyboard with a 3½-inch-square touchpad that mimics a mouse, cursor keys, function keys, and a digitizing tablet. The function-key mode even lets you record and play back macro keystrokes. Unfortunately, not all these capabilities are well implemented, and hardware/software incompatibilities further limit the keyboard's usefulness.

Still, a great deal of functionality has been crammed into a space-saving package. Even allowing for the touchpad, which is located on the far right side of the unit, the keyboard is only 2 inches wider than a standard IBM XT keyboard. It sports an atypical but space-saving 87-key layout, with ten standard function keys spread across the top, and garners high ratings for its quick, firm tactile response. Its only failing is the alarming proximity of the <Esc> and <Backspace> keys.

The touchpad, however, is the KB 5153's *raison d'être*. The pad's work surface covers

a circuit board that monitors surface pressure. Touching the keypad or dragging your finger (or a stylus) across it produces a number of results—some more useful than others.

The touchpad has five operating modes. Mouse mode emulates the cursor movements and clicks of a mouse—for software with Microsoft bus-mouse support. In function-key mode you can use up to 36 different areas of the touchpad as if they were function keys. Graphics mode turns the touchpad into a digitizing tablet for drawing. In cursor mode you can simulate mouse-like cursor moves in applications that don't support mice. Finally, dual mode combines the function-key mode with any one of the other modes.

Clearly, Key Tronic hopes to seduce users away from their old input devices by including all these input modes—but quality would be more useful than quantity. In fact, only the function-key and mouse modes are practical enough to use on a daily basis.

The promise of mouse mode is the touchpad's main attraction: Moving your fingertip across the pad produces a comparable cursor movement on screen. Regrettably, mouse mode doesn't offer the precise cursor control of a real cheese-burner. The pad's limited drawing space makes it easy to run out of pad. At the same time, its small surface area makes it hard to create precisely defined objects with paint programs or desktop publishing software—especially when you use your stubby fingertip instead of the supplied fine-point stylus. The KB 5153 allows you to improve drawing definition to some extent by adjusting the mouse speed (how far the cursor travels across the screen for each millimeter of fingertip movement on the touchpad)—but not enough.

Application functions that call for clicking the mouse (such as moving a paragraph in *Microsoft Word*) require precisely timed, two-handed coordination. You must maintain pressure on the pad while you press either the <Space> bar, <Gray Plus>, or the F key to click the left button. Pressing <Gray

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Circle 14 on reader service card

Minus> or D simulates a click on the mouse's right button. This gives new (and unwelcome) meaning to the phrase "flying fingers."

The function-key mode segments the touchpad into 4, 9, 25, or 36 "key" areas. A disk containing function-key macro files for *WordStar*, 1-2-3, and DOS comes bundled with the KB 5153, but you can also create your own macros. Each key area can record and play back a macro up to 70 keystrokes in length; the pad's total macro limit is 1500 keystrokes.

In graphics mode the petite touchpad functions as a digitizing tablet. However, it leaves a lot to be desired—especially for professional CAD users accustomed to tablets that range from 8½ by 11 inches to several feet in size.

Cursor mode provides limited, mouse-like cursor control for programs that do not normally support mice; the cursor can be moved up and down or sideways, but not diagonally. Obviously, mouse clicking is not supported. Still, this mode can be handy.

Dual mode allows you to combine function-key mode with the cursor, mouse, or graphics mode in one of two ways: You can either split the keypad into two separate modes or set up two full-pad modes and toggle between them. The split-pad mode is more convenient, but it makes the tiny pad even harder to use by paring down an already cramped workspace by 30 percent.

Before you can use the touchpad, you must create a separate configuration file for each application, using the menu-driven software that accompanies the keyboard. Even if you set up these files correctly, however, you're likely to run into software incompatibilities. Initially, the touchpad malfunctioned with *Microsoft Word 3.0* and *Ventura Publisher 1.0*, working only in cursor mode. Key Tronic tech support finally admitted that the KB 5153 doesn't support *Word* with an EGA display, and that *Ventura Publisher* must be installed for a Microsoft bus mouse in order to function properly.

Hardware incompatibilities are also a pain; Key Tronic says the keyboard works with IBM, Compaq, Epson, Tandon, Leading Edge, Kaypro, and MultiTech machines. If your machine is not on the approved list, you

may be in trouble. Of five machines tested, the KB 5153 bombed on three—a Fivestar, a PC Designs, and a Micro D.

The KB 5153 is a great idea, but its performance falls short. Although the touchpad merits high scores for its varied input modes, its value is tarnished by limited hardware compatibility, software glitches, and pedestrian performance in too many modes. Given these shortcomings and a price tag that could cover both a mouse and a full-featured keyboard macro program, it's unlikely that the world will be beating a path to Key Tronic's door in search of a better mousetrap. —Art Wilcox

WHERE TO BUY

KB 5153

Key Tronic Corp.
P.O. Box 14687
Spokane, WA 99214
800/262-6006, 509/928-8000

List price: \$249

Accessories: desktop publishing overlay kit \$39.95, PS/2 Models 25/30 adapter kit \$24, PS/2 Models 50/60/80 adapter kit \$16

Requirements: 128K, DOS 2.00 or later version

For more information, see Products Featured in This Issue.

CuRAM-2

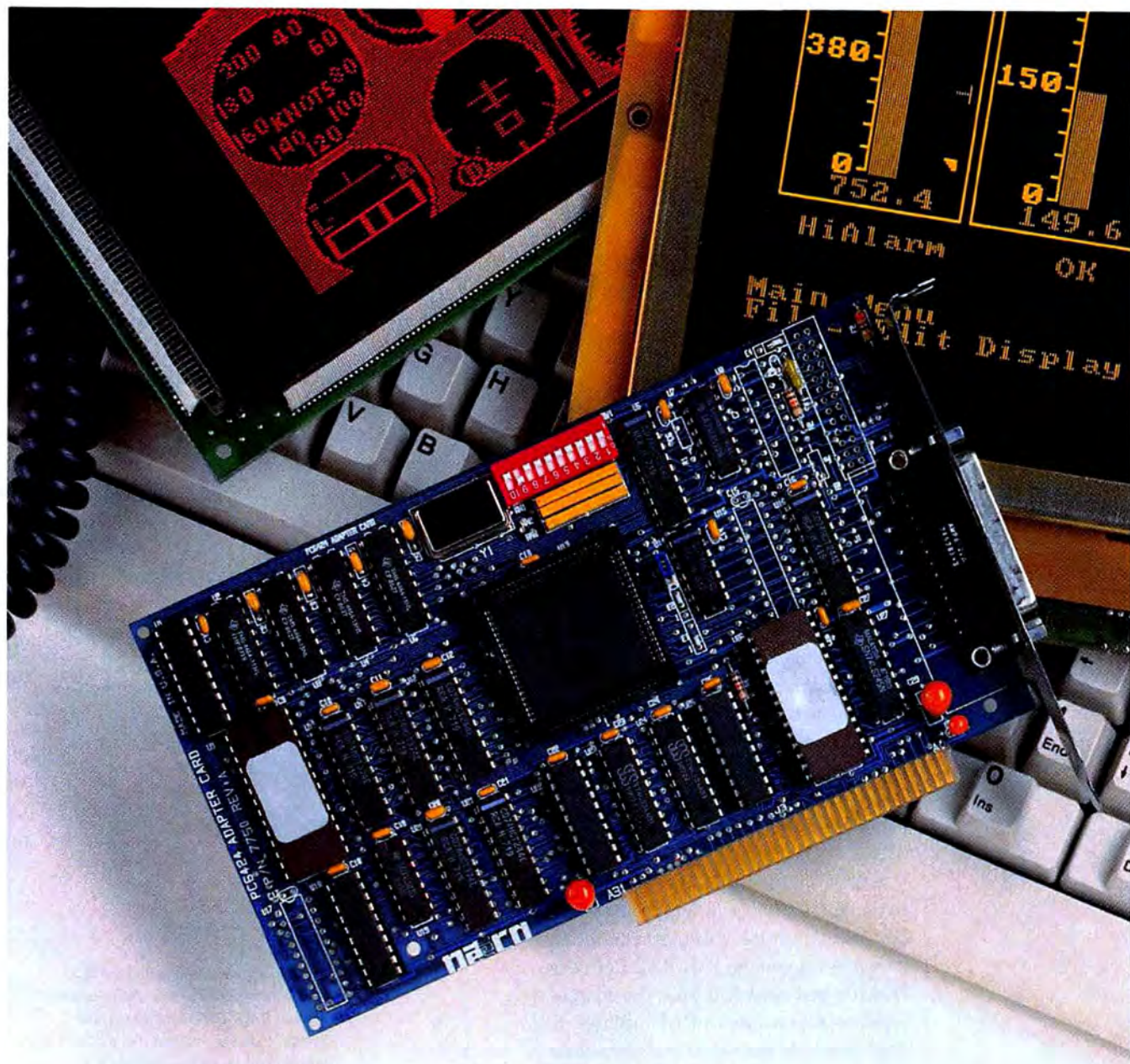
PS/2 multifunction board

PROS: Easy installation, reliable hardware, slot-saving piggyback boards

CONS: Unreliable print spooler

It's ironic. One of the Micro Channel's main benefits is its support for smarter, more reliable boards. Nonetheless, until recently only a handful of Micro Channel boards were available.

The CuRAM-2 from Cumulus Corporation is among the first PS/2 multifunction boards to hit the market. Designed to add a modem or a set of I/O ports to a Model 50 or 60, it can also provide 2MB to 6MB of one-wait-state expansion RAM. (The CuRAM-4, not



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Circle 5 on reader service card

The CuRAM actually contains no on-board memory; it is a Micro Channel platform with sockets and support circuitry for up to three piggyback modules.

reviewed here, uses 1-megabit RAM chips to deliver 4MB to 8MB of RAM.)

The CuRAM actually contains no on-board memory; it is a Micro Channel platform with sockets and support circuitry for up to three piggyback modules. One socket is reserved for a serial/parallel-port combo or a 2400-bps modem—neither of which is currently available. The other two sockets are designed for memory. The CuRAM-2 comes with one fully populated 2MB daughterboard; optional 2MB and 4MB modules can boost the CuRAM-2 to 6MB.

Setting up the CuRAM-2 is a snap, thanks to the Micro Channel's "programmable option select" feature. First you run the Update program on the IBM PS/2 Reference Diskette and allow it to read the adapter description files on the CuRAM utilities disk. Then you slide the board into any vacant slot, start the computer with the PS/2 Reference Diskette, and use the Change Configuration command to designate the CuRAM's memory as extended, expanded, or a combination of both. On-screen help is available for each option.

Once installed, the CuRAM board performed almost flawlessly. Its stable of expanded memory drivers—which includes LIM (EMS) versions 3.2 and 4.0, plus AST's enhanced expanded memory specification (EEMS)—worked perfectly with 1-2-3 release 2.01 and IBM's VDISK, as well as with Microsoft's *RamDrive* electronic disk and *SmartDrive* disk cache drivers. The only problem involved CuRAM's print spooler software, which choked occasionally on com-

plex bit-mapped graphics and on documents with downloadable laser printer fonts; Cumulus's advice was simply to turn off the spooler.

Several handy utilities come with the CuRAM. One turns expanded memory into extended memory, sidestepping the PS/2's Change Configuration routine. Other options copy drivers to the hard disk and rewrite the CONFIG.SYS file accordingly. Lucid documentation provides full instructions for those who prefer to do their own CONFIG.SYS rewrite.

Far too often, the first batch of products hurried out for a new computer are sleazy rush jobs. Happily, that isn't the case with the CuRAM board. It's well designed, competitively priced, and squeezes a lot of functionality into a PS/2 slot. If Cumulus's forthcoming modem and parallel/serial-port modules match their parents' performance, the CuRAM family will indeed be a welcome addition to the underpopulated but growing PS/2 environment. —*Jim Heid*

WHERE TO BUY

CuRAM-2

Cumulus Corp.
180 Basswood
Cleveland, OH 44022
216/247-2236

List price: with 2MB memory \$995, with 4MB memory \$1995; 2MB memory module \$595, 4MB memory module \$1495; 2400-bps modem module \$445; parallel and serial port module \$149

Requirements: IBM PS/2 Model 50 or Model 60

For more information, see Products Featured in This Issue.

Kevin Strehlo is chief correspondent for the nationally syndicated TV program The Computer Show. Lewis Perdue is the editor and publisher of PC Management Letter. Art Wilcox is a contributing editor for PC World. Jim Heid is a freelance writer and the author of Power Windows, forthcoming from Microsoft Press (Redmond, Washington). ●

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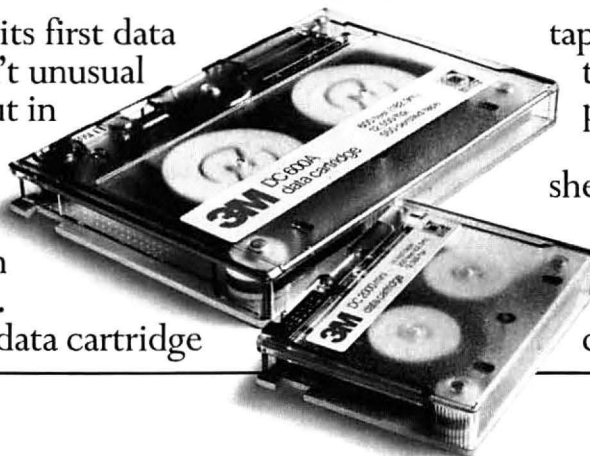
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172 **Surpass 1.0**

Though it offers fast worksheet consolidation and nifty graphics, *Surpass* is competing not only with *1-2-3* but with *Quattro* and *Excel* as well.

180 **QuickBASIC 4.0**

Better extensions to the BASIC language, a beefed-up editor, and lightning-fast in-memory compiles make this the best BASIC compiler yet.

184 **Publisher's Paintbrush 1.5**

A new gray-scale scanning ability lets PC publishers use high-quality images in their documents.

186 **Micrografx Designer 1.1**

Micrografx's new \$695 package has some CAD features, but it's better suited to PC artists.

190 **Dave 1.1**

Dave creates data entry forms that winnow out errors in *1-2-3* worksheets and can verify and correct historical data.

Surpass 1.0

Spreadsheet

PROS: Fast consolidation with dynamic file linking, advanced graphics, undo command, macro recorder, visual file management utility

CONS: No plotter support, expensive

Forget about the Chinese calendar; this is the Year of the Spreadsheet, as *Microsoft Excel*, *Quattro*, and even *VP-Planner Plus* enter the lists against *1-2-3* (see "Excel—Should You Switch?" *PCW*, March 1988; "Quattro Goes 1-2-3 Better," April 1988; and *The Software Shelf*, May 1988). Now, just as Lotus announced a delay in bringing out release 3.0, along comes *Surpass*, a 1-2-3 look-alike from *WordStar* mastermind Seymour Rubinstein.

Surpass will appeal to managers who can't wait for *1-2-3* release 3.0, especially if they often consolidate figures from multiple departments but lack the hardware to make *Excel* hum. And its closeness to the traditional standard makes worksheet transfers easy and retraining nil. But at \$495, *Surpass* costs twice as much as *Quattro*, and it faces an uncertain future when 3.0 appears late this fall.

Surpass packs a couple of punches sure to please spreadsheet fans: It's fast, it displays multiple linked worksheets in separate windows, and it makes consolidation among linked worksheets a breeze. Other nifty moves include a macro recorder, an undo key, minimal and optional background recalculation, and an *Xtree*-like file manager. And unlike *Excel*, the program runs quite nicely on an XT with a monochrome display.

Where *Excel* opted for a radically new on-screen look, *Surpass* remains faithful to *1-2-3*'s command menu, adding only a /View option (for managing windows) and a disconcerting jumble of pulldown submenus. Up to 32 worksheets can coexist on the screen at once, each in its own overlapped window. You can move from window to window and resize windows with the cursor keys, cycle through

active windows, and call up a list of all active windows when selecting a destination. *Surpass*, however, curiously lacks mouse support and many of the convenient windowing features found in *Excel*.

But *Surpass*'s claim to fame is the ease with which different worksheets can be hot-linked for consolidations. Making a reference is simple—as you write a formula, merely point to the desired cell in any worksheet on the *Surpass* desktop. (You can, of course, actually enter the worksheet/cell address directly.) And unlike *Excel*, *Surpass* automatically updates links when you move referenced cells or ranges in supporting worksheets, provided they are on screen when you make the change.

Surpass accepts .WKS and .WK1 files directly and saves *Surpass* worksheets in either format. All 1-2-3 release 1A and 2.0 macros will work in *Surpass*, and vice versa. However, 1-2-3 add-ins such as *Note-It* and *Write-In* won't work with *Surpass*. Ironically, *Surpass*'s compatibility with 1-2-3 could wind up hurting its sales: A department head could well buy a single copy to

consolidate figures while the staff continues to churn out worksheets with 1-2-3.

Compared to 1-2-3, *Surpass*'s graphing is a big improvement. You simply pick the desired pattern from the list *Surpass* pops on screen and print the graph without leaving the worksheet. *Surpass* offers a palette of 12 patterns, 16 colors, and 9 fonts (5 in Times Roman, 4 in Helvetica). Although convenient, *Surpass* doesn't match either *Excel* or *Quattro* in graphing talent. For example, you still must indicate an X range, an A range, and so on, a chore that *Excel* handles automatically. And while *Surpass* can generate 3-D graphs and display a clutch of graphs like a slide projector, it can't display graphs in a window or allow you to edit them interactively.

Surpass macros can do everything 1-2-3 macros can, and like its other two competitors, it includes a macro recorder. Macros can be pasted into any worksheet on the desktop. Any worksheet can also serve as a macro library. *Surpass* even boasts a Step



FEATURES EVALUATION

Surpass Compared to Quattro, Excel, and 1-2-3

Surpass is better than 1-2-3 release 2.01 but faces stiff competition from Quattro and Excel.

	Surpass release 1.0	Quattro release 1.0	Microsoft Excel release 2.01	1-2-3 release 2.01
Data entry and editing				
Reads/writes ASCII	●	●	●	●
Reads/writes .WKS and .WK1	●	●	●	●
Reads/writes .DBF	○	●	●	●
Undo command	●	○ ¹	●	○ ²
Goto feature	●	●	●	●
Global search and replace	○ ³	●	●	○
Searches using wild cards	●	○	●	●
Underlining/boldface in cells	○	○ ⁴	●	○
Invisible/hide feature	●	●	●	●
Background recalculation	●	○	●	○
Minimal recalculation	●	●	●	○ ⁵
Password protection	●	●	●	●
Transposes rows and columns	●	●	●	●
Supports mouse	○	○	●	○

Capacity				
Maximum number of rows	8192	8192	16,384	8192
Maximum number of columns	256	256	256	256
Maximum number of windows per screen	64	2	● ⁶	2
Maximum number of models displayed concurrently	12	1	● ⁶	1
Maximum number of keys sorted concurrently	2	5	3	2
Supports expanded memory	●	●	●	●
Supports dynamically linked files	●	○	●	○ ²
Supports math coprocessor	●	●	●	●

	Surpass release 1.0	Quattro release 1.0	Microsoft Excel release 2.01	1-2-3 release 2.01
Reporting and graphs				
Maximum report width (in characters per line)	240	240	255	240
Automatic page numbering	●	●	●	●
Number of graph types	21	10	8	6
Number of font styles per printed worksheet or graph	9	11	4	1
Number of colors supported	16	16	624	7
Color can be tied to value	○	●	●	○
Free text on graphs	○	○	●	○
Prints sideways	○	○	●	○
Spooler	○	○	●	○

Macro/programming

Macro libraries	●	○	●	○
Macro learn mode	●	●	●	○ ²
Input statements	●	●	●	●
Step mode	●	●	●	●
Trace cells option	●	●	●	●
IF...THEN...ELSE statements	●	●	●	●
DOS access from macro procedure	●	●	●	○
Reads/writes 1-2-3 macros	●	●	○ ⁷	●

● Yes ○ No ○ Deficient

¹ With included transcript add-in.

² With Lotus's HAL.

³ Search only.

⁴ With monochrome monitors only.

⁵ With Lotus's Speedup.

⁶ Unlimited.

⁷ Requires included utility.

mode that displays each line of a macro as it's being executed.

Although *Surpass* doesn't include the auditing and error-trapping tools found in *Excel*, it does have a handy /Worksheet Find command that zeroes in on specified character strings, formulas, or returned values. And undoing a *Surpass* operation is as sim-

ple as hitting the <Backspace> key—with one minor quirk: If you're in Edit mode and backspace past the beginning of a cell entry, you'll undo your previous command.

Surpass's documentation is aimed at knowledgeable spreadsheet users. Help screens offer numerous "buttons" that let you



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Personics ... NCP

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- ▣ SeeMORE 1.0 49.
- ▣ @BASE 1.1 119.

Peter Norton ... NCP

- ▣ Norton Utilities 4.0 55.
- ▣ Norton Guides (C, Assembler, Basic) each 55.
- ▣ Advanced Utilities 1.0 85.

Quarterdeck ... NCP

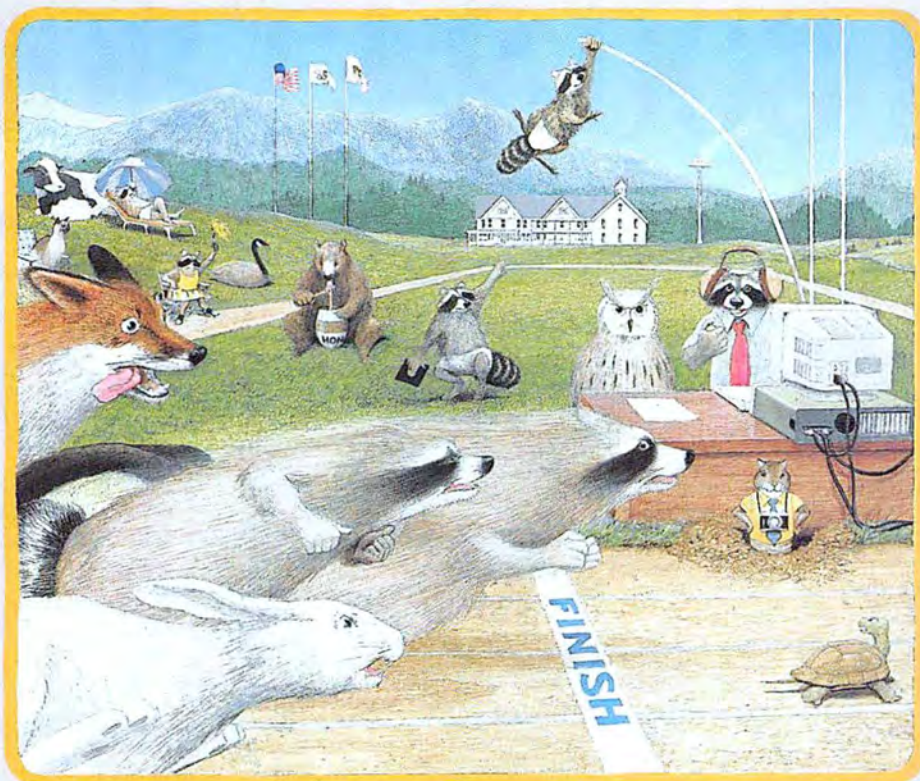
- DESQView 2.01 (operating environment) 79.
- Expanded Memory Manager 4.1 39.

Revolution Software ... NCP

- ▣ Cruise Control 3.02 39.

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Fuji MD2HD (10 disks per box)	22.
Sony (10 disks per box)	23.
Maxell MD2-DD (10 disks per box)	23.
Verbatim Datalife (10 disks per box)	22.
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Fuji (10 disks per box)	19.
Maxell (10 disks per box)	20.
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Fuji (10 disks per box)	55.
Maxell (10 disks per box)	59.

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CompuServe Information Service	24.
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Flashcard (AppleTalk network card)	169.
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Traveling Software ... NCP	
□ LAP-LINK Plus 1.0	85.
□ Desklint	105.
True BASIC, Inc. ... NCP	
□ True BASIC 2.01 (now includes Runtime)	57.
Vericomp ... NCP	
□ SoftBytes 2.0	35.
WordPerfect Corp. ... NCP	
□ WordPerfect Library 1.1	59.
□ WordPerfect 5.0	call
□ DataPerfect 2.0	299.
WordTech Systems ... NCP	
□ dBXL 1.2	119.
Xerox ... NCP	
Ventura Publisher 1.1	549.

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Microsoft ... CP	
□ Flight Simulator 2.13 (reqs. graphics brd.)	35.
Mindscape ... CP (reqs. graphics brd.)	
□ Balance of Power	30.
Parlor Software ... CP	
□ Bridge Parlor (best Bridge simulation)	49.
Sierra On-Line ... CP	
□ Leisure Suit Larry (requires CGA or EGA)	25.
□ Space Quest (requires CGA or EGA)	33.
□ King's Quest III (requires CGA or EGA)	33.
Sphere, Inc. ... NCP	
□ Tetris (addicting mind teaser)	24.
□ Falcon (F-16 simulation, reqs. graphics brd.)	32.
Sublogic ... NCP	
□ Jet 2.1 (requires EGA or CGA)	33.
XOR ... NCP	
□ NFL Challenge	69.

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I/O Mini 2 C/S/P	\$89.
SixPakPlus 64k C/S/P	
(now upgrades to 576k)	call
SixPakPremium 256k C/S/P	
(upgrades to 1 Meg or 2 Meg w/Piggyback)	call
Advantage Premium 512k S/P	
(upgrades to 1 Meg or 2 Meg w/Piggyback)	call
Advantage 2 512k (for PS/2)	call
RAMpage! 286 512k (upgrades to 2 Meg)	call
Hot Shot 286 (10 MHz)	399.

Amdek ... 1 year

410A (amber monochrome monitor)	159.
LaserDrive-1 (CD-ROM Drive; 90-day wrty.)	629.

Compucable ... 2 years

2-Position switch box	29.
3-Position switch box	39.

Cuesta ... 1 year

Datasaver 400 Watt (standby power unit)	459.
---	------

Curtis ... lifetime

ACCESSORIES

Disk Holder DB-1 (holds 50 5 1/4" disks)	8.
Printer Stand PS-1	18.
Universal System Stand SS-3	25.
DS-1 Switch Box (controls 2 printers)	33.

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Smartmodem-to-PC Cable (9 feet)	17.
Printer-to-IBM cable (9 feet)	17.

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Safestrip SP-3 (6 outlets; 1 year wrty.)	21.
Diamond SP-1 (6 outlets)	32.
Ruby (6 outlets; EMI/RFI filtered; 6 ft cord)	59.
Ruby-Plus (w/FAX & modem protection)	69.

DCA ... 1 year

Irma 2 (3270 emulation board)	729.
-------------------------------	------

Epson ... 1 year

FX-86e printer (80 column, 240 cps)	call
FX-286e (136 column, 240 cps)	call
LQ-500 (80 column, 180 cps)	call
LQ-850 printer (80 column, 264 cps)	call
LQ-1050 printer (136 column, 264 cps)	call
LQ-2500 printer (136 column, 324 cps)	call
LX-800 printer (80 column, 180 cps)	call
Printer-to-IBM cable (6 feet)	15.

Everex ... 1 year

1200 Baud Internal Modem	99.
2400 Baud Internal Modem	199.

5th Generation ... 6 months

Logical Connection 256k	349.
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Featured in This Issue.**

QuickBASIC 4.0

BASIC compiler



PROS: Very fast compilation, checks program syntax as it is written, comfortable interactive programming environment

CONS: Initial release not fully compatible with DOS 2.10, compiled programs run slightly slower than those compiled with Turbo Basic

With the release of QuickBASIC 4.0, Microsoft has fired the latest salvo in the Great BASIC Compiler Wars—and Borland International had better duck. QuickBASIC 4.0 represents a quantum leap forward for the BASIC language. It's easy to use; compiles to memory incredibly quickly; develops reasonably tight, fast-running native code; and provides the kind of structural programming and data-handling tools that make programming fun. While programs compiled with QuickBASIC 4.0 may not always match the speed of those compiled in Turbo Basic,

Borland certainly has something to think about (see "From the Software Shelf," *PCW*, August 1987).

Programmers will find QuickBASIC 4.0 makes them an order of magnitude more productive than any other PC compiler can. It has a first-class software debugger—a feature Turbo Basic lacks altogether. QuickBASIC 4.0's support for both structured programming and user-defined data structures will undoubtedly move BASIC solidly into the mainstream of development languages. The ability to call routines written in Macro Assembler or Microsoft's versions of C, FORTRAN, and Pascal is a real bonus for programming shops that use more than one language.

On the downside, QuickBASIC 4.0 takes longer than QuickBASIC 3.0 to compile a program into a stand-alone .EXE file. Version 4.0's .EXE files also sometimes run slower than those produced by Turbo Basic. Moreover, the initial release of QuickBASIC 4.0 has a compatibility problem with DOS 2.10: If a BLOAD or BSAVE command is executed, QuickBASIC 4.0 incorrectly generates a 'Too many files' error message. Microsoft has fixed the problem in release 4.00a, and upgrades are available free to registered 4.0 owners.

At first glance, the QuickBASIC 4.0 programming environment isn't much different than 3.0's, with its pulldown menus, mouse support, and support of *WordStar*-like editing commands. But there have been notable changes. QuickBASIC 4.0's editor now checks the syntax of each line of code as you enter it. As soon as you press <Enter> or <Cursor Down> to indicate the end of a line, all BASIC keywords in the line (such as AND, IF, and WHILE) immediately change to uppercase. If you commit a syntax error—for example, misspelling a keyword—a message appears and the cursor moves to the offending part of the line so you can make the correction. Structural errors—such as creating a WHILE loop but forgetting the WEND required to end it—receive the same help but are found when the program is run.

The syntax-checking editor is part of what

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NSTL TEST REPORT

QuickBASIC 4.0

Although loading and compiling to disk are slower than with Turbo Basic, QuickBASIC 4.0's lightning-fast compilation to memory makes debugging faster.

Load

PC-Talk III

Turbo Basic 1.1		1.0
QuickBASIC 3.0		2.3
QuickBASIC 4.0		10.4 ¹
IBM BASIC		14.1

Globe²

IBM BASIC		1.8
-----------	---	-----

seconds 0 3 6 9 12 15

Compile and Link

PC-Talk III to memory

QuickBASIC 4.0		3.0
Turbo Basic 1.1		20.1
QuickBASIC 3.0		25.3

PC-Talk III to .EXE file

Turbo Basic 1.1		21.2
QuickBASIC 3.0		25.8 ³
QuickBASIC 4.0		80.6

Globe to .EXE file

Turbo Basic 1.1		1.1
QuickBASIC 3.0		15.2
QuickBASIC 4.0		19.1

seconds 0 5 10 15 20 25

¹ QuickBASIC 4.0 parses the program as it is loaded to speed compiling.

² Globe.BAS is small. Except for the IBM BASIC interpreter, the times to load the source code and compile and link to memory are too small to measure.

³ This figure is for a run-time .EXE file; the stand-alone .EXE file created by QuickBASIC 3.0 was not functional.

⁴ This is the size of the source code file.

Benchmarks were conducted on an 8-MHz IBM AT Model 339 with a 30MB hard disk using IBM PC-DOS 3.30. PC-Talk is a popular shareware telecommunications program. Globe is a calculation-intensive program that uses DRAW "M x,y" repeatedly. IBM BASIC is not a compiler and was used for comparison only in the Load and Execution tests. All tests were measured from the time the command was issued until control was returned to the user.

Load

This test measured the time required to load the test source code of ASCII text.

Execution

PC-Talk III

Turbo Basic 1.1		18.9
QuickBASIC 3.0		20.0
QuickBASIC 4.0		21.6
IBM BASIC		53.8

Globe

QuickBASIC 3.0		13.3
Turbo Basic 1.1		38.2
QuickBASIC 4.0		52.8
IBM BASIC		84.4

seconds 0 20 40 60 80 100

Size

PC-Talk III

IBM BASIC		5157 ⁴
QuickBASIC 3.0		69,856 ³
Turbo Basic 1.1		92,677
QuickBASIC 4.0		115,293

Globe

QuickBASIC 4.0		31,676
IBM BASIC		45,326 ⁴
Turbo Basic 1.1		48,784
QuickBASIC 3.0		54,533

thousands of bytes 0 25 50 75 100 125

Compile and Link

For each program, the same BASIC code was used for all the compilers.

Execution

The execution times for PC-Talk III represent the time needed to transfer a 10K text file using the XMODEM protocol at 9600 bps through a null modem. For Globe, they represent the time it took to calculate over 1100 points and connect them to form the image of longitude and latitude lines in perspective. The figures for Globe tests are more representative of an average program's overall performance.

Size

These figures represent the sizes of the stand-alone .EXE files.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

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Microsoft calls its three-state machine, the secret to QuickBASIC 4.0's speed-of-light compilation. As you type in a program or load it from disk, QuickBASIC 4.0 partially compiles it. This makes loading much slower than with other compilers but compilation to memory very fast. When you run the program from within QuickBASIC 4.0, the compiler changes the "state" of the program twice more, first converting it to a symbolic state for easy compilation and lastly to a threaded state, in which the actual program operations are translated into executable code.

QuickBASIC has had a built-in debugger since version 2.0, but QuickBASIC 4.0 adds capabilities that make debugging almost a pleasure. You can set several *watch variables* so program execution is interrupted when one or more of the variables equals a particular value. Similarly, you can define *watch expressions* involving calculations or comparisons between variables. Both features simplify pinpointing logical problems in long programs.

Each incarnation of QuickBASIC has added new capabilities to the BASIC language, and QuickBASIC 4.0 is no exception. The clumsiness of previous versions is eased by true FUNCTIONS (instead of DEF FNs) that can be compiled separately and added to libraries; definable array bounds that make indexing easier; and long-integer (4-byte) variables, recursive SUBs and FUNCTIONS, and user-definable variable types and record structures. Version 4.0 also supports all the modes of the popular IBM video adapters, including the EGA's 80-column-by-43-row text mode and the VGA's 16-color, 640-by-480-pixel graphics mode. QuickBASIC 4.0 also supports the Hercules Graphics Card.

Math coprocessor support, introduced with version 3.0, has also been enhanced. Programs compiled with version 4.0 automatically use 8087, 80287, or 80387 coprocessors for numeric calculations; when none is present, software emulation is used. Finally, in contrast to QuickBASIC 3.0's slapdash documentation, the new version comes with three thoroughly edited, well-written manuals.

QuickBASIC 4.0 offers an extremely fast, friendly programming environment and im-

proved language features at a price that makes it one of the best software values on the market. The Borland language development gurus must be shaking their heads—and gearing up for the next round.

—Dennis Dykstra

WHERE TO BUY

QuickBASIC 4.0

Microsoft Corp.
P.O. Box 97017
16011 N.E. 36th Way
Redmond, WA 98073-9717
800/426-9400, 206/882-8080

List price: \$99; upgrade from version 3.0 \$27.50, from version 2.01 or earlier \$37.50

Requirements: 256K, DOS 2.10 or later version

Not copy protected

For more information, see **Products Featured in This Issue.**

Publisher's Paintbrush 1.5

High-end paint program

PROS: Generates high-quality scanned images with up to 256 gray-scale levels

CONS: Limited gray-scale editing features; doesn't convert gray-scale files into TIFF

Before too long, PC publishers will routinely use high-quality digitized photos instead of camera-based halftones—and *Publisher's Paintbrush* is paving the way. While version 1.5's gray-scale editing talents are still limited, its new gray-scale scanning ability is a sign of things to come.

Publisher's Paintbrush and its low-end cousin, *PC Paintbrush Plus*, are highly interactive, bit-mapped painting and scanning programs from Z-Soft Corporation (see "The Publisher's Companion," *PCW*, July 1987). They feature the same mouse-driven interface, replete with pulldown menus, scroll bars, and drawing tools. They can drive a number of popular image scanners and send output to a variety of laser, dot matrix, and color printers. But where *PC Paintbrush Plus* displays only a portion of an image, *Publisher's Paintbrush* can display and edit a full-page, 300-dot-per-inch (dpi) image.

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286	\$1499
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What version 1.5 adds to the mix is true gray-scale control and image editing. Earlier versions of *Publisher's Paintbrush* simulated the gray scales in a scanned image using *dithering*—grouping equal-size dots in cells and then arranging the cells in different patterns to simulate gray. With version 1.5, you can generate high-quality scanned images that contain from 16 to 256 levels of gray (depending on the scanner hardware used) that keep their quality as you resize them. The program's gray-scale editing features, however, are limited to resizing, cropping, flipping, and rotating a scanned image. And retouching an image at the pixel level is difficult, though possible.

Actually, just using the program's new talents is far harder—at least for now. No desktop publishing program currently supports *Publisher's Paintbrush's* new gray-scale file (.PCX) format, and Z-Soft doesn't provide an option that converts .PCX files into TIFF files. The program does include a file-conversion utility that converts gray-scale images into black-and-white images.

You can also send a *Publisher's Paintbrush* gray-scale image to a Linotronic typesetter by using an included PostScript device driver.

Until *Publisher's Paintbrush* expands its gray-scale editing capabilities and attracts more support for the .PCX format, Z-Soft may be raising more expectations than it can satisfy. That said, the fact remains that *Publisher's Paintbrush* gives PC publishers more power to manipulate gray-scale images than any other program now on the market.

—Richard Jantz

WHERE TO BUY

Publisher's Paintbrush 1.5

Z-Soft Corp.
1950 Spectrum Circle #A-495
Marietta, GA 30067
404/428-0008

List price: \$285

Requirements: 512K, DOS 2.00 or later version, graphics board and display, mouse recommended
Not copy protected

For more information, see Products Featured in This Issue.

Micrografx Designer 1.1

Illustration program

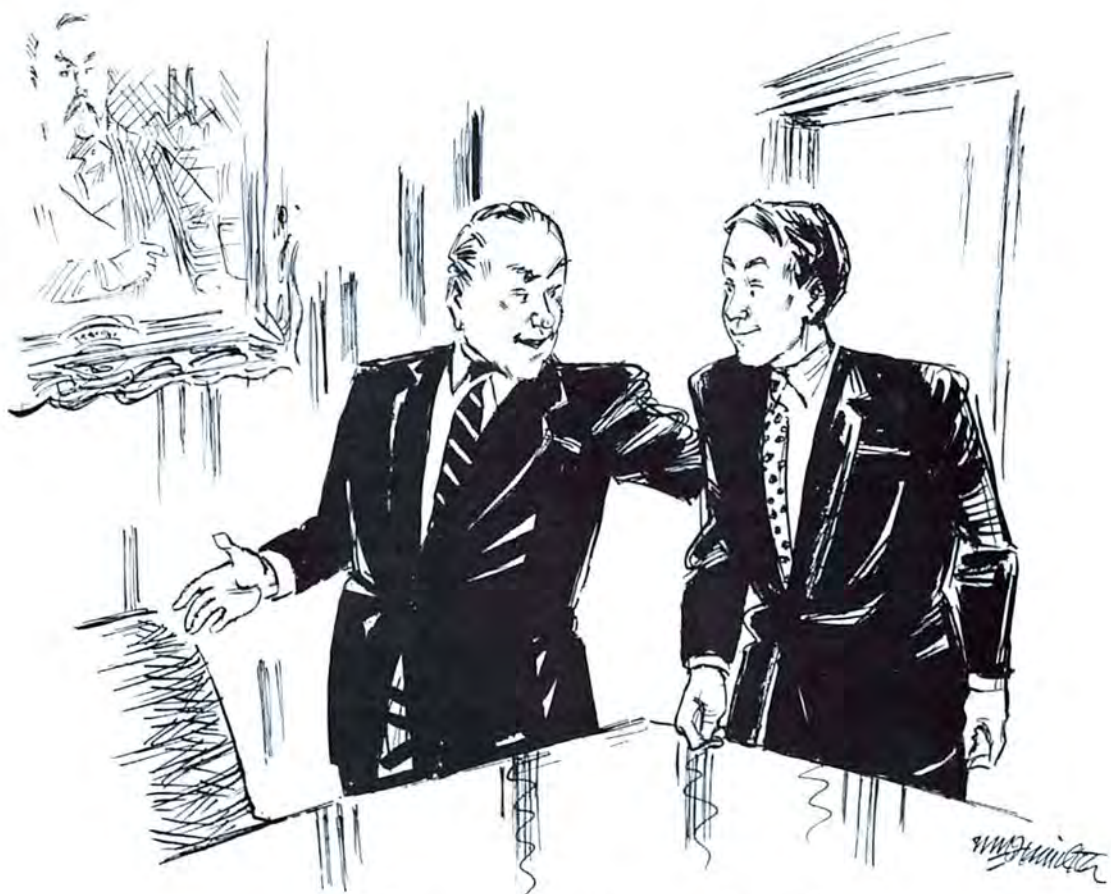
PROS: Wide selection of drawing tools and shapes; capable of multilayer drawings and color separations; supports PostScript, PaintJet, and other popular printers; comes with run-time version of Windows 2.0

CONS: Not powerful enough for most CAD applications, can't accept TIFF or EPS graphics file formats

While others predict the death of *Windows*, Micrografx keeps turning out applications. The most recent addition to the company's design stable is a *Windows*-based color illustration package called *Designer*. It's a high-end drawing package with a \$695 price tag, rudimentary CAD capacities, and a lot of visual appeal. If you want to do fancy illustration work under *Windows*, *Designer* is about the only game in town—for now.

If you're an engineer, don't get your hopes up; *Designer* is strictly for artists. Though *Designer* has such CAD-like features as layering and the ability to generate and reshape complex curves and manipulate objects using coordinates, it can't handle large-scale, high-precision drawings. One key reason: To keep the graphic user interface moving, *Designer* uses integer-based rather than floating-point arithmetic, limiting overall precision to roughly 1 part in 32,000. Also, because *Windows* can't swap data to and from disk, *Designer* applications are limited to available RAM. Finally, the program lacks many fundamental CAD tools—true B-splines, triple lines, instant fillets, and so on—usually found in CAD programs costing hundreds of dollars less, such as Evolution Computing's *EasyCAD 2*.

Look beyond CAD, however, and you'll find that *Designer* is an excellent tool for professional artists and designers. Starting with a full set of quality, vector-based paint/draw tools (basically, an enhancement of those offered by *Windows Draw*), Micrografx adds CAD-like layering and dimensioning, curve reshaping, variable line widths and end styles, and a symbol library manager.



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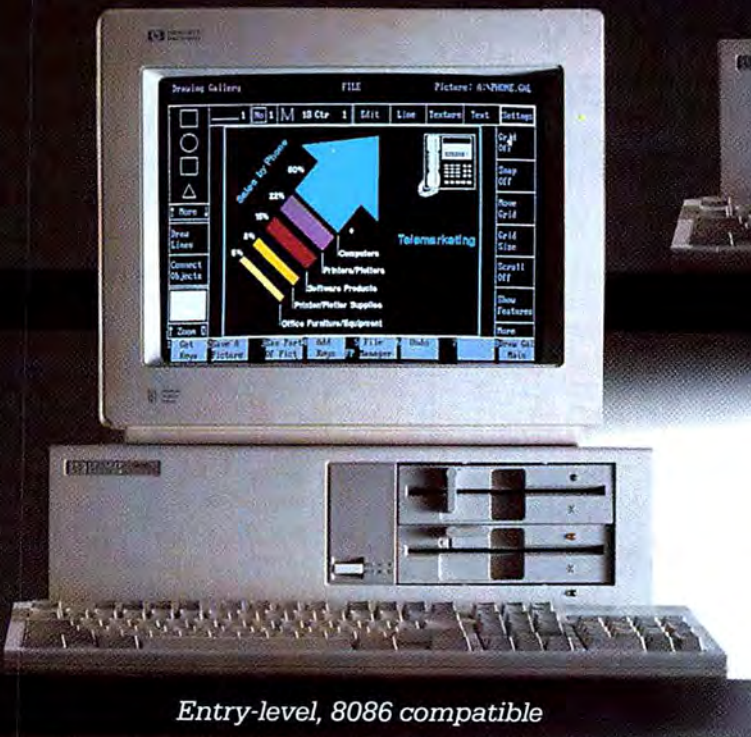
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- Separate mouse/graphics tablet port included
- Intel 80387 and Weitek 1167 co-processor support

HP Vectra ES and ES/12 Personal Computers

Mid-level, 80286 based

- Choice of 8 or 12 MHz, Intel 80286-based microprocessors
- Up to 8 Mbytes of expanded memory, accessed at 12 MHz in the Vectra ES/12 PC, supporting LIM 4.0 expanded memory specification without using I/O slots
- 7 accessory slots for expansion
- 20 and 40 Mbyte hard disc models
- Both 5.25 and 3.5 inch flexible disc drives supported internally
- Separate mouse/graphics tablet port included

HP Vectra CS Personal Computer

Entry-level, 8086 compatible

- 7.16 MHz, 8086-compatible microprocessor with zero wait states
- Up to 8 Mbytes of expanded memory, addressable via LIM 3.2 expanded memory specification
- 7 accessory slots for expansion
- 20 Mbyte hard disc model
- Both 5.25 and 3.5 inch flexible disc drives supported internally

HP Portable Vectra CS

Personal Computer

8086 compatible

- 7.16 MHz, 8086-compatible microprocessor with zero wait states
- Up to 6 Mbytes expanded memory, addressable by LIM 3.2
- Four I/O slots
- Supports two 3.5 inch flexible disc drives
- 20 Mbyte internal hard disc model available
- Up to 10 hour battery life
- IBM style keyboard

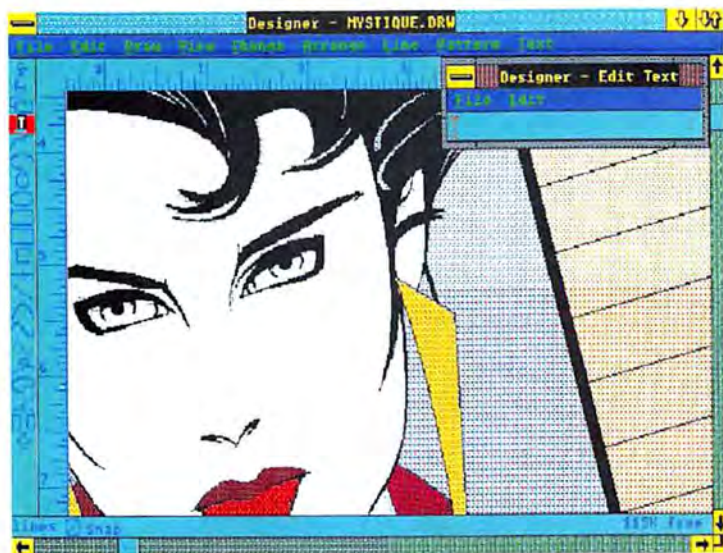
AutoCad is a U.S. trademark of Autodesk, Inc.
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Designer's versatile drawing and color-selection capabilities make it a tool for graphics professionals. Though the process is awkward, you can incorporate text in illustrations in a variety of sizes, styles, and colors.

Thanks to a clever Windows dithering technique, you can mix virtually thousands of colors on a 16-color EGA system.

Desktop publishers and presentation graphics users take note: *Designer* can even prepare color separations for offset printing. The program formulates the percentages of cyan, yellow, magenta, and black needed to mix each color. Micrografx is currently working on a driver that will automatically generate four-color separations from any *Designer* drawing on any PostScript printer.

To Windows' standard pulldown menu interface, *Designer* adds rulers, an icon menu of paint tools, and a status line that displays object dimensions, available memory, cursor-snap status, and the current layer selected. Most menu choices are available from both icon and pulldown menus, and keystroke shortcuts abound.

For all its talents, *Designer*'s inability to accept popular graphics and scanned image formats such as EPS (Encapsulated PostScript) or TIFF (currently supported by *PageMaker*) will lessen its appeal to desktop publishers. Artists, however, will probably be satisfied. *Designer* can read .PIC files from other Micrografx programs and pull in bit-mapped graphics or scanned images through the Windows clipboard; the program's clipboard viewer can convert the bit map to *Designer*-compatible format. (You can't import TIFF files through the clipboard, however.) The company even throws in one volume of its extensive symbol library,

Windows ClipArt, and offers free copies of a utility that converts AutoCAD .DXF files to Micrografx's .PIC format.

At press time, Micrografx was planning an upgrade that will improve the user interface for text entry, as well as allow users to load custom color palettes—supporting Pantone and other color palette schemes.

Rumor has it that Xerox will bring out *Cricket Draw* under Windows, and that Aldus will do the same with *Illustrator* or *Freehand*. But for the time being, *Designer* is pretty much alone in its field. Architects and office planners will like its graphics and drawing tools, and graphic artists and publishers its color speeing capabilities and printer support. —Steven Lord

WHERE TO BUY

Micrografx Designer 1.1

Micrografx
1820 N. Greenville Ave.
Richardson, TX 75081
800/272-3729, 214/234-1769

List price: \$695

Requirements: 512K (640K recommended), hard disk, DOS 3.00 or later version, color or Hercules graphics adapter, mouse, Windows 2.0 or Windows/386 recommended

For more information, see Products Featured in This Issue.

Dave 1.1

1-2-3 data entry utility



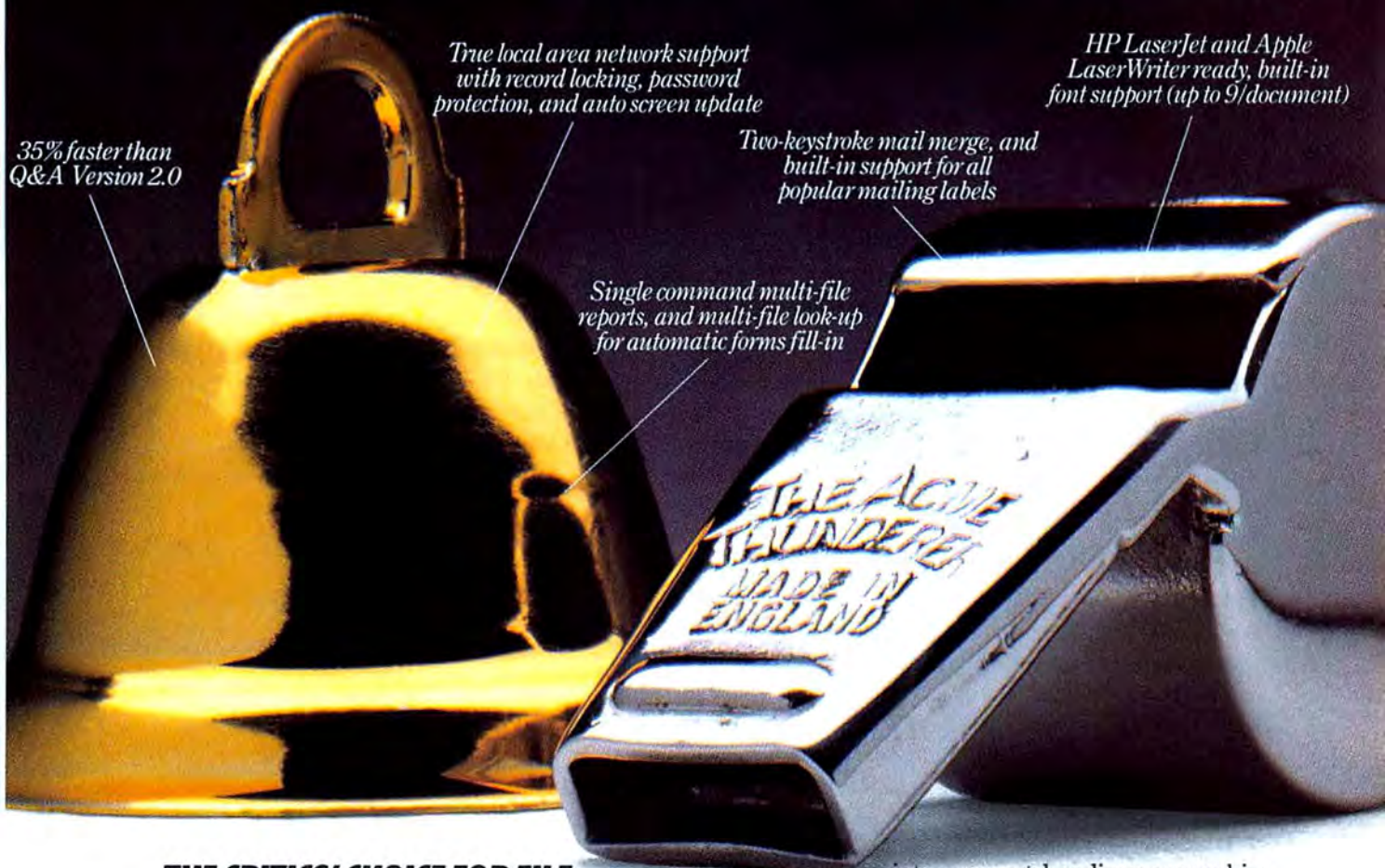
PROS: Validates data, checks and edits its historical data, creates forms easily, templates available at extra cost

CONS: Can't use computed fields, creates forms separately from the worksheet

The best way to eliminate erroneous data in a worksheet is not to enter it in the first place. But if you're using 1-2-3 for data entry, it's all too easy to enter the right data in the wrong column. And 1-2-3 won't check to see that data being entered fits predefined specifications.

Thanks to *Dave*, a two-part, \$99.95 package from Goldata Computer Services, entering 1-2-3 data can be both simple and accu-

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Acquisition Date 01/01/1980

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Comments

F1-Fld help/F2-Your help/F3-List/F4-Fld1/F5-Fld4/F6-Row1/F7-Row4/F8-Formula
Adding cell H1 page 1 Worksheet: NOME
Press <ESC> to exit Image: C:\123\INVENT.IMG

```

Dave lets you create data entry forms familiar to most office workers. Labeled fields, a space for each entry, and a display of acceptable values ensure that data is accurate before it is moved to a worksheet.

rate. Dave lets you create on-screen data entry forms and then monitors the data as it's entered. The package is especially handy for organizations where clerical workers must regularly update patient or client lists, enter orders, fill out service requests, or record customer information.

Dave's forms generator lets you create complete and attractive forms, which can run to 10 screens holding a total of 256 fields. You can embellish the forms with headings, character graphics, labels for each data field (for example, Address), and prompts and help messages. If you don't care to generate your own forms, Goldata sells Dave with a set of 12 business data entry templates for \$149.95.

To create a form, you paint it out on the screen and specify the characteristics of each field and the worksheet column in which that data will be entered. You can specify that a field be an integer, numeric, alphanumeric, or a date. You can have Dave check each entry against a high/low range of values, a short list of specific values (such as names of auto parts), an external ASCII file (such as a list of client or vendor names), or a named 1-2-3 range (if the list is already in the worksheet). Finally, you can require that a field be mandatory (like ZIP codes and patient IDs) or that it follow a unique format (like an order number).

Sound hard? It isn't. You can set field lengths with a single command, and lines are centered automatically. A block move/copy command makes it easy to rearrange the lay-

out and speeds up the preparation of forms that have many duplicate fields.

Using Dave's data verification routine is also straightforward. Two batch files automatically install this add-in, and you press an <Alt>-function key combination to run it. Call up a form from the Dave menu, fill in the blanks, and Dave inserts your entries on the next open row of the worksheet. Dave won't transfer the data to the worksheet unless all entries are acceptable and all mandatory entries have been completed.

Dave will also check previously entered data by scanning the worksheet for values that violate the rules specified in the form. You use the entry form to make corrections.

Dave's only drawback is that it doesn't do calculated fields. If you must have that capacity, try Data Manager, a \$79.95 1-2-3 add-in from Intex Solutions of Wellesley, Massachusetts. But for accuracy and convenience, Dave is an excellent value. —Phillip Good

WHERE TO BUY

Dave 1.1

Goldata Computer Services
2 Bryn Mawr Ave.
Bryn Mawr, PA 19010
800/432-3267, 215/525-1036

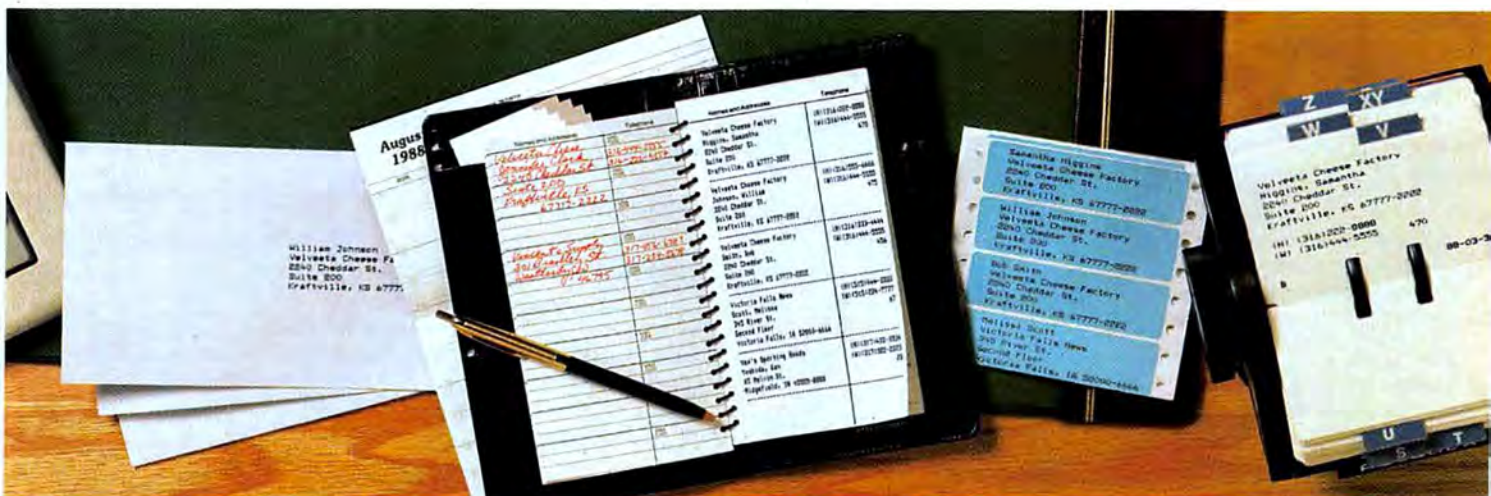
List price: \$99.95, \$149.95 with templates

Requirements: 340K, DOS 2.00 or later version, 1-2-3 release 2.0
Not copy protected

For more information, see Products Featured in This Issue.

Ralph Soucie is a certified public accountant with McCallister & Co. in Portland, Oregon. Dennis Dykstra is a professor at Northern Arizona University in Flagstaff, as well as a freelance writer and software developer. Richard Jantz is a desktop publishing consultant and the author of *The Complete Scanner Handbook* (Peachpit Press, Berkeley, California, 1988) and Ventura Publisher for the IBM PC: *Mastering Desktop Publishing* (John Wiley & Sons, New York, 1987). Steven Lord is a mechanical engineer and freelance writer living in Tewksbury, Massachusetts. Phillip Good is the editor of *Laboratory Computer Letter* in Warner Robins, Georgia. ●

"I put Velveeta[®] in my computer and it ended up all over my desk."



"Minutes later, it was in my pocket"

Enter any name just once. Pocket Address Book software prints listings four different ways automatically. That's why Brad the box salesman entered his Velveeta Cheese Factory sales prospect list into an IBM PC. And five minutes later had Velveeta in his pocket, ready for the road in the leather-bound address book that came with the package. Then, five minutes after that, he had Velveeta in his Rolodex, on mailing labels, and on envelopes. Just by choosing from printing options.

Pocket Address Book is really that simple. And that fast. Just print your address list on the prepunched tractor-feed paper that we've included to make it easy, tear along the perforations, and insert your completed address book into our Day-Timers Senior-Size black leather cover.

You can enter up to 2,000 names, complete with 10 different sorting codes that let you selectively organize and print Christmas card lists, sales mailings by zip code, business directories, you name it. Or, if you already have lists in other programs, merge them into Pocket Address Book automatically to save retyping. Either way, you'll always have a neat, up to date address book, Rolodex cards, labels, and lists at your fingertips.

Power Up!

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New Uses For Personal Computers.



Samantha, Bob, Bill... manage all your names and addresses more effectively in the office, at home, on the road, or through the mail. For only \$69.95. Order today on our famous 30-day, money-back guarantee.

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YES! Send _____ copies of Pocket Address Book at \$69.95 each, plus \$4.50 for shipping. CA residents add \$4.90 sales tax per unit.

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Card # _____ Exp. _____

Name _____

Company _____

Address _____

City/State/Zip _____

Day Phone (_____) _____

Send to: Channelmark at 2929 Campus Dr.,
P.O. Box 7600, San Mateo, CA 94403 M 107

30-DAY, MONEY-BACK GUARANTEE

*Requires IBM or IBM-compatible personal computer, at least 256K of RAM, and DOS 2.0 or higher. For address book requires printer that prints condensed characters (15-17 characters per inch). Pocket Address Book is a trademark and Power Up! is a registered trademark of Channelmark Corporation. IBM, Velveeta, Day-Timers, and Rolodex are registered trademarks of IBM, Kraft, Day-Timers, and Rolodex Corp. respectively. © 1988 Channelmark Corporation, 2929 Campus Drive, P.O. Box 7600, San Mateo, CA 94403.

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More Power, More Flexibility. We cut the price, but we certainly didn't cut corners. Today, Peachtree Complete II: The Business Accounting System is the most comprehensive accounting system you can buy at virtually any price. We've made enhancements to each of the eight modules that make up Peachtree Complete II. You can use them individually, or integrate them for maximum control and efficiency. You can even distribute them among separate computers. Over 250,000 Peachtree customers have already put these modules to work in their businesses.

- | | |
|-----------------------|----------------|
| • General Ledger | • Payroll |
| • Accounts Receivable | • Inventory |
| • Invoicing | • Fixed Assets |
| • Accounts Payable | • Job Cost |

More New Features. Peachtree Complete II has a brand new look and an entire range of state-of-the-art features to make your accounting procedures easier and more effective than you thought possible. Peachtree's Complete II's latest features include:

- ✓ **Windows and Pop-Up Menus** make it easy to see what you're doing and where you want to go next. When you get ready to make a choice, just "aim and shoot."
- ✓ **Smart HELP** on-line, all the time. One keystroke gives you a pop-up rescue window full of context-sensitive information.
- ✓ **Quick and Easy Error Handling** gives error messages in plain English along with suggested solutions. No more complicated error codes.
- ✓ **Enhanced Report Capabilities.** Range printing allows you to print only what you need, only when you need it. A great feature for starting and stopping long reports. And now Complete II can produce over 450 reports.
- ✓ **Increased Numeric Capacities** to \$999,999,999.99 in key areas. Plus, an unlimited number of companies.
- ✓ **Ongoing Tax Updates.** Complete II allows you to update your accounting tax files or you can order updates directly from Peachtree.
- ✓ **Service Invoicing,** the perfect addition to our product invoicing. Enter information free form on service invoices or store predefined paragraphs.

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...head and shoulders above the manuals

for other low-priced systems..."

More Confidence. Peachtree Complete II includes comprehensive documentation to get you started and help you along the way: a separate quick-start Installation Guide, Accounting Primer, eight-volume Reference Library, and extensive

MORE COSTS LESS

PEACHTREE COMPLETE™ II: Complete Accounting Is Still Just \$199.

COMPARE FEATURE FOR FEATURE

System-Wide Features

- Over 450 reports
- Unlimited number of companies and consolidations
- Automatic menu-driven conversion of your existing Peachtree Business Accounting data files
- Increased numeric capacities to \$999,999,999.99 in key areas

General Ledger

- Chart of Accounts includes 76 suggested and 26,000 user-defined accounts
- 1 to 13 user-defined fiscal periods
- Repeating journal entries
- Financial statement comparisons may include current period and year-to-date with budget and/or prior period comparison
- Reversing journal entries

Accounts Receivable/Invoicing

- Open item or balance forward customers
- Up to 14,400 customers
- Supports partial payments
- User-defined terms codes and aging periods
- Automatic transactions with monthly, bi-monthly, quarterly, semi-annual, and annual frequency options

Accounts Payable

- Up to 14,400 vendors
- Partial payments of invoices
- Cash requirements forecasting by due date
- User-defined billing cycle on automatic invoices

- Checks printed with unlimited invoice listing on stub
- Ability to void and reprint checks

Inventory

- Supports average, last purchased and standard costing methods
- Up to 19,500 inventory items (SKUs)
- Automatic price change on multiple items by percent or amount

Fixed Assets

- Handles 13,000 assets and 13 methods of depreciation
- Updated to handle current tax laws

Job Cost

- Tracks costs and profitability on a job-by-job basis
- Compares estimated costs with actual costs for specific tasks

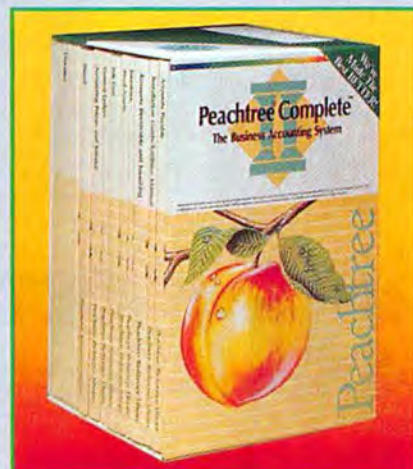
Payroll

- Built-in current year federal, state, city and county tax tables for all 50 states with automatic calculation capabilities
- Automatic payroll processing supporting hourly, salaried, commission or draw-against-commission pay types
- New tax laws incorporated into program
- Processes up to 3,900 employees
- Supports Cafeteria Plan
- User modifiable tax tables with updates published regularly by Peachtree Software
- Printed and magnetic media W-2s generated automatically

Tutorials on each application—all at no extra charge! Plus, we stand behind all our products with a toll-free hotline for technical support (\$1 per minute, \$20 minimum) and an established network of support centers across the country.

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and solid documentation make this a

top choice..."

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And now Peachtree Complete II is compatible with **Timeslips III™**, a leading time and expense tracking program. With Time-Link: Plus III™, you can integrate your time and billing with your Peachtree accounting for total efficiency. Order Peachtree Complete II with Timeslips III now for just \$399 and receive the accounting link (reg. \$79.95) FREE.

**InfoWorld, December 1987.*

Hardware Specifications: Requires PC/MS-DOS version 2.0 or higher with 384K of usable memory and a minimum 10 MB hard disk. For use with the IBM® PC, PCXT, PCAT, Personal System/2™ and compatibles. 3 1/2" media optionally available. Not copy protected.

Lotus 1-2-3 is a registered trademark of Lotus Development Corporation. dBASE is a registered trademark of Ashton-Tate Corporation. Timeslips and Time-Link: Plus III are trademarks of North Edge Software Corp. IBM is a registered trademark and Personal System/2 is a trademark of International Business Machines.

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New 4.0 Version!

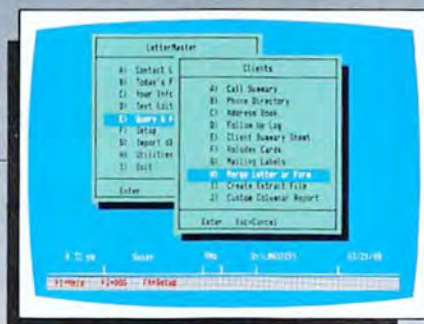
**Now directly
import your
dBase III
files.**

Master your mailings in minutes

LetterMaster™

4:30 "Susan—Send our sales letter to all buyers of apples and cherries in Washington and oranges or bananas in Florida, in time for today's 5:00pm pick-up.—Mr. Wermer."

4:32 Mailing lists sorted.

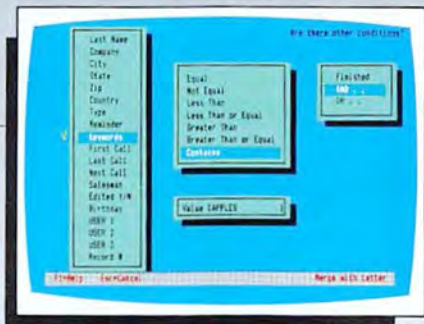


Our new LetterMaster mailing software is a lifesaver. It sorts any list according to any criteria in its own internal database and our dBASE® III files.

4:33 Lists merged and purged.

LetterMaster merges lists and purges duplications in a matter of seconds. It's incredible! I can create instant custom mailing lists with a few keystrokes!

4:38 Personalized sales letters printed.

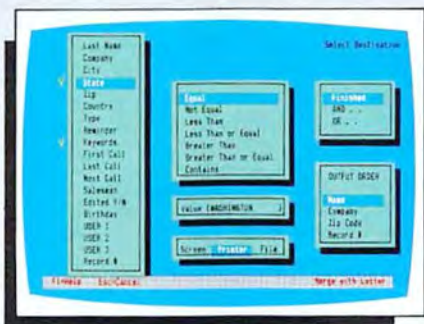


With LetterMaster, all I do is name the list, name the letter, activate the printer, and "go do." It's that simple!

4:41 Labels printed.

LetterMaster prints off any list onto leading brand address labels. It prints Rolodex cards and file folder labels, too.

4:45 Mailing complete and ready for pick-up.



5:00 "Susan—Good work on that mailing."

LetterMaster operates with all the popular word processing programs. About the only thing it doesn't do is lick the envelopes!

System requirements for Single User: DOS 2.1 or higher IBM PC or your IBM PS/2 or 100% compatible, 512K RAM. System requirements for Network Work Station: DOS 3.1 or higher, 640K RAM, any combination of hard, floppy, or no disk drives. Trademark/Owners: LetterMaster: Dig Properties, Inc.; dBase III: Ashton-Tate Corp.; IBM PC & IBM PS/2: International Business Machines Corp.; DOS: International Business Machines Corp. and Microsoft Corp.

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Have an apple.—Bob

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☐ Send C.O.D.
Credit Card # _____ Expir. Date: _____
Signature _____
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Address _____ Phone # _____
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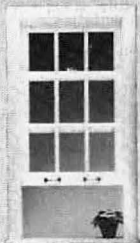
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Combine text,
graphics and
pictures in
notes.



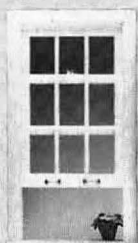
Cross-index information
(notes, appointments, phone
conversations, etc) by
person, subject, date—
virtually any criteria.



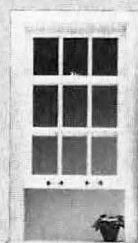
Build instant
lists of
customers,
prospects,
patients,
friends, club
members ...



Track detailed
expenses.



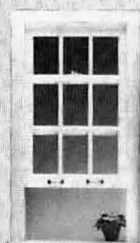
Time meet-
ings, phone
calls, events
for billing
purposes.



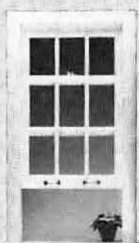
Manage "To Do"
tasks with
priorities,
start/end times,
prerequisites,
dependencies.



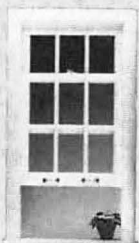
Create mail-
merge files for
letters & mail-
ing labels.



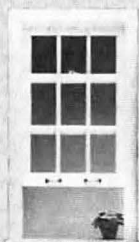
Auto-Dial
the phone.



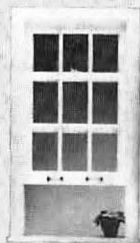
Print expense
reports, calendars,
To-Do tasks,
appointments,
phone lists, and
notes, etc.



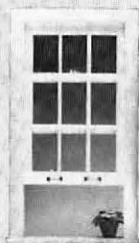
Keep track of any-
thing—who, what,
where, when, why
& how—& find it
all Fast!



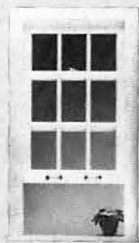
Schedule
appointments.



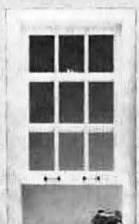
Display tele-
marketing
scripts. And
MORE!



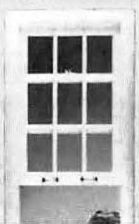
Import/export
text and
graphics
between Pack-
Rat and other
programs.



Set audible &
visual
"tickler"
reminder
alerts.



Log phone
conversations
referenced by
person, sub-
ject, date, etc.



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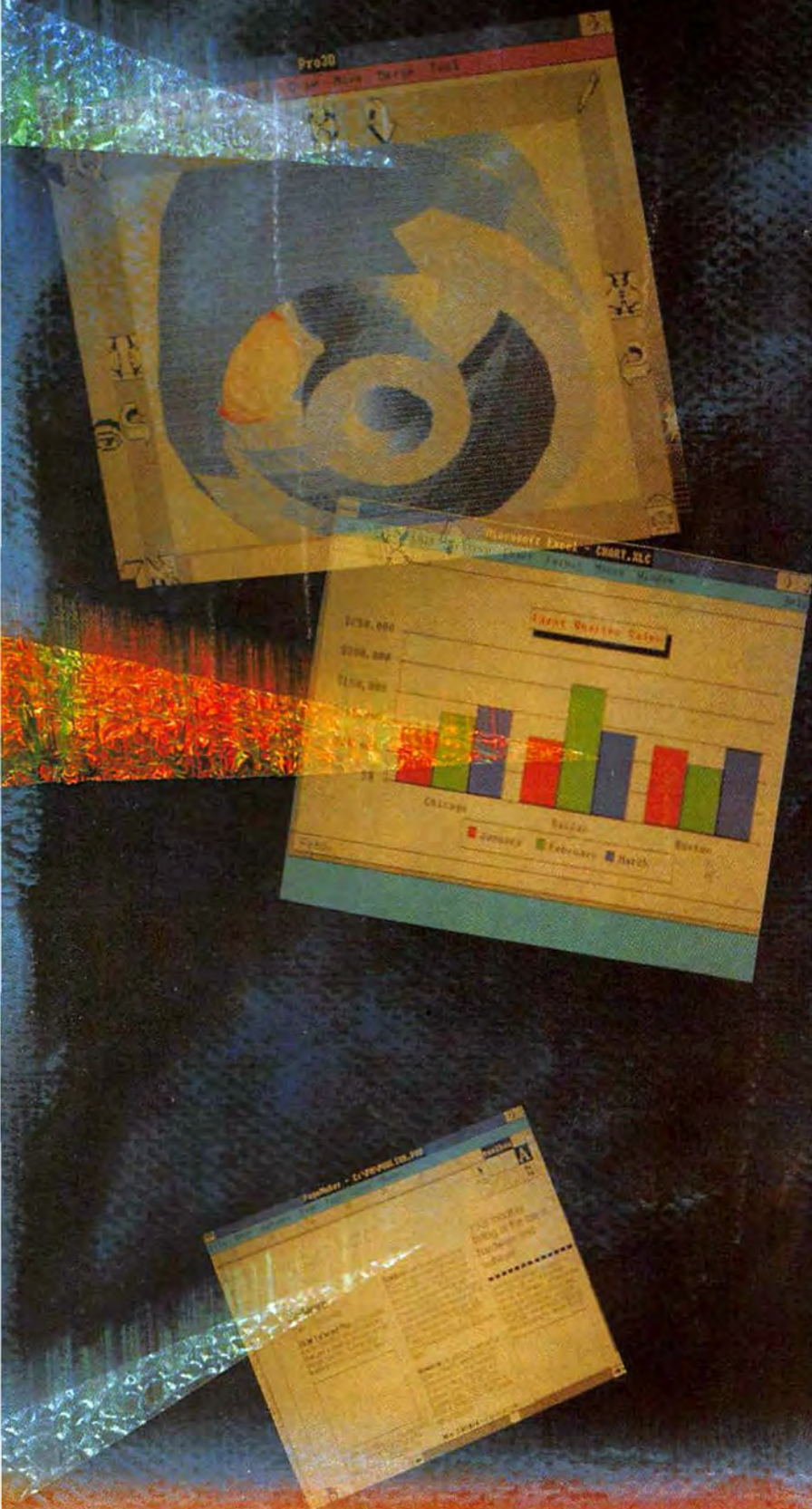
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Paradox, multi-user relational data base application, Ansa Software, A Borland Co.



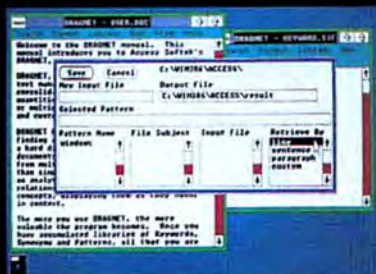
Windows Mail, electronic mail application, DaVinci Systems.



The Network Courier, electronic mail application, Consumers Software, Inc.



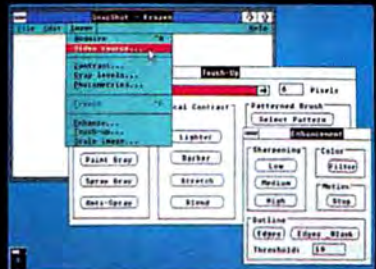
PC Paintbrush, color design and graphics application, ZSoft Corporation.



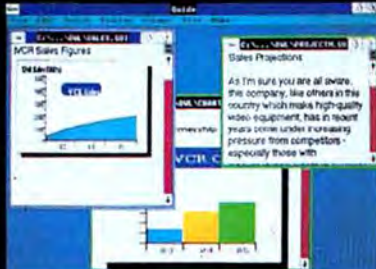
Dragnet, text retrieval application, Access Softek.



Windows Spell, spell checking application, Palantir Software.



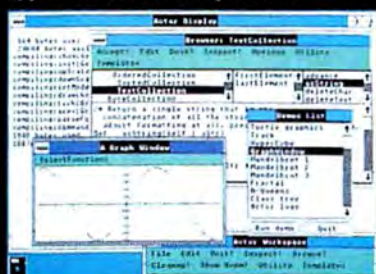
SnapShot, electronic photography application, Aldus Corporation.



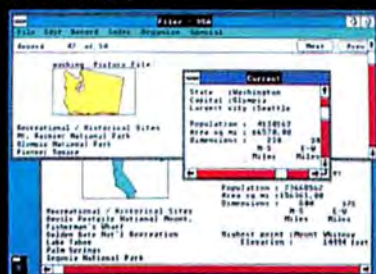
Guide, hypertext application, OWL International, Inc.



In'a Vision, intermediate CAD application, Micrografx, Inc.



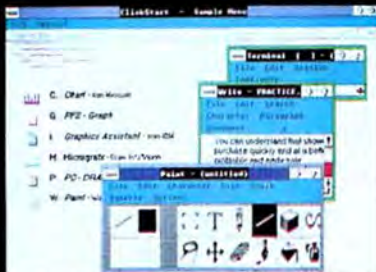
Actor, programming language (4th-generation), The Whitewater Group, Inc.



Windows Filer, filing and reporting application, Palantir Software.



Windows inTalk, desktop communications application, Palantir Software.



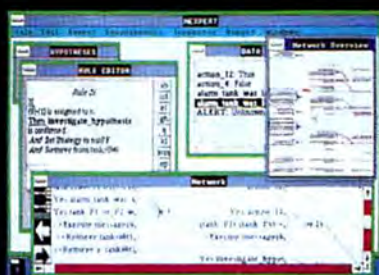
ClickStart!, applications organizer application, hDC Computer Corporation.



VIEW/PC, host data base access system application, DB/ACCESS, Inc.

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in for the Windows office.



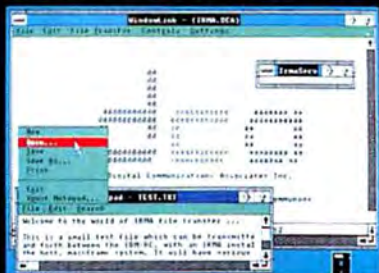
Nexpert Object, AI graphical expert, system application, Neuron Data.



Windows DRAW, presentation graphics application, Micrografx, Inc.



Wave Test, GPIB test program generator, Wavetek San Diego, Inc.



Windowlink for IRMA, 3270 terminal emulation, DCA, Inc.



Beacon, 4th-generation language, Micro Data Base Systems, Inc.



Designer, CAD application, Micrografx, Inc.



Omnis QUARTZ, multi-user database application, Blyth Software, Inc.



Microsoft Pageview, page preview/graphics integration for Microsoft Word.



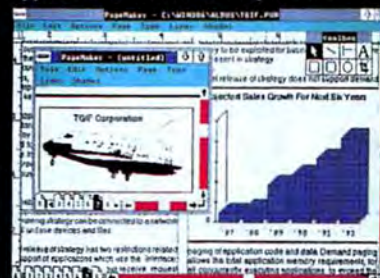
Windows GRAPH, business graphics/charting application, Micrografx, Inc.



WinTime, resource scheduling application, Palantir Software.



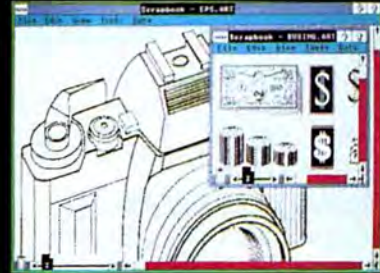
Microsoft Excel, spreadsheet application, Microsoft Corporation.



PageMaker, desktop publishing application, Aldus Corporation.



Opus I, The HyperGraphics Program, Roykore Software, Inc.



Scrapbook, art images application, T/Maker Company.



FormBase, relational data base application, Columbia Software, Inc.

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DESQview™ is the operating environment that gives DOS the capabilities of OS/2. And it lets you, with your trusty 8088, 8086, 80286, or 80386 PC, leap to the productivity of the next generation. For not much money. And without throwing out your favorite software.

Add DESQview to your PC and it quickly finds your programs and lists them on menus. So you can just point to the program, using keyboard or mouse, to start it up. DESQview knows where that program lives. And what command loads it.

For those who have trouble remembering DOS commands, it adds menus to DOS. It even lets you sort your files and mark specific files to be copied, backed-up, or deleted—all without having to leave the program you're in.

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full screen. Open more programs than you have memory for. And multitask them. In 640K. Or if you own a special EMS 4.0 or EEMS memory board, or a 386 PC, DESQview lets you break through the DOS 640K barrier for multitasking. If you have other pre-EMS memory expansion products like AST's Advantage or the IBM® Memory Expansion Option, we

have a solution for you, too. The ALLCARD™ 'unifies' all your memory to provide up to 16 megabytes of continuous workspace. DESQview lets you use this memory to enhance your productivity. You can start 1-2-3 calculating and tell Paradox to print mailing labels

while you're writing a report in Word Perfect, or laying out a newsletter in Ventura Publisher, or designing an office building with AutoCAD.

DESQview even lets you transfer text, numbers, and fields of information between programs.

Fulfill the 386 promise.

For 80836 PC users, DESQview becomes a 386 control program when used in conjunction with Quarterdeck's Expanded Memory Manager (QEMM)-386—giving faster multitasking as well as virtual windowing support.

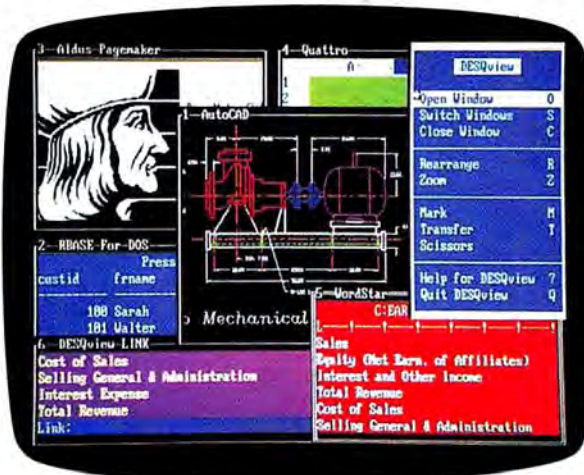
And when you use DESQview on an IBM PS/2 Model 50 or 60 with QEMM-50/60 and the IBM Memory Expansion Option, DESQview gives you multitasking beyond 640K.

Experts are voting for DESQview. And over a million users, too.

If all of this sounds like promises you've been hearing for future systems, then you can understand why over a million users have chosen DESQview. And why PC Magazine gave DESQview its Editor's Choice Award for "The Best Alternative to OS/2," why readers of InfoWorld twice voted DESQview "Product of the Year"

why, by popular vote at Comdex Fall two years in a row, DESQview was voted "Best PC Environment" in PC Tech Journal's Systems Builder Contest.

DESQview lets you have it all now.



For programmers, DESQview's API, with its strengths in inter-task communications and multitasking, brings a quick and easy way to adapt to the future. With the API's mailboxes and shared programs, programmers are able to design programs running on DOS with capabilities like those of OS/2.

DESQVIEW SYSTEM REQUIREMENTS:
IBM Personal Computer and 100% compatibles (with 8086, 8088, 80286, or 80386 processors) with monochrome or color display; IBM Personal System/2• Memory: 640K recommended; for DESQview itself 0-145K• Expanded Memory (Optional): expanded memory boards compatible with the Intel AboveBoard; enhanced expanded memory boards compatible with the AST RAMpage; EMS 4.0 expanded memory boards• Disk: two diskette drives or one diskette drive and a hard disk• Graphics Card (Optional): Hercules, IBM Color/Graphics (CGA), IBM Enhanced Graphics (EGA), IBM Personal System/2 Advanced Graphics (VGA)• Mouse (Optional): Mouse Systems, Microsoft and compatibles• Modem for Auto-Dialer (Optional): Hayes or compatible• Operating System: PC-DOS 2.0-3.3; MS-DOS 2.0-3.2• Software: Most PC-DOS and MS-DOS application programs; programs specific to Microsoft Windows 1.03-2.03, GEM 1.1-3.0, IBM TopView 1.1• Media: DESQview 2.0 is available on either 5-1/4" or 3-1/2" floppy diskette.

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WINDOWS



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A WINDOW ON WINDOWS



by Harry Miller

If *Windows* did nothing more than create a smooth graphic screen interface for MS-DOS computers, it would be a notable technical achievement. But *Windows* does more—a lot more—and some of its biggest benefits may come from its hidden talents. Microsoft's goal for *Windows* was for it to become the standard graphics environment for PCs and compatibles. While that objective may ultimately be met, the current situation is somewhat obscured by the many varieties of *Windows*—*Windows 2.0*, *Windows/386*, the OS/2 Presentation Manager, and Hewlett-Packard's *New Wave*. This examination of what *Windows* is about will

Photography by Lisa Powers

attempt to sort out some of the pieces of the puzzle.

Windows and the Presentation Manager are the platforms upon which a new generation of applications—with substantially enhanced functionality and ease of use—will be based. *Windows* is the bridge between so-called “old” (character-based rather than graphics-based) applications and this new generation, enabling users to convert slowly and gracefully while making the most of their existing investments in equipment and data.

Windows is an operating environment that provides for the control and management of all computing resources, specifically the screen, memory, disk storage, and interaction with peripheral devices. Thus, in simple terms, the application program interacts with *Windows* rather than with the underlying operating system or directly with the hardware. Because it controls memory management, *Windows* enables multitasking—running more than one application at a given time. And it enables those applications to transfer data to each other, sometimes even without user intervention. Similarly, controlling input and output device interaction enables applications to be independent of specific printers, graphics monitors, and the like.

The basic set of features and functions is available in any version of *Windows*. *Windows/386* adds important functionality by taking advantage of the 80386 processor's unique memory management facilities. The OS/2 Presentation Manager changes the structure as discussed later in this article, but it provides all the same functions as *Windows 2.0*.

For the vast majority of IBM-compatible users, however, *Windows* more than anything else is a promise of these future benefits. Performance of *Windows*-based programs requires more and faster hardware—processors, memory, graphics displays, and controllers. At the current state of hardware development, character-based programs simply seem to run faster.

And the promised benefits have been elusive. It's not as easy as it sounds to get two *Windows* applications to share data automatically; some of the *Windows* device drivers have required tweaking to take advantage of a new printer or graphics board. In addition, running old applications and *Windows* applications simultaneously quickly fills to capacity even those workstations having 2MB or more of RAM. Until a full complement of powerful and useful *Windows* applications is available, the promise will remain elusive; *Windows*' benefits will continue to be just around the next development corner.

Examining the features—screen or window management, memory management, data exchange, and device independence—in turn, you get a sense of the depth of *Windows* and its promise as a platform for the future.

WINDOWS FOR SCREEN CONSISTENCY

Windows is named well. The window is where all the action—and user interaction—is. Each window provides the facility to display text and graphics, to select command options from a menu, to change the window's size, to “put the program away” (displaying only a representative icon), and to display messages or prompt for specific user input. Virtually all elements of an application can be controlled by *Windows*' pull-down menus, scroll bars, dialog boxes, or the client (work) area.

Although *Windows* itself doesn't enforce rules of style, there is wide agreement among developers and users that conformity to those rules is desirable. A consistent user interface across applications means greater ease in learning subsequent applications and, as a result, reduced training time and costs. The Microsoft Application Style Guide provides specifications for icons, captions, scrolling, overlapping windows, pop-up windows, menus, dialog boxes, message boxes, and data selection methods, as well as keyboard and mouse interfaces.

Besides the consistency among

Windows applications, the graphic user interface also promotes compatibility with other computing environments, notably the Apple Macintosh. Aldus' *PageMaker* was the pioneer in this trend of having PC and Mac versions operate almost identically. Microsoft followed with *Excel*, and other *interoperable* versions are imminent.

JUGGLING TASKS

Because *Windows* is a multitasking environment, you can move among a spreadsheet, a word processor, and a data management program and return to each just as you left it, thus obviating the need to close one program, open the next, load the appropriate data file, and so on. While several applications can be running simultaneously, only one can actually be processing. Since the PC's processor is designed to be sequential rather than concurrent, *Windows* manages how the processor's time is divided among the applications currently running.

The vehicle for apportioning the processor is the message system. Messages signify computing events: for example, the user selects a menu option or moves the mouse, or the processor completes a calculation. The message may be generated by the user, the processor, an application program, or by *Windows* itself. In any case, when such an event occurs, *Windows* sends a message to the relevant application and dedicates the processor to that application so it can take the indicated action. Messages are an application's only means of communication with its environment: it can generate or respond to events solely via messages.

Access to expanded memory also enables multitasking. *Windows 2.0* takes advantage of the Lotus/Intel/Microsoft (LIM) 4.0 specification, while *Windows/386* emulates the LIM specification and enables old applications to access expanded memory as if they were running independently of *Windows*. Expanded memory is a moot point with the Presentation Manager, as OS/2 provides direct access to up to 16MB of RAM.

LIVE LINKS AND OTHER TRANSFER TRICKS

Running multiple tasks simultaneously provides a simple benefit by enabling users to switch among applications as quickly as they wish, but its real power is unleashed when those applications can share and transfer data. Applications can thus cooperate to a much greater extent than used to be possible. *Windows* provides several methods for passing information among tasks or applications. The simplest is the user-driven cut-and-paste technique that utilizes the Clipboard as a holding area for data; the most complex uses *Windows*' Dynamic Data Exchange (DDE) protocol for application-driven data transfer.

To transfer data via the Clipboard, a user must mark the data block in question, select the menu command to cut or copy the data to the Clipboard, then switch to the target application and data file, move the cursor to where the data should be delivered, and finally select the paste option from the menu. Only one transfer operation can occur at any one time, but the user may determine the donor and recipient programs in an ad hoc manner, and data may flow in both directions so

some programs will be both senders and receivers. The applications involved don't have to be running at the time of the transfer, nor do they have to be aware of each other.

In contrast, DDE transfers are seemingly automatic in nature. Once the link between two currently running applications is specified, data can flow on an ongoing or event-driven basis from one to the other. That is, data may flow continuously or only when a certain event occurs. DDE transfers require the applications to be aware of each other; either the application or the user must have previously established the link. See "Freedom of Information" and "Midnight Links" later in this section for more about the workings and application of Dynamic Data Exchange.

WINDOWS DECLARES DEVICE INDEPENDENCE

Windows is structured to manage interaction with peripheral hardware, such as printers and video monitors. The application doesn't have to be modified for use with different keyboards, screens, or printers. Instead of letting each application create drivers (the programs that support specific

hardware devices), each device needs only a single *Windows* driver. The application sends its output data to *Windows*, and the *Windows* device driver does the rest. Assuming that the device drivers have been written properly, *Windows* will use the highest quality and fastest method of display or printing available. The result of this system is that application developers and hardware vendors need not worry about supporting a myriad of individual devices or programs.

MULTIPLE VERSIONS

WINDOWS 2.0. The standard, lowest-common-denominator version of *Windows* provides the basic platform described earlier. Its screen management, device independence, memory management, and multitasking are fully implemented. Its most distinctive attribute is that it can be run on almost any workstation. An 8088-based PC will need extra RAM and a faster graphics processor to attain acceptable performance, but it can run. Other versions have been developed to take advantage of more powerful hardware platforms.

WINDOWS/386. The special 386



PROCESSOR ENVIRONMENTS

PROTECTED MODE APPLICATIONS EXECUTION

MULTITASKING

LARGE MEMORY SUPPORT

NEW USER "SHELL" AND KEYBOARD INTERFACE

RUNS EXISTING WINDOWS APPLICATION

Comparison of Windows Versions

Microsoft Windows 2.0	Microsoft Windows/386	MS-DOS/2 Presentation Manager
8088	—	—
8086	—	—
286	—	286
386	386	386
—	—	Yes
Non Preemptive	Non Preemptive	Fully Preemptive
EMS/EEMS	EMS/EEMS	16Mb
—	—	Yes
Yes	Yes	No

Source: Microsoft Systems Journal

version of *Windows* encompasses all the features of *Windows 2.0* but also takes unique advantage of the 80386's virtual 86 mode. Essentially, *Windows/386* creates multiple *virtual machines*, each controlling 640K, residing in its own screen window, and able to run old-style DOS applications. *Windows/386* uses one virtual PC to run all *Windows* programs and one for each old-style program. While you can use a batch file to run a memory-resident program with an application, the most generally useful method is to run each RAM-resident program in its own window.

PRESENTATION MANAGER. When IBM and Microsoft announced OS/2, their new operating system for computers based on 80286 or 80386 processors, they included the Presentation Manager as an integral part of that product. Essentially, the *Windows* interface will be the user's control mechanism for a much more complex operating environment. The Presentation Manager is designed to be consistent with IBM's System Application Architecture (SAA), so users will eventually be able to control PC-based, minicomputer, and mainframe applications in a straightforward, consistent manner.

Presentation Manager with OS/2 provides the same benefits as *Windows* under MS-DOS: consistent user interface, multitasking, intertask communication, and device independence. However, OS/2 adds some substantial benefits of its own in the form of *preemptive* multitasking and larger memory address space. Briefly, *preemptive* multitasking means that the operating system retains ultimate control of the processor and uses that privilege to adjudicate among applications.

Essentially, the system works as follows: Responding to a hardware-generated signal at regular intervals, the operating system takes control of the processor, saves the context (the code and all currently active data structures) of the task that was processing, and polls the other applications that are ready to run, evaluating the priority and needs of each as it goes. Larger memory space takes advantage of the larger address capabilities of the 80286 and 80386 processors to break

CATCHING THE NEW WAVE

Hewlett-Packard has used *Windows 2.0* as a base for its ambitious *New Wave* environment. *New Wave's* enhancements include greater dependence on icons for user interaction, user-definable "hot links" among applications, and a facility called the *Agent* that can automate and perform tasks across applications on behalf of the user. The *Agent* can be likened to a sophisticated macro language, complete with a "task language" and a learn mode to create scripts. Further, the *Agent* can be programmed to perform its tasks at a predetermined time.

Potentially the most significant addition is *New Wave's* treatment of data and its associated application as an object. *New Wave's* Object Management Facility (OMF) enables such objects to be shared by several *New Wave* tasks simultaneously. Users can easily combine objects to create compound objects: A report might contain data from word processing, data management, a spreadsheet, and graphics tasks. Simply by moving icons into a common area, the report itself becomes a task represented by a single icon.

While *New Wave* can run old-style applications, the aforementioned benefits, as you may have guessed, are available only to applications that have been written for *New Wave*; *Windows* applications will have to be rewritten to take full advantage of the new environment. Therein lies its Achilles heel: Application developers, already stretched to create *Windows* and Presentation Manager versions of their programs, will be understandably reluctant to create yet another version for *New Wave*.

On the other hand, because some Hewlett-Packard technology from its own version of *Windows 1.04* found its way into Microsoft's *Windows 2.0*, it's altogether possible that in *New Wave* we may be seeing part of what will become *Windows 3.0*. *New Wave* technology will likely evolve to support and enhance the Presentation Manager as well. —H.M.

the previous 640K barrier for program code and data.

From the *Windows* developer's perspective, there's a price to pay for freedom from memory limitations: The graphics interface in the Presentation Manager is different from the graphics device interface (GDI) in *Windows 2.0* or *Windows/386*; some of the graphics routines have been changed and enhanced to provide consistency with IBM's SAA.

A RICH ENVIRONMENT

What results from the synergy of all of *Windows'* features and facilities is a rich environment that supports a very wide range of computing systems and maintains flexibility to encompass innovations as they develop. Users benefit from reduced training time and costs due to a consistent user interface across applications, from the conven-

ience of multitasking and context switching, from the increased automation possible through applications that can exchange data without user intervention, and from optimized performance due to *Windows'* implementation of hardware independence. Similarly, *Windows* developers take advantage of the freedom from creating myriad device drivers, the synergy with other complementary applications, and simplified decisions about interface design.

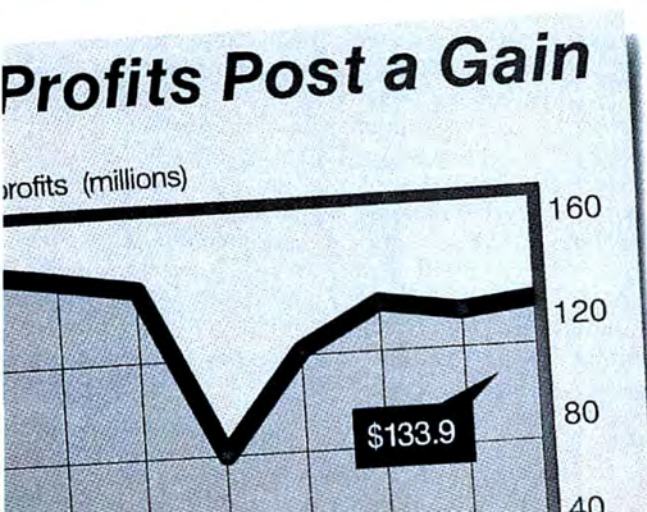
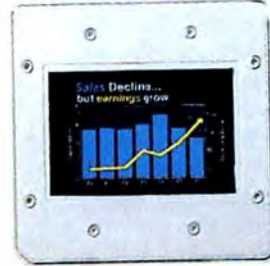
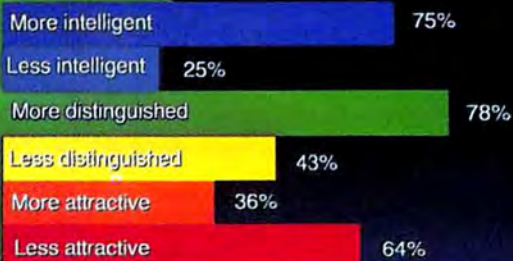
For users and vendors alike, *Windows* provides a sturdy bridge between the installed base of computing systems and the more powerful systems of the future. It is an ideal environment for the development of the next generation of useful, innovative applications.

Harry Miller is the Corporate Editor at PCW Communications.

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FREEDOM of Information

Windows' Dynamic Data Exchange protocol
brings the holy grail of computing closer;
finally, applications can
pass information
back and forth
without user intervention.



Ever since the first dual-floppy disk PCs, users have crusaded for the ability to share information between programs. Along the way, data exchange strategies evolved from a cut-and-paste approach, to disk swapping, then to

by T J Byers

True success and acceptance will depend on whether developers other than Microsoft build DDE capability into future products and upgrades.



relying on the limited finesse of integrated software packages. The advent of *Windows*, however, may at long last herald true freedom of information among applications—thanks to its Dynamic Data Exchange facility.

Dynamic Data Exchange (DDE) holds the promise of passing information between applications without user intervention and with little worry that the programs may be incompatible. Unlike the familiar—but less sophisticated—Macintosh-style Clipboard, the DDE link can go about its data exchange business in the background. Since it is dynamic, DDE allows real-time analysis by passing information whenever changes in the data of one program trigger the need for an update to a second application.

For example, a communications link to a stock quotation service might provide continuous, automatic updating to a charting program, without user intervention. If and when a stock price changes, the chart changes, too.

On paper, DDE sounds great. Indeed, the few applications that currently implement DDE protocol can provide powerful synergies for users. But as with any major computing innovation, true success and acceptance will depend on whether developers (other than Microsoft) build DDE capability into future products and upgrades. Although DDE purports to standardize inter-program communication, it is unclear how well programs equipped with basic DDE functions will work with each other and whether those programs must incorporate specific support for other individual programs.

BEYOND CUT AND PASTE

DDDE and the Clipboard rely on very different strategies for passing messages, but they share a common approach. In both cases, *Windows* uses a shared memory area—an intermediate portion of memory that disparate applications can use for transferring data.

The Clipboard first took advantage of the *Windows* ability to exchange and transfer data by basic cut-and-paste operations. While the Clipboard's facilities are flexible, they are limited to one item at a time and require manual intervention for each transfer.

DDE provides a dynamic, ongoing link between the transferred material and its source via the shared memory area. The protocol accommodates a wide variety of data exchanges, ranging in scope from simple one-time data transfers to automatic continuous transfer of real-time data. In effect, DDE provides the hooks necessary for multitasking applications to link with one or more data sources and to automatically request that data.

MESSAGE UNITS

Data exchange under DDE provides a much richer features environment than the Clipboard. Under *Windows*, applications routinely receive messages corresponding to user- and system-initiated actions, such as the entry of a keystroke, mouse movement, or a request to paint the screen. You may send messages within the *Windows* environment without explicit knowledge of the nature of any application or its final determination. Similarly, applications may define private messages on their own with unique meanings pertinent to only those applications that have been "taught" through DDE to understand it.

A DDE message can communicate information about the data itself and cause specific actions to take place. To accomplish this task, DDE messages include information on data format, data status, and priorities.

SERVING THE CLIENT

Under DDE, applications are referred to as *clients* and *servers*. As the names imply, a client application receives data and a server supplies data. The DDE protocol also permits a single server application to supply data to many clients, and a single client may be serviced by many servers.

Among the capabilities of DDE messages is the ability to manage macros supported by spreadsheets, data bases, and graphics programs. You can use macros in DDE to link more than one server. One on-screen bar chart might display stock-market data, while another displays the value of the dollar against foreign currency. Macros contained within the bar-chart application could initiate either or both DDE links.

Unlike with the Clipboard, you must individually prepare each application using DDE. Whereas the Clipboard provides carte blanche data exchange between every active application, DDE-supported applications require a certain amount of customized programming before DDE can perform its magic. Of course, even if they contain the required protocols, not all *Windows* programs that support DDE will be able to work together; an application that works strictly with simple ASCII characters will have no use for bit-mapped graphics, and vice versa.

TAKING STOCK

The real-time application of stock-market quotes is a particularly fertile ground for fast message passing. During trading hours, the price of a stock can vary considerably from minute to minute as volume fluctuates. The tasks of isolating the desired stock from thousands of others that spew forth from the ticker tape and analyzing its direction of change provide the perfect opportunity for DDE to demonstrate its capabilities.

The front end of the stock-market project's configuration might be Signal, manufactured by Lotus Information

Network Corporation. The Lotus Signal system uses an FM side-band receiver to obtain financial data from the New York Stock Exchange for up to 600 selected stocks. Normally, the Signal receiver supplies data to special Lotus software via the PC serial port.

But a modified *Windows* Terminal utility can also be configured to detect price changes and respond to DDE messages. As data crosses the FM channel, the Signal receiver (the server) filters and presents it to *Windows* Terminal for perusal. Each time a stock of interest shows a change in price, Terminal posts the new price in the shared memory area and issues a DDE message.

When Signal issues an update message to *Windows* Terminal, a bar-chart program (the client), also active within the *Windows* environment, accesses the shared memory and draws a graph to reflect the new data.

Using DDE's macro capability, you could also write a Terminal macro that filters through the changes as they occur and activates a sound alarm the moment a particular stock's value exceeds a preset threshold value, either high or low.

SESSIONS

A sequence of DDE exchanges between a client and a server is called a *session*. A session typically begins with a DDE INITIATE message, in which the client queries the server to see whether desired data is available. INITIATE messages may target a specific application or broadcast for to hear and respond to.

In the case of the stock-market scenario, the bar-chart application specifically seeks out the Signal receiver by issuing an @EXTERN message. The @EXTERN message is not part of the DDE protocol but is instead a code that has been decided upon between the Signal receiver and the bar-chart application for sign-on purposes. Only the Signal application (or another application programmed

to respond to the same code) recognizes and responds to the @EXTERN query. The bar chart issues this message before the INITIATE message to establish Signal as the preferred server. Had the application not specified a server prior to issuing the INITIATE message, it could enumerate all active applications in the system to inquire whether they could provide the requested data. Each positive response would be a potential data exchange link.

The syntax of the INITIATE message is *INITIATE topic, format*, where *INITIATE* is the DDE command, *topic* is an argument for the type of information the client is seeking, and *format* is a second argument to describe in what form that data is to be delivered. A typical INITIATE message for the stock-exchange example might read:

'INITIATE NYSE.COMMON.IBM.LAST CF_TEXT'

This message asks the question, Are you able to supply price quotes for IBM common stock on the New York

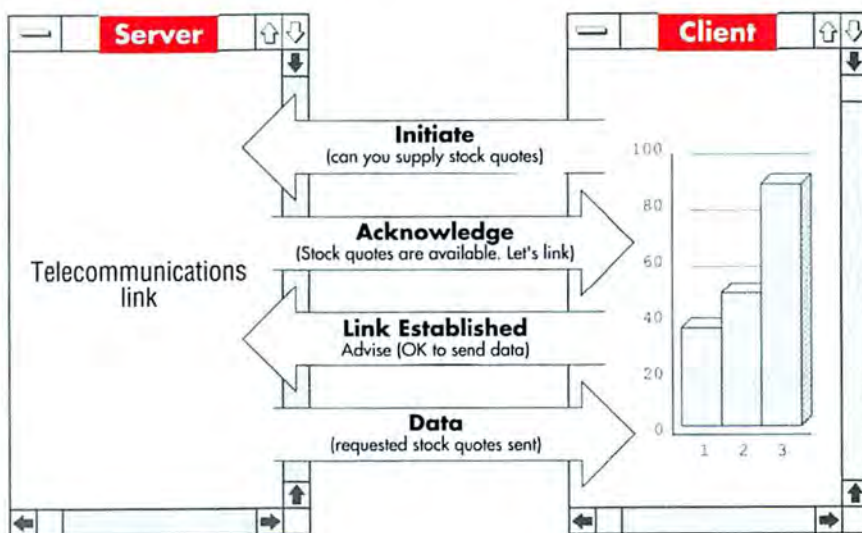
Stock Exchange in ASCII format?

DDE protocol specifies only the INITIATE command and ASCII format. The topic statement can be any designation two applications happen to agree upon. In this example, NYSE.COMMON.IBM.LAST identifies IBM common stock on the New York Stock Exchange; they could have as easily settled on IBM.COMMON or just plain IBM.

Here's where a small bit of user programming comes into play. Unless another application happens to be programmed to recognize this topic using the same name, it can't participate in the data exchange. Only applications that have agreed on the exact spelling of the topic can exchange data on the subject.

The same is true of the format statement. In our example, I chose the DDE-supported ASCII format, but I didn't have to. I could have specified any format I wanted—DDE-supported or not—if the format is recognized by the participating applications.

If the server can access the requested



THE SERVER AND CLIENT applications exchange messages. Once the link is established, the server sends the requested data to the client.

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TECHNICAL PAPER

kind of delay potentially unaffordable. A single such delay could not only slip out the savings of those tires on that road, it could lose a valued, profitable customer, thereby substantially reducing revenue.

Exact standardization is another difficulty today with wide-base singles. These tires cannot be used on steer axles due to their lateral wet traction problems and propensity for "steering" under cornering conditions. Even if they were, they would have to be for the steering positions. The problem with that is retrofits are not generally used on steer axles and the retrofitted tires wouldn't fit at any other position.

Equipping today's trucks with wide-base singles is also costly from a purchase tax standpoint. Since the Federal Excise Tax (FET) for a 212-pound 16.5R22.5 is \$7.150, the total purchase price of the wide-base single, though only 5% more than a standard radial, is now much closer to the cost of two low profile tires. To the cost of two low profile tires whose total FET is \$48.00. The small price advantage, as well as some of the cost savings of the wide-base single, can be more than offset currently by the added cost of the special axles and wheels they require.

Wide-base singles may be the tire configuration of the future. New materials and constructions could increase their value while new tread designs and compounds may reduce their disadvantages. Should a reli-

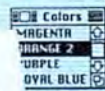
able, self-sealing liner be developed to eliminate equipment downtime and freight delays, the acceptance of this type tire would be appreciably accelerated.

To summarize, the following is what we consider realistic and achievable in five to ten years:

Low Aspect Ratio Tires: These must exhibit reduced rolling resistance, weight and size to increase vehicle payload and decrease fuel consumption. Fleet operators will want to choose between dual low profile tires for other than steering positions or low aspect ratio wide-base singles, which offer further advantages in weight and rolling resistance over dual low profile tires.

Hardware for Low Aspect Ratio Tires: In order to maximize these tires' performance, truck manufacturers must design equipment to fully accommodate the smaller diameter tires. As soon as practical, suspensions must be redesigned to be compatible with the springing characteristics of radial tires. Reduced tire size may also create a need for redesigned transmission and drive axle gearing.

Hardware for Wide-Base Tires: Axles will have to be lengthened to situate these tires correctly under 102" wide trailers. The added room afforded may provide for more design creativity in the brake and sus-



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Style Sheets

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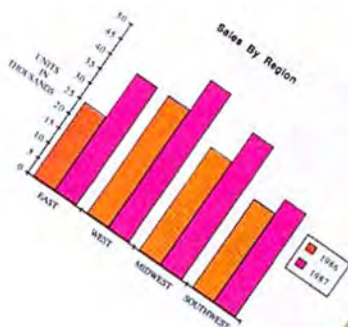
Autoflow

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Define styles

Style:

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LARGE HEAD
SMALL HEAD
SUBHEAD
TEXT

New...

Cancel

Edit...

Close

Remove

Copy...

face: Times + bold + size: 18

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In addition to supporting a wide range of PostScript® fonts, PageMaker for the PC now expands the capabilities of the HP LaserJet Series II and other PCL output devices.

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Beautifully Simple

Simply Beautiful

Consider this: How many Pixie menu selections does it take to create a complete bar chart – with annotation, axes, title, and legend? Just *one*.

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Zenographics introduces Pixie, a new charting and drawing program with the simplest, most obvious user interface yet devised for presentation graphics.

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Based on Microsoft® Windows, we think Pixie is the best example yet, in any software category, of the power of the graphical user interface.

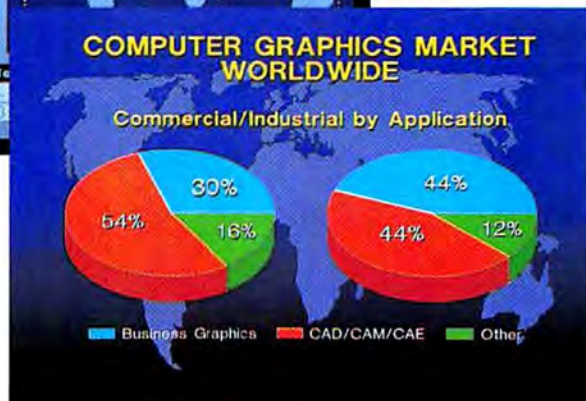
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Take a look at the slide on the left. Does it look like it could be created by a graphics amateur? In 10 minutes? With a \$195 graphics package? Thousands of Pixie users are making this very image: it's Lesson 3 (just six pages) in the Pixie manual!

Pixie is Zenographics' newest winner. It connects

beautifully with our flagship product **Mirage** – the PC-based tool of choice for graphics professionals. Through Mirage, Pixie gains access to the best and most complete output device drivers, and to the artistic expertise of thousands of Mirage power-users worldwide.



	Pixie	Harvard Graphics	Freelance Plus
Graphical user interface?	Yes (MS Windows)	No	No
User interface technique	Direct manipulation	Fill-in forms	Fill-in forms
Editing preserved if chart changes?	Yes	No	No
Screen Fonts	Windows, Bitstream, Mirage	Helv, 1 hardware font	Stick
Maximum colors per image	16 million (Windows limit)	16	12
Compatible with professional systems?	Yes (Mirage)	No	No
Price	\$195	\$495	\$495



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DDE provides the hooks necessary for multitasking applications to link with one or more data sources and automatically request that data.



information in the desired format, it responds with an ACKnowledge message. Receipt of the ACKnowledge message establishes an agreement between the two applications to share data and creates a link between the applications. Once a link is established, the INITIATE command is not used again unless the link is terminated.

Actual data exchange begins when the client issues an ADVISE message: **'WM__DDE__ADVISE NYSE.COMMON. IBM.LAST CF__TEXT'**.

ADVISE is a DDE command that opens a session between the two applications for data exchange. This channel remains open until terminated, with data flowing freely according to the operating rules defined by the server. Allowing the server to set the ground rules for data exchange is an important aspect of DDE protocol. For example, a server might restrict the number of clients it is willing to serve or the types of transfers it will honor.

The Signal application, for example, responds to the ADVISE message with an ACKnowledge message:

'WM__DDE__ACK ADVISE NYSE.COMMON. IBM.LAST'

and sends the first value for the IBM data item by establishing a shared memory item, filling it with the data, and sending the shared memory item to the client as part of a data update message:

'WM__DDE__DATA NYSE.COMMON. IBM.LAST'.

Each time Lotus Signal detects a requested item on the FM channel, it issues a DATA message informing the client that a new price quote is posted

in the shared memory area. The client then accesses the memory area and revises its bar graph. This process continues for as long as ADVISE is in effect.

You may open multiple sessions between the client and server by issuing an ADVISE message for each item of interest, with each message requesting the subject by name. This feature allows the server application to supply data for more than one subject (provided the data is available to the server). For example, you may want to open multiple sessions to obtain quotes for several stocks and display them in the bar-chart application along with the IBM quotes. The server accumulates these messages and places traps for the requested items as it receives them.

To close the IBM quote session you would use the UNADVISE message: **'WM__DDE__UNADVISE NYSE.COMMON. IBM.LAST CF__TEXT'**.

An UNADVISE message is required for each ADVISE session initiated. Finally, when the client no longer needs to communicate with its server, using the TERMINATE command severs a DDE link.

FOREIGN EXCHANGE

With the trend toward distributed computing in the workplace, it makes sense that DDE's capabilities are not limited just to applications running on the same PC. The principles of DDE also apply to transfers between machines and between other systems. The medium that links the two systems may be of any type, including a local area network (LAN), a micro-to-mainframe connection, a dedicated phone line, or a satellite link. No matter how the systems are linked or where they are physically located, they may communicate through DDE as long as they agree on the programming specifics of the DDE protocol (such as subject name, data format, and so on).

The magical ambassador that pulls off this exchange is called an *agent*—an

application that serves as an importer/exporter of data. An agent works somewhat like a modem that interfaces with the host PC on one side and a phone line or network on the other. It is, in effect, a gateway between the host PC and the outside world.

When an agent application receives a request for data about a given topic via DDE, the agent determines whether it can satisfy the request by broadcasting the message to its correspondents. At the receiving end of the broadcast is another ambassador called a *foreign agent*. This agent receives the DDE request and passes it through to its *Windows* environment, then waits for a response. A positive response to the request prompts the foreign agent to inform the local agent that it indeed has the requested data. This establishes a session between the local client and distant server, and the exchange of data proceeds over the link with neither client nor server being aware of the agent's involvement.

THE FUTURE OF DDE

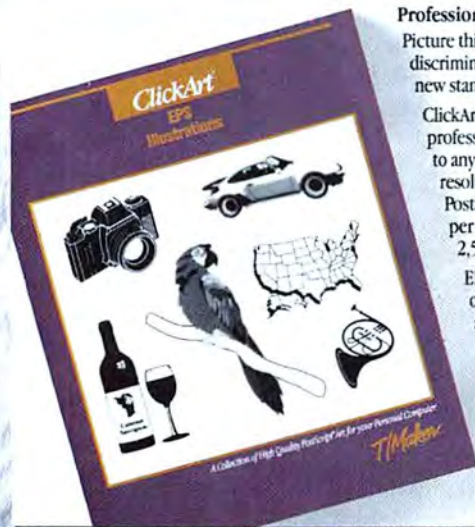
As a communications protocol, DDE is an important step toward the holy grail of automated communication between applications. Although DDE holds tremendous potential for users to exploit the *Windows* multitasking environment, the key remains in the hands of developers, who must write in the basic protocols for their *Windows* programs and publish the specific argument names for suitable data exchange tasks. Fortunately, because DDE represents a subset of the OS/2 data exchange protocol, the routines developers write for themselves today under *Windows 2.0* and *Windows/386* will easily port over to future OS/2 applications. In the meantime, we can look forward to DDE as the long-awaited enhancement that opens the borders between applications. ■

TJ Byers is a Contributing Editor for PC World.

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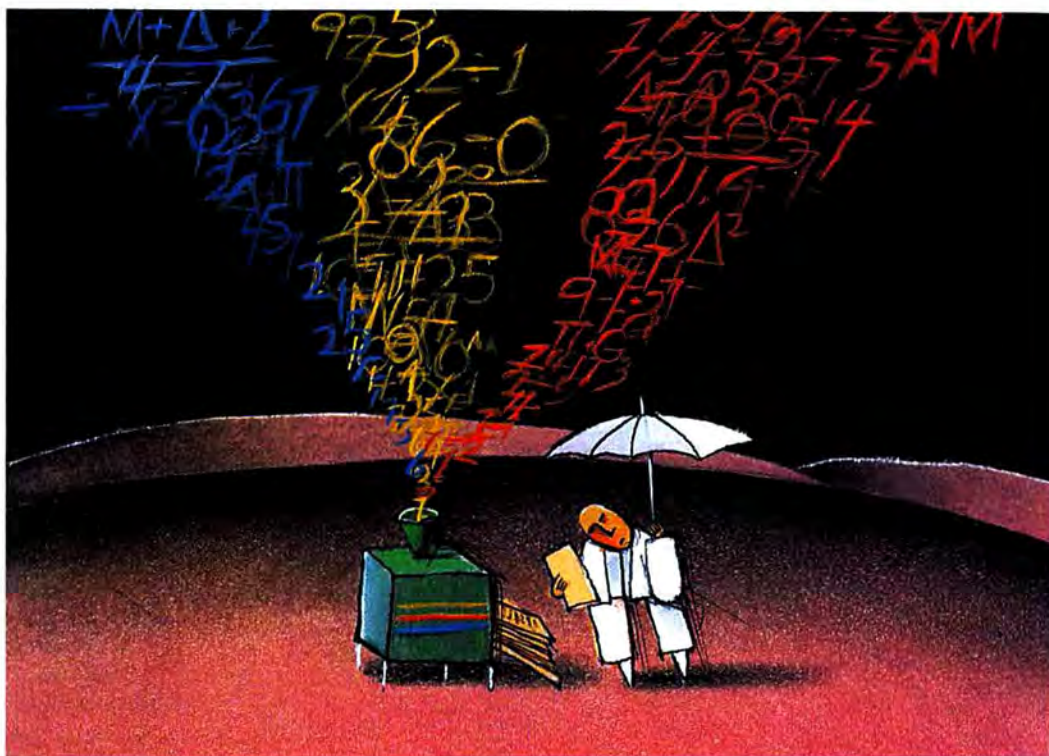
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MIDNIGHT Links

Under the watchful eye
of *Windows*, your computer can
grab timely data from a remote PC at midnight,
and analyze, chart, and print it—
all before you arrive at the office.



In theory, *Windows*' promise of technical acrobatics that allow applications to pass data and share processing time could open new doors to productivity. But will it really work in an everyday setting?

The key is setting up two-way links between programs so your computer can accomplish in the middle of the night what might have taken you a few hours to do during the day. With *Windows*' Dynamic Data Exchange (DDE) protocol as a backbone, we set up a combination of sample tasks that illustrate how to establish links between certain *Windows* applications. Naturally, your sets of tasks will be different than ours, but the strategies may be the same. We had *Microsoft Excel* and Future Soft Engineering's *DynaComm* work the graveyard shift together to pluck timely data from a remote computer, place it in a spreadsheet, and print a chart based on the new information.

by Ron Person


```

title "DynaComm - Excel DDE Server Demo"

; This defines our first table.
table define 1 fields char 20 char 40 char 15
if error display "table 1 not defined^M", goto the_end

; Read table from file DDE1DATA.DCM
table load 1 from "DDE1DATA.DCM" as text
if error display "unable to load data file^M", goto the_end

when request 1 'request1' perform reply1      ;respond to heading request
when request 2 'request2' perform reply2      ;respond to main data request

when terminate quit

;Put DynaComm in wait state, waiting for DDE commands.
wait signal

*the_end
cancel

*reply1
;Define temporary table.
table define 2 fields char 20 char 40 char 15
if error display "table 2 not defined^M", resume

record read 1 at 0
set @R2 @R1
record write 2 at 0

display "data reply 1:  "
table reply 2 to "request1"
if error display "unsuccessful^M"
else display "process complete^M"

table close 2
display 'reply 1 done^M'
return

*reply2
display "Reply 2^m"

table define 3 fields char 20 char 40 real 15
if error display "table 3 not defined^M", resume

set @R1.1 ""
record write 1 at 0
table copy 1 to 3 exclude ""

display "data reply 2:  "
table reply 3 to "request2"
if error display "unsuccessful^M"
else display "process complete^M"

table close 3
return

```

LISTING 1: The *DynaComm* script that orchestrates our midnight operations.

The steps we followed were based on a simulated computing environment—a remote PC sending updated data to a local spreadsheet—and are intended only as a guide for customizing your own system. A remote computer and real data are required to create working links.

To effect this bit of multiple application magic, we started by writing a *DynaComm* script to retrieve the data and store it as a table. Then we designed a spreadsheet to accept the data and create a chart based on it. Finally, we wrote a few macros that serve to retrieve the data from *DynaComm*, import it to *Excel* where the worksheet and the chart are updated.

A word of caution: The applications we used were handpicked for this task because they had fully implemented the DDE protocol. While many *Windows* programs promise DDE, you should greet such claims with skepticism. One *Windows* program that boasted DDE capability was unable to make reliable connections.

SCRIPTING THE SHOW

DynaComm is a feature-laden *Windows* program that facilitates communication links with mainframes or remote PCs. Although you can operate *DynaComm* manually with pulldown menus, we used its script capability to set up the DDE link. In DDE jargon, *DynaComm* is the *server* application that provides data to its *client*, in this case, *Excel*. Our script set up two temporary tables; *DynaComm* can handle up to ten active tables.

The *DynaComm* script *XLserver* shown in Listing 1 orchestrates the session by establishing the communications link, retrieving data, and loading it into a temporary table waiting to be claimed by *Excel*. The main script starts with the word *title*. The first portion, starting with *;Read table* defines a table to store data retrieved from the remote computer. We assumed that the remote data would be in the form of a text file arbitrarily named *DDE1DATA.DCM*.

The commands *when request 1* and *when request 2* (and the accompanying lines) prepare *DynaComm* for the first and second DDE requests from *Excel*. After loading the remote data into a temporary table, *DynaComm* waits for a signal from the client application, *Excel*.

Upon receiving a request signal, *DynaComm* runs either the **reply1* or **reply2* command, which copies the data from the temporary tables to *Excel*. As you'll see below, *Excel* then uses a variety of macros to organize the data it receives.

When *Excel* determines it has the data it needs, it transmits the terminate DDE signal. *DynaComm* then invokes the *when terminate quit* line, which closes the script and ends the communication session.

BUILDING THE COMMAND CENTER.

While *DynaComm* establishes the link, *Excel* serves as mission control for this task. *Excel*'s worksheet (Figure 1), macro sheet (Figures 2 and 3), and chart (Figure 4) combine to create a seamless flow of controlled information.

WORKSHEET First, we created the *Excel* worksheet shown in Figure 1 by typing the data shown in range B14 through D17. This data will serve as the base to which our remote data is added to generate the data for a chart.

Once the session begins, *Excel* requests two arrays of data and places them in areas defined in the worksheet as *heading* and *body*. Keep in mind that the structure of your particular worksheet will influence not only how to organize your server (*DynaComm*) script, but also how to construct the macro functions. In cell C4, we named the array by typing *heading* and pressing <Shift>-<Ctrl>-<Enter> to enter an array formula. Similarly, we entered the array formula for the body data by selecting the range B7 through D10 and typing *body* and pressing <Shift>-<Ctrl>-<Enter>. The heading and body cells contain array formulas that appear as {=heading} and {=body}. (While our setup organizes the data into these two discrete sections, you can easily customize the *Excel* macros to match the structure of your worksheet.) We then saved the worksheet as PROJ COST (the extension .XLS is added for worksheets).

THE CHART We built the chart shown in Figure 4 by selecting the range B14 through D17 in the worksheet and choosing the File Open command with the Chart option. The chart displays the default labels and scaling settings, but those can be further customized with a few additional

menu options. Finally, we saved the chart with the name PROJ COST (the file extension .XLC is added for charts).

MACRO SHEET We used *Excel*'s macro facility to direct our automated mid-night operation. For ease of understanding, the macro functions were split into two main macros with three subroutines. We entered the macros listed in Figures 2 and 3 in PROJ COST.XLM and saved it as the macro sheet associated with our worksheet.

Each cell in the macro sheet was named, using the Formula Define Name command. Set Timer and Update are command macros, so we selected the Command Macro option when we named them.

Set Timer simply enables the user to set the time for the unattended operation to begin. The macro begins in Figure 2, cell A2, with an INPUT function that displays a box asking for a date and time to start operations. If the user selects the Cancel button in the INPUT box, the value of cell A2 becomes False, ending the Set Timer macro. If the user enters a time in the input box of A2 and selects OK, then cell A2 stores the time. The ON.TIME function then reads the time stored and, at the appointed hour, runs the Update macro.

Although it wasn't built into our task, we could have constructed the ON.TIME function to execute *x* minutes after the last update, which would cause the entire operation to repeat at any interval we specified.

The Update macro (cell A6) contains the basic instruction for setting up the communications session. The EXEC() function loads *DynaComm* as an icon (specified by the 2 argument). Then the APP.ACTIVE(,FALSE) function activates *Excel*, since no other application is named as the first argument within the parentheses. After *Excel* is activated, the OPEN function loads the PROJ COST.XLS worksheet. The 0 specifies that external or remote references to other worksheets or applications will not be updated.

In case there is a preexisting name for the heading and body data in the worksheet, the Update macro deletes those names to make way for the new names. The Update macro then branches to the DDE Link subroutine (Figure 3), where the INITIATE com-



The structure of your worksheet will influence not only how you organize your server script, but also how you construct the macro functions.

mand opens a DDE channel to *DynaComm*. Cell C2 stores the ID number given to the link. When the INITIATE command opens the channel it also requests *DynaComm* XLserver, the *DynaComm* script that establishes the telecommunications link.

The REQUEST functions in Figure 3, cells C3 and C5, ask *DynaComm* for the data. When the data is received, the DEFINE.NAME command serves as the traffic cop, assigning each data array that is received to the named array—first heading, then body. Again, depending on your particular worksheet, the named arrays might be organized differently.

The array formulas {=heading} and {=body} in the worksheet show the new data as soon as it is assigned to the names heading and body. Once

the data is received, the **TERMINATE** function closes the DDE channel identified by the ID number in cell C2.

We then included a macro that automatically performs internal calculations in the worksheet. Macro oper-

ation returns to cell A13 where the Accumulate Data subroutine kicks in. This subroutine takes the new Month Cost amounts in Figure 1, cells D7 through D10, and adds them to the existing Cumulative Cost amounts.

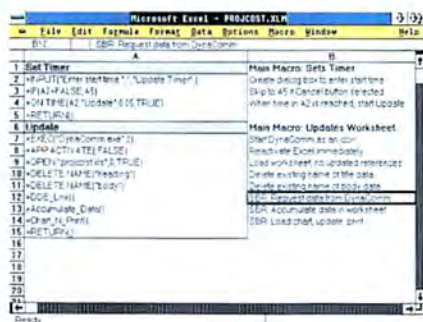


FIGURE 1: Data from the remote computer is imported into this sample Excel worksheet.



FIGURE 2: The Excel macro sheet directs the DDE session. The Set Timer macro sets the time for the operation to begin. The Update macro sets up the communications sessions.

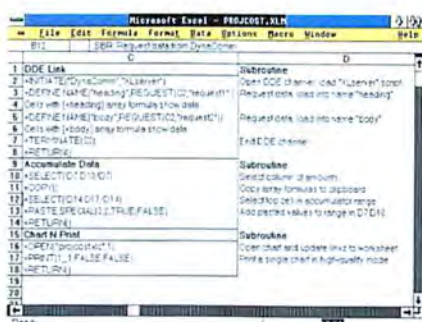


FIGURE 3: The Update macro branches to its subroutines: DDE Link opens the channel to DynaComm, Accumulate Data sends the data to the targeted cells in the worksheet, and Chart N Print sends the new chart to the printer.

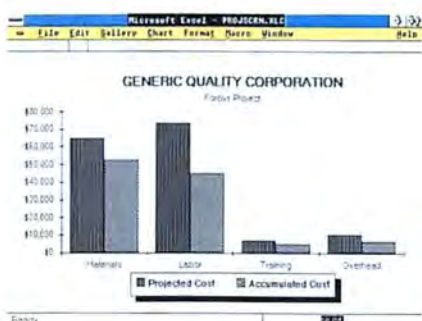


FIGURE 4: An Excel chart analyzing the new data.

Accumulate Data does this by selecting the range D7 through D10 with the Select function shown in cell C10. (The ! indicates that the selection will be on the active worksheet.) Once the Monthly Cost figures have been selected, the Copy function copies them so they can be pasted to the cells specified by the Select function, in this case D14 through D17. Then the Paste. Special function uses the first argument 3 to paste values and a second argument of 2 to add them to the existing values. The result is that the Cumulative Cost increases by the amount of the Monthly Cost. While we chose to simply add the new data to the old, you can construct a macro that manipulates the data any way you choose.

The final subroutine, Chart N Print, begins in Figure 3, cell C16. It opens the chart sheet, PROJ.COST.XLS, which is linked to the PROJ.COST.XLS worksheet. When the chart is opened, it is immediately updated with the new data. The final command in the Chart N Print macro prints a single copy of the chart to the currently selected target printer.

A more extensive macro and script can control communication to multiple mainframe sites or information services. For example, with additional subroutines you can set up an Update macro to produce consolidated operations reports from sites across the nation. We've done this and shown the steps you can adapt, but be aware of the amount of work in coordinating DDE applications.

Excel
Microsoft Corp.
16011 N.E. 36th
Redmond, WA 98073
206/882-8088

DynaComm
Future Soft Engineering
12777 Jones Rd.,
#300 Houston, TX 77070
713/469-5446

Ron Person is the owner of Ron Person & Co., Software Training Consultants, a San Francisco-based training company. His books, *Using Excel: IBM Version* and *Using Microsoft Windows* are published by Que Corporation.

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General and administrative	110,062	81,825	
Operating income before unusual item	1,710,995	1,424,368	
Unusual item-provision for consolidation of operations	207,270	91,493	
Interest and other income, net	(36,981)		
Income before taxes	9,771	17,722	
Provision for income taxes	180,060	109,215	
Net income	58,807	45,115	
Common and common equivalent shares used in the calculations of earnings per share	\$ 121,253	\$ 64,100	
Earnings per common share	61,880	60,872	
	\$ 1.96	\$ 1.05	

See accompanying notes

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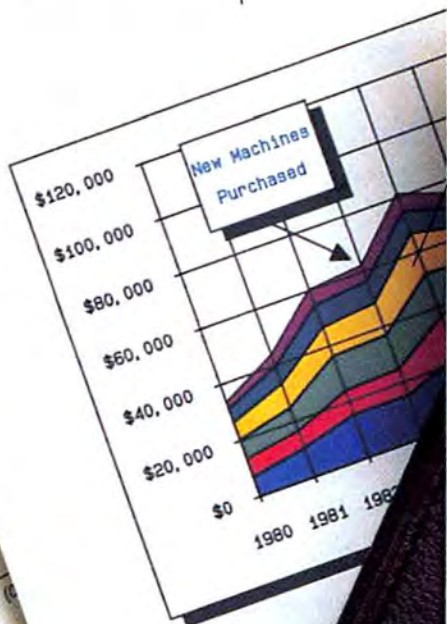
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Forecast Revenue	\$1,815	\$3,031	\$3,806	\$3,025	\$3,207	\$3,690	\$17,544
Actual Revenue	\$1,752	\$2,453	\$2,804	\$3,309	\$3,660	\$3,504	\$17,522
Variance	\$63	\$578	\$982	(\$304)	(\$473)	\$186	\$22
%	104%	124%	129%	91%	87%	93%	102%
Tasty Taffy							
Actual Units	13554	11311	11311	11328	2248	39783	105916
Forecasted Units	11774	16484	16484	18839	22371	24726	117743
Forecasted Revenue	\$2,627	\$2,195	\$2,195	\$2,180	(\$515)	\$7,643	\$20,396
Actual Revenue	\$2,242	\$3,139	(\$941)	\$3,568	(\$4,773)	\$4,708	\$22,417
Forecasted Revenue	\$385	117%	70%	61%	-12%	\$2,935	(\$2,022)
%						140%	91%



Candy Factory

Interest Rate Analysis:

Year: 1987 1988 1989 1990 1991

Yield Curve -(yr 0 to yr 't') : 0.00% 9.67% 9.73% 9.86% 9.91%

Forward Rates (yr t1 -> yr t2): 0.00% 9.67% 9.79% 10.12% 10.25%

Multiplicative Discount 1.0000 0.9118 0.8305 0.7542 0.6812

Cash Flow Analysis

Year: 1987 1988 1989 1990 1991

Costs: (000)	1987	1988	1989	1990	1991
Building Costs	0	0	0	0	0
Working Capital	(275)	(40)	(25)	0	0
Depreciation (SYD method)	159.09	143.09	127.27	112.27	100.00
Marginal Tax Rate	0.46	0.46	0.46	0.33	0.33
Depr. Tax Shield	73.18	55.84	42.00	37.00	33.00
Sales Revenue		275	330	390	450
Costs		185	196	212	225
Labor		85	90	95	100
Material		75	80	90	95
Administrative		15	15	15	15
Maintenance		10	11	12	13
Rev - Costs		90	134	178	225
Incremental Cash Flow	(1,250)	123.18	164.84	220.00	225.00
Discounted Cash Flow:	(1,250)	112.32	136.903	165.923	165.923

TOWARD A WINDOWS WORKSTATION

What motivates people to adopt *Windows* as a standard, everyday computing environment? The answer's simple: the right application or mix of applications. To fulfill the promise of running multiple application programs with a standard operating interface and sharing data fluently among those applications, a critical mass of useful and desirable applications must first be available.

We present this chart as a representative sampling of current *Windows* applications serving both horizontal and vertical markets. In some cases, the application itself is compelling enough to warrant using *Windows*; in others, the deciding factor will be the existence of multiple useful programs with which to create a workstation based on *Windows* applications.

PRODUCT	DESCRIPTION	COMPANY	CITY/STATE	PHONE	PRICE
COMPUTER-AIDED DESIGN					
Design/2.0	Drawing	Meta Software	Cambridge, MA	(617) 576-6920	\$ 350
Desktop Publishing Utility	Manipulates technical drawings	Generic Software	Redmond, WA	(206) 885-5307	\$ 49.95
Engineering Capture System	Captures electrical schematics	CAD/CAM Group	Los Gatos, CA	(408) 356-2939	\$ 695
In* A* Vision	Computer-aided design	Micrografx	Richardson, TX	(800) 272-3729	\$ 495
Instinct	Technical drawing	Cadlogic Systems	San Jose, CA	(408) 943-9696	\$ 199
IsoContours	3-D solid modeling	Verity Software House	Topsham, ME	(207) 729-6767	\$ 495
Pro3D	3-D graphic modeling	Enabling Technologies	Chicago, IL	(312) 427-0386	\$ 395
Windows Draw	Drawing	Micrografx	Richardson, TX	(800) 272-3729	\$ 299
COMMUNICATIONS					
ASCII-Pro	General purpose communications	United Software Industries	Canoga Pk, CA	(800) 332-7244	\$ 99.95
DaVinci EMail	Electronic mail	DaVinci Systems	Raleigh, NC	(919) 839-2000	\$ 99
DynaComm	General purpose communications	Future Soft Engineering	Houston, TX	(713) 469-5446	\$ 295
inTalk	General purpose communications	Palantir	Houston, TX	(800) 368-3797	\$ 195
The Network Courier	Electronic mail	Consumers Software	Bellingham, WA	(604) 688-4548	\$ 995
WindowLink for IRMA	Communication with mainframes	Digital Communications Associates	Alpharetta, GA	(404) 442-4000	\$ 195
DATA BASE MANAGEMENT					
FormBase	Forms-based relational data base	Columbia Software	Northridge, CA	(818) 363-2574	\$ 495
General Property Income Analyst	Real estate analysis	a la mode	Salt Lake City, UT	(801) 268-6911	\$ 295
Omnis Quartz	Relational database and applications development	Blyth Software	Foster City, CA	(415) 571-0222	\$ 795
Opus I	Graphic and text management	Roykore Software	San Francisco, CA	(415) 333-7833	\$ 395
Service Manager	Service management system for repair shops	ServiceLink Systems	Sunnyvale, CA	(408) 985-0644	\$ 795
SQLBase	Distributed relational data base	Gupta Technologies	Menlo Park, CA	(415) 321-9500	\$ 995
SQLWindows	Data base applications generator	Gupta Technologies	Menlo Park, CA	(415) 321-9500	\$ 595
View/PC	Host data base	DB/Access	Cupertino, CA	(800) 982-9911	\$ 495
Window Data Entry	Improved keyboard entry for data bases	Glenco Engineering	Arlington Hts, IL	(312) 392-2492	\$ 99
Windows Filer	Flat-file manager	Palantir	Houston, TX	(800) 368-3797	\$ 195
Windows/On the World	Geographic mapping information	Geovision	Norcross, GA	(404) 448-8224	\$ 495
DATA BASE MANAGEMENT—VERTICAL					
Masterpiece	Photo studio management	Burrell Business Systems	Crown Point, IN	(800) 348-8732	\$ 895
Salary Magic	Salary management	Magic Software	Bellevue, NE	(402) 291-0670	\$ 395
ENGINEERING					
Inertia	Computer-aided engineering	Modern Computer Aided Engineering	West Lafayette, IN	(317) 497-1550	\$ 495 to \$1995
labWindows	Scientific and engineering software development	National Instruments	Austin, TX	(512) 250-9119	\$ 495
STAR System	Structural testing analysis and reporting	Structural Measurement Systems	San Jose, CA	(408) 263-2200	\$6500
Wavetest	GPB instrument test generator	Wavetek San Diego	San Diego, CA	(619) 279-2200	\$3990

GAMES

Balance of Power	World political simulation	Mindscape	Northbrook, IL	(312) 480-7667	\$ 49.95
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GRAPHICS

Arts & Letters	Presentation graphics and word processing	Computer Support Corporation	Dallas, TX	(214) 661-8960	\$ 395
Click Art Library	Clip art	Software Publishing Corp.	Mountain View, CA	(415) 962-8910	\$ 39
Clip Art Designer	Symbol library	Micrografx	Richardson, TX	(800) 272-3729	\$ 49.95
	Graphic art and technical illustration	Micrografx	Richardson, TX	(800) 272-3729	\$ 695
Dr. Halo III	Paint program and raster editor	Media Cybernetics	Silver Spring, MD	(301) 495-3305	\$ 139.95
Graph Plus	Enhanced version of Windows Graph	Micrografx	Richardson, TX	(800) 272-3729	\$ 395
Graphics Label Genie	Creates labels, bar codes, and forms	KPG	Atlanta, GA	(404) 252-7366	\$2195
PC Paintbrush	Paint program	ZSOFT Corporation	Marietta, GA	(404) 980-1950	\$ 84
Picture Perfect	Presentation graphics	Computer Support Corporation	Dallas, TX	(214) 661-8960	\$ 295
WinChart	Presentation charts and graphics	Palantir	Houston, TX	(800) 368-3797	\$ 195
Windows Graph	Graphics and charting	Micrografx	Richardson, TX	(800) 272-3729	\$ 395
Windows Scrapbook +	Stores and views graphics	T/Maker Company	Mountain View, CA	(415) 962-0195	\$ 129.95

LEGAL

Document Modeler	Expert systems for law offices	Legalware	Toronto, CN	(800) 268-8181	\$ 599
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MEDICAL/DENTAL

WindowsDENT/2	Dental billing	Soft Systems	Riverside, CA	(714) 686-4234	\$4995
WindowsMED/2	Medical billing	Soft Systems	Riverside, CA	(714) 686-4234	\$4995

PRODUCTIVITY

NetTime	Network resource scheduler	Palantir	Houston, TX	(800) 368-3797	\$1200
Nexpert Object	Expert system authoring tool	Neuron Data	Palo Alto, CA	(415) 321-4488	\$5000
WinTime	Resource scheduler	Palantir	Houston, TX	(800) 368-3797	\$ 195

PROGRAMMING

Actor	Object-oriented programming language	The Whitewater Group	Evanston, IL	(312) 491-2370	\$ 495
FORTH Compiler	Interactive compiler	Laboratory Microsystems	Marina Del Rey, CA	(213) 306-7412	\$ 350

PUBLISHING

Archetype Designer	Page makeup	Archetype	Boston, MA	(617) 482-2739	\$3995
Fontware Installation Kit	Downloadable fonts	Bitstream	Cambridge, MA	(800) 522-3668	\$ 95
PageMaker 3.0	Page makeup	Aldus	Seattle, WA	(206) 622-5500	\$ 795
PC Fonts	Downloadable PostScript fonts	Adobe Systems	Mountain View, CA	(800) 292-3623	varies
PC Image Kit	Image processor	Datacopy Corporation	Mountain View, CA	(800) 821-2898	\$ 695
ReadySetGo	Page makeup	Manhattan Graphics	Valhalla, NY	(800) 451-1668	\$ 695
Scan-Do	Image scanner/editor	Hammerlab Corporation	New Haven, CT	(203) 624-0000	\$ 195
Snap Shot (Model 20)	Transfers bit-mapped images	Aldus	Seattle, WA	(206) 628-2375	\$2700
Ventura Publisher	Desktop publishing	Ventura Software	Salinas, CA	(800) 822-8221	\$ 895
WinScan	Imports and edits scanned images	Palantir	Houston, TX	(800) 368-3797	\$ 95

SPREADSHEETS

Microsoft Excel	Spreadsheet and graphics	Microsoft Corporation	Redmond, WA	(206) 882-8080	\$ 495
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UTILITIES

ClickStart	Application organizer/menuing system	hDC Computer Corporation	Redmond, WA	(206) 885-5550	\$ 79.95
Dragnet	Text retrieval	Access Softek	Berkeley, CA	(415) 654-0116	\$ 145
WinPrint	Increases printing speeds	Tangent Technologies	Norcross, GA	(404) 662-0366	\$ 79

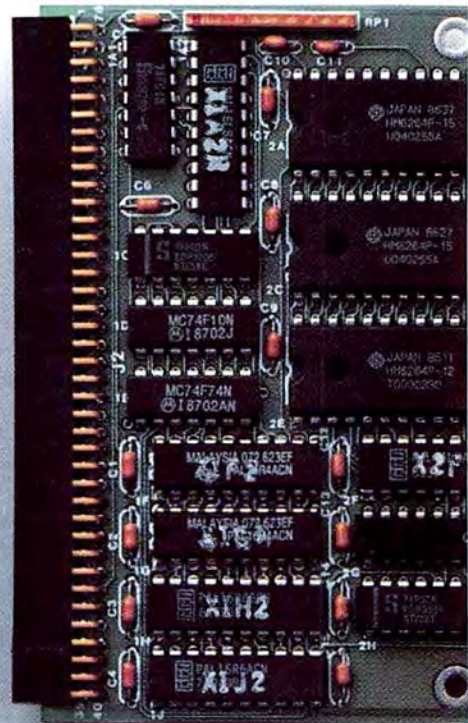
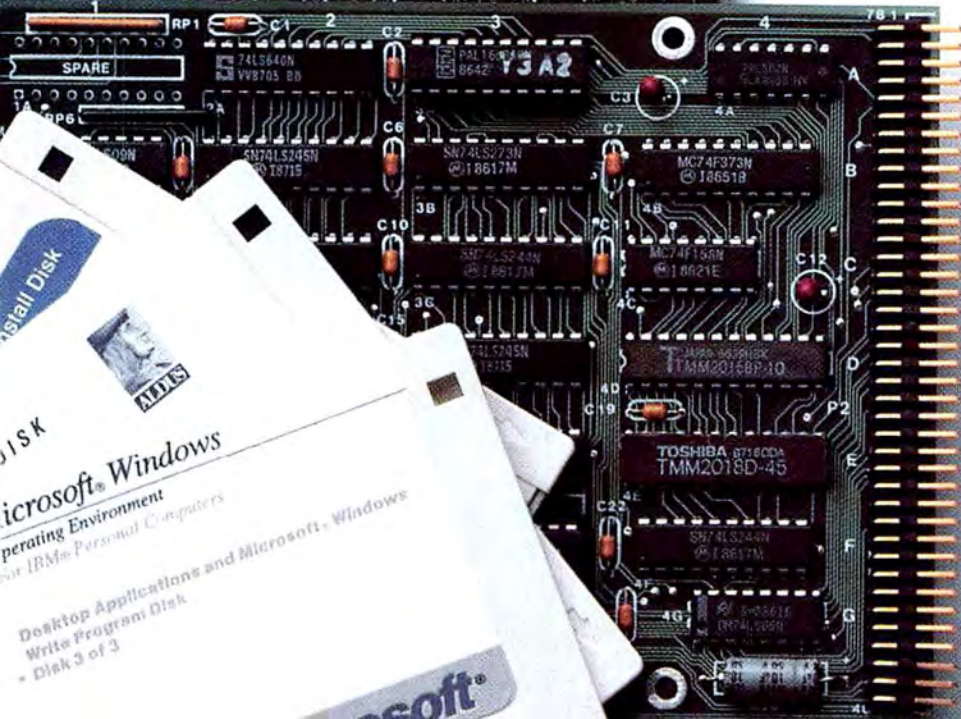
WORD PROCESSING

AlKaati International	Multilingual Arabic word processor	Eastern Language Systems	Provo, UT	(801) 377-4558	\$ 495
Guide 2.0	Hypertext word processing and information management	Owl International	Bellevue, WA	(206) 747-3203	\$ 275
Pageview	Page preview	Microsoft Corporation	Redmond, WA	(206) 882-8080	\$ 49.95
Windows Spell	Spelling checker	Palantir	Houston, TX	(800) 368-3797	\$ 95
WinText	Multilingual word processor	Palantir	Houston, TX	(800) 368-3797	\$ 350

Microsoft just plugged



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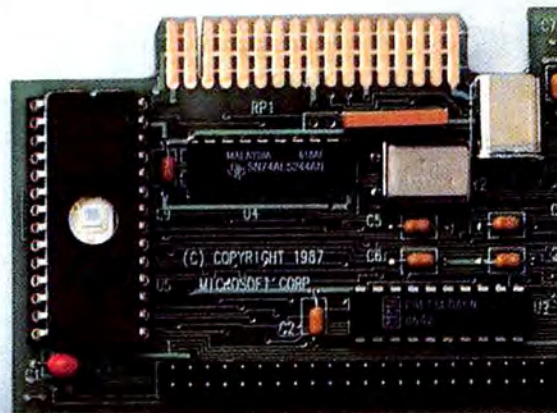
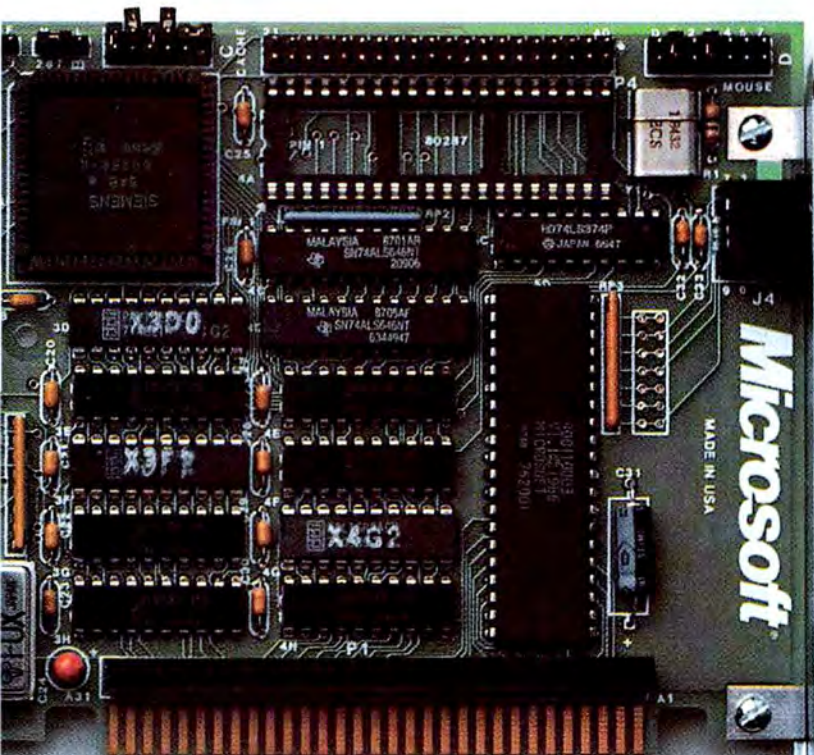
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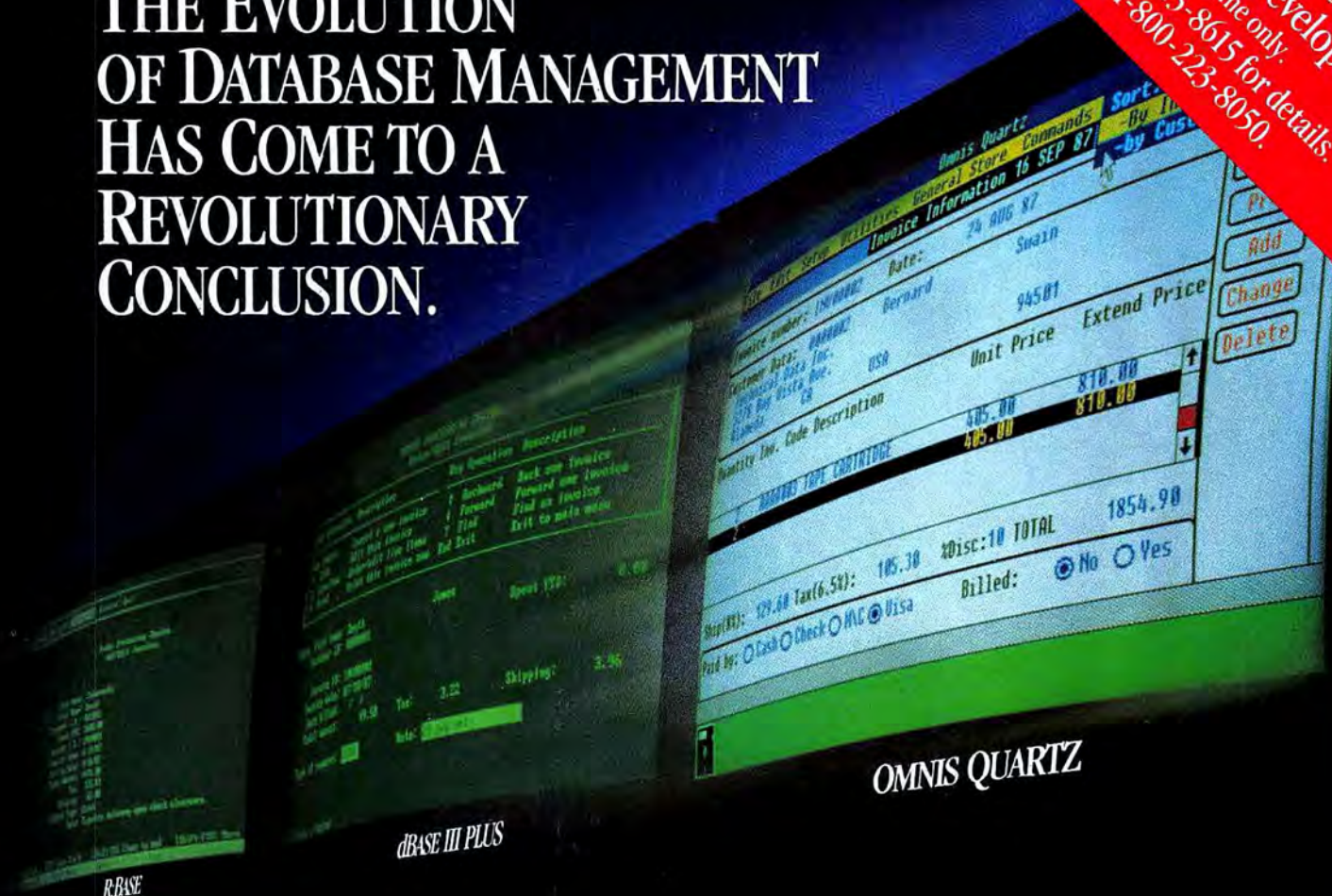
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Closer to the Promised

LAN?

OS/2 offers a powerful platform for PC networks, but the major players are squabbling about what will appear on the platform.

Promises, promises: The OS/2 operating system will rewrite the rules for PC local area networks, where DOS's limitations have proved much more exasperating than on individual PCs. Tapping OS/2's ability to address up to 16MB of memory and let users run multiple applications without fear, the new nets should comfortably combine personal computing with flexible, economical access to powerful network resources.

Like everything else associated with OS/2, this happy scenario will take years to unfold, but the foundation is being laid. IBM shipped the first OS/2 version in early December, and vendors of compatible machines started shipping a few weeks later. Initial OS/2 applications cropped up in the first quarter, and biggies like 1-2-3 release 3 should appear in late 1988. Bare-bones software that lets OS/2 applications share files and printers on existing networks has arrived.

But the major players—IBM, Novell, and the Microsoft enlistees led by 3Com—are banging heads as they rush toward the next generation of PC nets, and users may suffer.

IBM's OS/2 LAN Server will require users to buy the proprietary \$795 OS/2 Extended Edition for each OS/2 workstation. Other LAN suppliers begin with the \$325 Standard Edition. Beyond that, the standard setters diverge on a flurry of technical issues. Among these, IBM is ignoring the network interface that Microsoft recommends as the natural extension of OS/2 for future distributed applications that really exploit the net. And while the heavyweights agree on other routes that software authors can travel, they've posed a number of puzzles for developers and users.

Except for the leading net vendors, all concur that the near-term outlook is confusing. "At the point where we absolutely need them to standardize, everybody's going their own way," grouses Ed Be-

ERIC
BENDER



While Novell is taking a proprietary road, Netware will handle any upcoming OS/2 distributed applications without modifications.

CRAIG BURTON

*Senior Vice President
for Corporate Development,
Novell*

love, Lotus's head of corporate research and development. "The implementations are so fragmented and inconsistent that users don't know how to go forward," agrees Harry Saal, president of Network General in Sunnyvale, California. "The market will say, if you guys can't figure it out, call us when you can."

The Common Promise

The promise is straightforward. Although DOS nets typically find it difficult, dangerous, or impossible to handle more than one task at a time, OS/2 nets will be blessed from birth with that capability. For example, you'll be able to jot down notes in a word processor while a spreadsheet pulls in data from the net server. And you won't have to exit either application to check your electronic mail.

Additionally, software will be designed to draw on the computing power of all the OS/2 machines on the net. In this distributed computing setup, applications will divvy tasks among workstations, net servers, and other application servers specialized for data base management, communications, and even more esoteric chores. "You could have a server that spell-checks documents for everyone in a department," suggests Daniel Collins, director of software services at LAN Services, a New York City reseller.

But OS/2 itself holds no magic that transforms applications to work in a distributed environment; they must be written that way. Because distributed applications are split into various jobs on various machines, the jobs must be able to communicate with each other through some kind of transport mechanism. That's usually the role of net application program interfaces, or APIs, for which the software must be tailored.

OS/2 nets also will allow DOS siblings to join the team, letting them share files and printers and providing access to OS/2 data base servers. They may also bring a few questionable perks. 3Com chairman William Krause points out, for instance, that DOS workstations can ship off lengthy tasks to run in the server's compatibility box. But Michael Goulde, senior analyst at the Yankee Group, calls that approach suicidal. "If the box crashes, you lose the whole server."

True Blue Nets

This kind of verbal jousting has been rampant during the year since IBM launched OS/2. At that time Microsoft introduced the *OS/2 LAN Manager*, but IBM dodged questions about its own net plans.

Since then Microsoft has emphasized, and IBM downplayed, the links between the two companies' projects and products.

In November, IBM clarified its intentions by unveiling the *OS/2 LAN Server*, based partly on Microsoft's code, but aimed at another goal. "Although Microsoft and IBM started with the same kernel products, they're developing them differently," comments Clare Fleig, director of systems research at International Technology Group in Los Altos, California. "Microsoft is not and has never been a strategic partner in networking for IBM."

IBM will offer no net support for OS/2 workstations until the *OS/2 LAN Server* ships in November. Working with Extended Edition 1.1, IBM's net software is optimized for all the paraphernalia of the Big Blue corporate computing environment—rather than for PC nets.

The *LAN Server* offers broad file serving, print serving, and net administration features similar to those in IBM's *PC LAN Program* version 1.3, coming in July. "A *PC LAN Program* workstation will appear to the user much like an OS/2 workstation," notes Michael O'Dell, Entry Systems Division product manager for LAN systems in Austin, Texas.

IBM's primary goals are ease of administration and ease of use: Users needn't log on for each application or service, and they'll get a clearer view of net resources and events. Running in OS/2's protected mode, the *LAN Server* should prove more crash-proof than its DOS predecessors.

How about distributed applications? "We don't support them in the initial release," O'Dell says. The *LAN Server* does include a utility that starts up an application on the server and redirects input and output to a window on the workstation. (Such features are not unique—Information Builders, for one, took a similar approach with a data base server on a PC LAN two years ago.)

For distributed packages, says O'Dell, "Advanced Program-to-Program Communications will be the interface we support across our range of systems." Other IBM APIs include NETBIOS plus a low-level IEEE standard.

Beyond this, IBM's OS/2 net plan "won't shake out for a while," remarks Nat Goldhaber, founder of Tops, a LAN vendor in Berkeley, California. "Whatever it is, it will be terribly complicated."

IBM will set the standards, but will it capture sales outside the sphere of its traditional corporate



DAN ESCOBAR

clients? "IBM will just be staggering along behind," predicts John McCarthy, research director at Forrester Research in Cambridge, Massachusetts. "At the operating system level, its LAN track record is dubious at best."

A Partnership Platform

The two other leading players in PC nets, 3Com and Novell, are jumping ahead of IBM. 3Com made the first move a year ago by disclosing a partnership with Microsoft to enhance the *LAN Manager*.

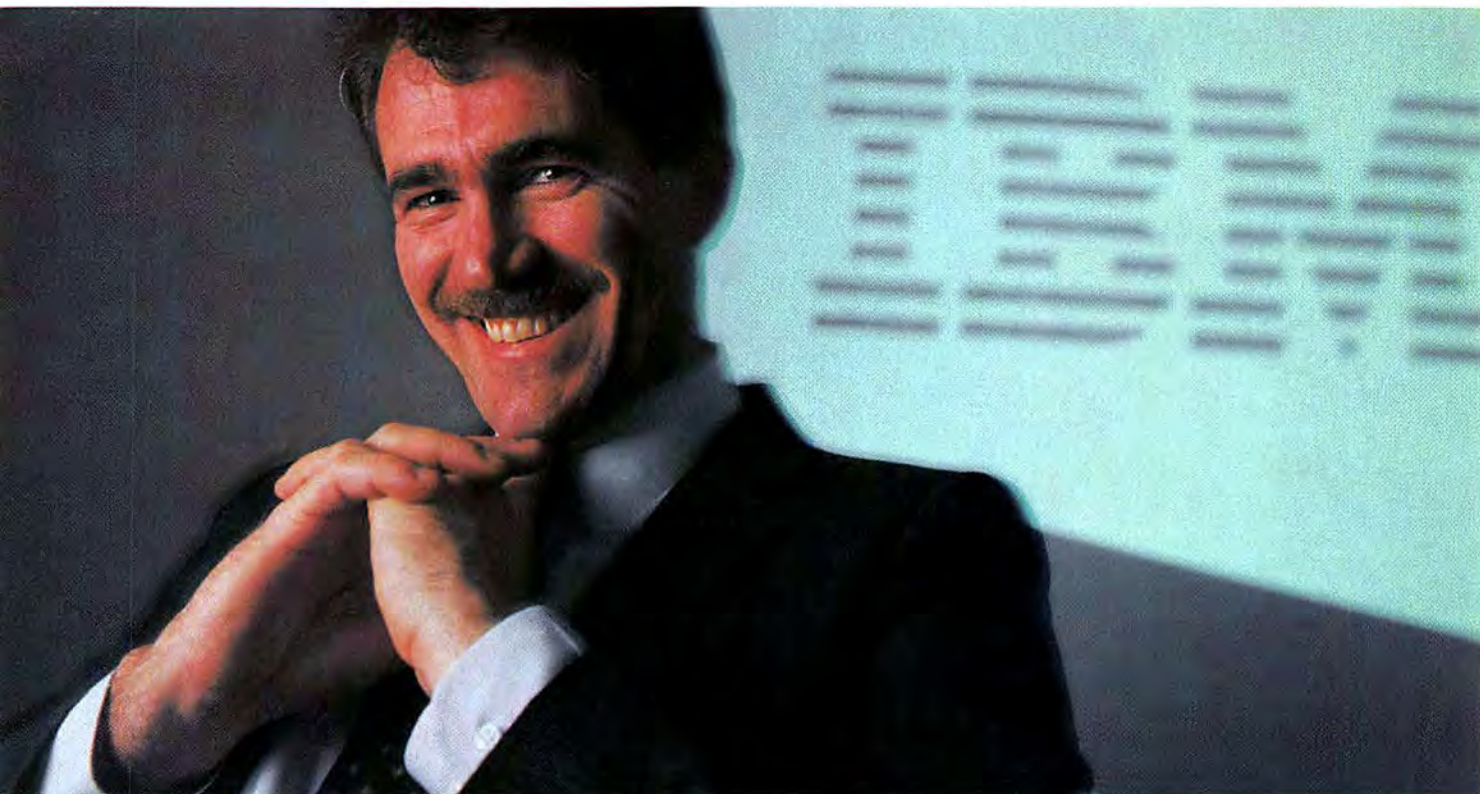
Earlier this year 3Com upgraded its *3+* environment software to support file and print services for OS/2 workstations. But OS/2 will really kick off with *3+ Open*, *LAN Manager*-based net system software scheduled to ship this summer at an undisclosed price. Product previews impressed both users and analysts, particularly for the ease and flexibility of net administration.

3+ Open will run OS/2 on the server, which gives it the new ability to tap the server's computing horsepower in addition to playing its traditional role as a file and peripherals server, according to chairman Krause. Servers running a proprietary operating system like Novell's *Netware* will be unable to perform this trick, he emphasizes. In the fall, *3+ Open* will begin adding net services similar to those found in the *3+* environment, including file tracking, electronic mail, and internet routing.

3Com will support all of IBM's OS/2 APIs. But, like other Microsoft licensees, 3Com claims that the best technique for distributed applications is

Like other *LAN Manager* products, *3+ Open* will run OS/2 on the network server, "which gives it the ability to act as a 'compute' server in addition to a file and peripherals server."

WILLIAM KRAUSE
Chairman, 3Com



STEVEN PUMFREY

"A PC LAN Program workstation will appear to the user much like an OS/2 LAN Server workstation."

MICHAEL O'DELL
Product Manager for LAN Systems,
IBM Entry Systems Division

through a net API known as named pipes. (Multiple OS/2 processes can interact through what Microsoft calls pipes. A relatively minor programming effort can extend this mechanism over a net, Microsoft claims.) IBM has not endorsed named pipes, although such a move is under consideration.

3Com also strongly backs another Microsoft project—the partnership with Ashton-Tate that addresses the special case of distributed data base management on OS/2 nets. The Microsoft/Ashton-Tate *SQL/Server*, scheduled to ship later this year, splits tasks between front-end OS/2 or DOS workstations and a heavy-duty back-end data base server. After the appearance of *dBASE IV* and other front-end software tailored for *SQL/Server*, existing data base applications should run without modification.

Predictably, *SQL/Server* presents rich new opportunities for market confusion, with similar but not quite compatible data base servers coming from IBM, Lotus, and other vendors.

The Novell Approach

The most dazzling success story in PC nets was built on system software, and Novell is not about to ask Microsoft for a *LAN Manager* license.

Novell executives argue that OS/2 is the wrong base for building a net file server because it's not optimized for that specialized job. Among the technical glitches, OS/2 currently hits a storage barrier at 32MB, demonstrates poor performance in handling background tasks, and permits only one user

at a time to access the server's hard disk, they say.

Like archrival 3Com, Novell has already taken the first step in providing file and print functions for OS/2 workstations, but won't offer full-blown support for OS/2 until the fourth quarter.

Novell has taken a year to sketch out its interpretation of *full-blown*. In December, when the strategy was first outlined, the company proposed to run OS/2 distributed software on a *Netware* server via an add-in 80286-based application coprocessor. "Microsoft's *LAN Manager* doesn't require an application coprocessor," acknowledges Craig Burton, Novell senior vice president for corporate development. "But you may wish you had one."

As 3Com's Krause is quick to suggest, the coprocessor tactic complicates life for applications that might otherwise run directly on the server. Burton replies that "less than 5 percent of applications will need to run on the server. In most cases, they probably will run better elsewhere on the network."

In February, Novell disclosed plans for *Nondedicated Netware*, a cost-sensitive alternative that will let you run *Netware* on the server as a task under OS/2. The advantage of this offering, the company declares, "is that OS/2, OS/2 server-based applications, and *Netware* can all run in the same machine on the same processor." The drawback: reduced performance.

Novell initially said it would support all of IBM's net APIs, plus existing *Netware* interfaces. Named pipes joined the ranks in February, so *Netware* will handle any upcoming OS/2 distributed applications without modification, Burton says.

Still, the proprietary nature of the underlying architecture worries many observers—despite Novell's installed base of more than a million networked PCs, rapid response to the earlier PC net standards, and enviable technical reputation. "The only problem is that it's not the direction IBM is taking," comments Richard Kimball, senior analyst at Montgomery Securities in San Francisco. "No matter how good Novell is, it will be very difficult to make this approach succeed."

While the Microsoft/Ashton-Tate *SQL/Server* is still far from commercial form, Burton says he expects that *Netware* will soon host that product and major competitors.

The Long March

Ungermann-Bass and many other suppliers are lining up behind *LAN Manager*, but some, such as

Banyan Systems, are plotting individual courses for distributed OS/2 applications. "It's not really clear what the standards are," notes Anand Jagannathan, vice president for business development at the Westboro, Massachusetts, firm.

Network General's Saal also cautions about the sheer technical barriers to distributed packages. "The beauty of OS/2 is the ability of the server to run shared processes. That's a clear benefit, but people underestimate just how complicated that is." Additionally, he questions whether OS/2, as a



Microsoft's OS/2 LAN Manager will simplify administration of network servers; adding and deleting resources becomes almost a point-and-shoot operation. The network system software has been endorsed by many communications and applications vendors—but not by IBM or Novell.

new software package, is sufficiently debugged for a networked environment: "There are too many chances to crash."

While standard OS/2 applications should prove suitably robust for file and printer sharing, full-fledged distributed applications will lag considerably behind. "Even with the *PC Network* APIs, which were comparatively simple, it took a year to 18 months for products to come out," International Technology's Fleig remarks. However, distributed packages could arrive by year-end, probably led by data base offerings.

Also on the bright side, moves like Novell's blessing of named pipes help to establish common ground and encourage hopes that net users will finally begin to attack business problems with OS/2 in the near future. "Nineteen eighty-nine will be the year when OS/2 begins to do the things on a LAN that will make it unique," predicts Peter Hayes, Businessland's director of product marketing. "Once OS/2 servers come out, everyone is going to start dabbling, because the opportunity is so appealing." ●

Eric Bender is PC World's East Coast editor.

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Ralph
Blodgett

WordPerfect packs a full arsenal of word processing features but only a few that are accessible with a single keystroke. Thank heaven for macros. Custom-made macros can reduce long command sequences to a few keystrokes, chain different functions together, and organize commands mnemonically.

Here are 26 <Alt>-key macros designed to streamline WordPerfect 4.2 for everyday use. WordPerfect 4.1 hyphenation menu options are numbered differently, so users of that version will have to modify the <Alt>-H macro to make it work correctly.

Basic Macro Types

WordPerfect features three types of macros: temporary macros, named macros, and <Alt>-key macros. To set up any one of

them, you begin by pressing <Ctrl>-<F10> and then responding to the prompt with an appropriate macro name. WordPerfect's macro recorder distinguishes among the three types according to the name you assign.

Temporary macros automate functions you need for a particular work session. Designate a macro with a single letter or just press <Enter>, and WordPerfect recognizes it as temporary. To use a temporary macro, simply press <Alt>-<F10> and respond to the prompt for a macro name. When you exit the program, that macro is not saved to disk.

Named macros, on the other hand, are automatically saved to

disk with the extension .MAC. You can label the macro mnemonically to make its function easy to remember, but using a named macro requires at least five keystrokes. To retrieve a macro, you press <Alt>-<F10>, type in the macro name, and press <Enter>.

<Alt>-key macros are the fastest aids in *WordPerfect's* macro stable: Simply hold down the <Alt> key and press a letter. <Alt>-key macros are ideal for routine *WordPerfect* functions.

Macros Sought and Found

Since <Alt>-key macros work in combination with the letter keys, they're limited to sets of 26. However, there's no ceiling on the number of <Alt>-key macro sets you can create with *WordPerfect*; you can store each set on a different disk or in a different subdirectory.

With a hard disk you can store a set of commonly used <Alt>-key macros in the subdirectory where WP.EXE is located (for example, C:\WP). This will be the default set unless you've stored different <Alt>-key macros in the current directory. When you invoke a macro, *WordPerfect* looks first for a file with the .MAC extension in the current directory. If it doesn't find the macro there, it

checks the directory containing WP.EXE.

Keep in mind, however, that when you activate a specialized <Alt>-key macro from a subdirectory, *WordPerfect* stores that macro in RAM and recognizes it as the default until you quit the program. You can circumvent its being stored in RAM by retrieving a default <Alt>-key macro in the same way you would a named macro: Press <Alt>-<F10>, type the macro's full path name (for example, C:\WP\ALTA), and press <Enter>.

26 <Alt> -Key Macros

Creating an <Alt>-key macro involves four basic steps. First, you press <Ctrl>-<F10> to turn on the macro definition function (Macro Def); *WordPerfect* will display a 'Define macro:' prompt in the lower left corner of the screen. Next you name the macro by pressing <Alt> and a letter key; a flashing 'Macro Def' prompt will appear. Then you type the exact keystrokes and command sequences you want the macro to perform. Finally, press <Ctrl>-<F10> to turn off Macro Def and save the macro.

<Alt> -Key Macros

<Alt>-A	Align Numbers on a Tab
<Alt>-B	Block On/Off
<Alt>-C	Center Text
<Alt>-D	Date Insert
<Alt>-E	End of File
<Alt>-F	Flush-Right Text
<Alt>-G	Go To (page/line/column)
<Alt>-H	Hyphenation On or Off
<Alt>-I	Indent
<Alt>-J	Justification On or Off
<Alt>-K	Variable Macro
<Alt>-L	List Files on Drive A:
<Alt>-M	Macro
<Alt>-N	Number Pages
<Alt>-O	Outline On/Off
<Alt>-P	Print Menu
<Alt>-Q	Quit and Save
<Alt>-R	Retrieve
<Alt>-S	Spelling Checker
<Alt>-T	Thesaurus
<Alt>-U	Undelete
<Alt>-V	View Another Document
<Alt>-W	Word Count
<Alt>-X	Exit Without Saving
<Alt>-Y	Save Your File
<Alt>-Z	Zap a Sentence

You may wish to clip this chart and tape it to your computer, at least until you become familiar with the 26 macros that you created with this article.

<Alt>-A:

Align Numbers on a Tab

<Alt>-A plants a format code in your document that centers characters and numbers on a tab stop to produce quick and simple columns. It is especially useful for aligning numbers with decimal points. This macro and many of the others don't save you any keystrokes, but they're easier to remember than *WordPerfect's* keystrokes.

1. Turn on Macro Def by pressing <Ctrl> - <F10> .
2. Label the macro <Alt>-A by holding down the <Alt> key and pressing A.
3. Press <Ctrl> - <F6> (Tab Align).
4. Next, press <Ctrl> - <F10> to save the macro.

To remove the tab alignment code, press <Alt>-<F3> (Reveal Codes) to display the format codes, move the cursor to the tab alignment code, press <Delete>, and then type Y.

<Alt>-B:

Block On/Off

<Alt>-B switches on the block function to mark text that can then be moved, copied, or deleted. When you use this macro, the 'Block on' prompt appears at the bottom left corner of the screen. Use the cursor keys to highlight the text you want to mark.

1. Press <Ctrl> - <F10> and label the macro <Alt> -B.
2. Press <Alt> - <F4> (Block).
3. Press <Ctrl> - <F10> to save the macro.

Press <Alt>-B again or <F1> to cancel the block function.

<Alt>-C:

Center Text

<Alt>-C centers an existing line of text or moves the cursor to the middle of the screen and centers a line as you type it.

1. Press <Ctrl> - <F10> and label the macro <Alt> -C.
2. Press <Shift> - <F6> (Center).
3. Press <Ctrl> - <F10> to save the macro.

To center new text, press <Alt>-C and type in the text. To center text you've already created, position the cursor under the first letter and press <Alt>-C.

<Alt>-D:

Date Insert

<Alt>-D automatically inserts the current date at the cursor position.

1. Press <Ctrl> - <F10> and label the macro <Alt> -D.
2. Press <Shift> - <F5> -1 (Date).
3. Press <Ctrl> - <F10> to save the macro.

<Alt>-E:

End of File

<Alt>-E moves the cursor to the end of a document.

1. Press <Ctrl> - <F10> and label the macro <Alt> -E.
2. Press <Home> twice and then <Cursor Down> .
3. Press <Ctrl> - <F10> to save the macro.

<Alt>-F:

Flush-Right Text

<Alt>-F shoots the cursor to the right margin so you can produce a line of flush-right copy. When you type text, it aligns along the right margin.

1. Press <Ctrl> - <F10> and label the macro <Alt> -F.

2. Press <Alt> - <F6> (Flush Right).

3. Press <Ctrl> - <F10> to save the macro.

To delete the command, position the cursor under the first letter of the flush-right text and press <Backspace>Y.

<Alt>-G:

Go To

<Alt>-G activates *WordPerfect's* Go To command, which takes you quickly to another page in the document (when you type the page number and press <Enter>), to the top or bottom of the current page (with <Cursor Up> or <Cursor Down>), or to another column when in column mode (with <Cursor Right> or <Cursor Left>).

1. Press <Ctrl> - <F10> and label the macro <Alt> -G.
2. Press <Ctrl> - <Home> (Go To).
3. Press <Ctrl> - <F10> to save the macro.

Press <Alt>-G twice to return to the previous cursor position. Press <F1> (Cancel) to stop the Go To command.

<Alt>-H:

Hyphenation On or Off

<Alt>-H either turns hyphenation on or turns it off, depending on your default setting. Hyphenation can be enabled from *WordPerfect's* setup menu. The default setting is hyphenation off.

1. Press <Ctrl> - <F10> and label the macro <Alt> -H.
2. Press <Shift> - <F8> to display the line format menu.
3. Type 5510 to turn hyphenation on and 5520 to turn it off. For *WordPerfect 4.1*, press 51 to

turn hyphenation on and **52** to turn it off.

4. Press **<Ctrl> - <F10>** to save the macro.

Hyphenation reverts to the default setting when you exit a file. To remove a hyphenation code, press **<Alt>-<F3>** (Reveal Codes), move the cursor to the hyphenation code, and press **<Delete>**.

<Alt>-I:

Indent

<Alt>-I automatically indents a block of text from both the left and right margins to create indented quotations or centered paragraphs.

1. Press **<Ctrl> - <F10>** and label the macro **<Alt> -I**.
2. Press **<Shift> - <F4>**.
3. Press **<Ctrl> - <F10>** to save the macro.

<Alt>-J:

Justification On or Off

Like hyphenation, justification can be preset at the setup menu. Depending on your default setting, **<Alt>-J** can turn justification on or off.

1. Press **<Ctrl> - <F10>** and label the macro **<Alt> -J**.
2. Press **<Ctrl> - <F8>** to display the print format menu.
3. Press **4** to turn justification on or **3** to turn it off. Press **<Enter>** to return to the document.
4. Press **<Ctrl> - <F10>** to save the macro.

<Alt>-K:

Variable Macro

Keep this key combination free for creating special macros. Change this **<Alt>-key** macro as often as your needs change. For example, you might use

<Alt>-K to insert boilerplate text or save special printer settings for a particular project. Later you could redefine it for other activities.

<Alt>-L:

List Files on Drive A:

Hard disk users may find it time-consuming to use the List Files command to display the contents of a disk in drive A:. **<Alt>-L** displays a directory of drive A:, highlighting the first file.

1. Press **<Ctrl> - <F10>** and label the macro **<Alt> -L**.
2. Press **<F5>** (List Files).
3. Type **A:** and then press **<Enter>** and **<Cursor Down>**.
4. Press **<Ctrl> - <F10>** to save the macro.

<Alt>-M:

Macro

<Alt>-M activates *WordPerfect's* macro function so you can use named macros.

1. Press **<Ctrl> - <F10>** and label the macro **<Alt> -M**.
2. Press **<Alt> - <F10>** (Macro).
3. Press **<Ctrl> - <F10>** to save the macro.

To use a named macro, press **<Alt>-M**, type in the macro name, and press **<Enter>**. If you press **<Alt>-M** and decide not to use a macro, press **<F1>** (Cancel).

<Alt>-N:

Number Pages

If you frequently number the pages of your documents, **<Alt>-N** will shorten the pro-

cess. This version of **<Alt>-N** centers numbers at the bottom of every page using *WordPerfect's* default margin settings.

1. Press **<Ctrl> - <F10>** and label the macro **<Alt> -N**.
2. Press **<Home>** twice and then **<Cursor Up>** to move the cursor to the beginning of the document.
3. Press **<Home>** and **<Cursor Right>**, then **<Home>** and **<Cursor Left>** to move the cursor to the right of any margin settings at the beginning of the document. This ensures that the numbers are always centered at the bottom of the page, whatever the margin settings.
4. Press **<Alt> - <F8>** to display the page format menu; then enter **631** to position the page numbers at the bottom of the pages.

5. Press **<Shift> - <F6>** to center the page number.
6. Type an open parenthesis, press **<Ctrl> -N**, and type a close parenthesis to enclose the number in parentheses. Then press **<F7>** and type **0** to exit the page format menu.
7. Press **<Ctrl> - <F10>** to save the macro.

<Alt>-O:

Outline On/Off

<Alt>-O activates *WordPerfect's* automatic Outline feature. When this feature is active, the word 'Outline' appears at the lower left corner of the screen.

1. Press **<Ctrl> - <F10>** and label the macro **<Alt> -O**.
2. Press **<Alt> - <F5>** and then type **1**.
3. Press **<Ctrl> - <F10>** to save the macro.

Press **<Alt>-O** to turn Outline off.

<Alt>-P:

Print Menu

<Alt>-P displays the print menu, from which you can print an entire document, print a page, or access each printer control with a single keystroke.

1. Press <Ctrl> - <F10> and label the macro <Alt> -P.
 2. Press <Shift> - <F7> (Print).
 3. Press <Ctrl> - <F10> to save the macro.
- Press 0 to exit the print menu.

<Alt>-Q:

Quit and Save

<Alt>-Q saves and exits a named file.

1. Press <Ctrl> - <F10> and label the macro <Alt> -Q.
2. Press <F7>, Y, and <Enter>. Then type Y.
3. Press <Ctrl> - <F10> to save the macro.

<Alt>-R:

Retrieve

The <Alt>-R macro retrieves the last deleted text block. This macro can also be used with the <Alt>-Z macro to cut and paste text.

1. Press <Ctrl> - <F10> and label the macro <Alt> -R.
2. Press <Ctrl> - <F4> and then type 5.
3. Press <Ctrl> - <F10> to save the macro.

<Alt>-S:

Spelling Checker

<Alt>-S displays *WordPerfect's* Speller menu.

1. Press <Ctrl> - <F10> and label the macro <Alt> -S.

2. Press <Ctrl> - <F2> (Spell).

3. Press <Ctrl> - <F10> to save the macro.

Press the <Space> bar to remove the menu.

<Alt>-T:

Thesaurus

<Alt>-T displays the *WordPerfect* Thesaurus menu.

1. Press <Ctrl> - <F10> and label the macro <Alt> -T.
2. Press <Alt> - <F1> (Thesaurus).
3. Press <Ctrl> - <F10> to save the macro.
4. Press <F1> twice to exit the Thesaurus menu.

To use the macro, position the cursor in a word and press <Alt>-T. Press 0 to exit the Thesaurus if there's no match for the word you're looking up.

<Alt>-U:

Undelete

<F1>, *WordPerfect's* Cancel key, will restore up to three previous deletions. Using <Alt>-U is faster than using the Cancel menu to restore text, but the macro retrieves only the last deleted passage.

1. Deleted text must be present in memory before the Cancel menu will display; so type an A and then delete it.
2. Press <Ctrl> - <F10> and label the macro <Alt> -U.
3. Press <F1> (Cancel), then 1 (Restore). The A will appear on screen, but it won't be saved as part of the <Alt>-U macro.
4. Press <Ctrl> - <F10> to save the macro.

<Alt>-V:

View Another Document

<Alt>-V enables you to flip back and forth between two documents.

1. Press <Ctrl> - <F10> and label the macro <Alt> -V.

2. Press <Shift> - <F3> (Switch).

3. Press <Ctrl> - <F10> to save the macro.

<Alt>-W:

Word Count

<Alt>-W counts the number of words in your document by activating the word count function on the Speller menu.

1. Press <Ctrl> - <F10> and label the macro <Alt> -W.
2. Press <Ctrl> - <F2> and then type 6.
3. Press <Ctrl> - <F10> to save the macro.

Press the <Space> bar once or twice to exit the Speller menu.

<Alt>-X:

Exit Without Saving

<Alt>-X exits a document without saving any changes. It's fast and doesn't wait around for a confirmation, so proceed cautiously.

1. Press <Ctrl> - <F10> and label the macro <Alt> -X.
2. Press <F7> and type N twice.
3. Press <Ctrl> - <F10> to save the macro.

<Alt>-Y:

Save Your File

It's always a good practice to save your file periodically while you work. The <Alt>-Y macro makes it easy.

1. Press <Ctrl> - <F10> and label the macro <Alt> -Y.
2. Press <F10>, <Enter>, and then type Y.
3. Press <Ctrl> - <F10> to save the macro.

<Alt>-Z:

Zap a Sentence

<Alt>-Z deletes a sentence no matter how long it is or whether it ends with a period, a question mark, or an exclamation point.

1. Press <Ctrl> - <F10> and label the macro <Alt>-Z.

2. Press <Ctrl> - <F4> and then type 11.

3. Press <Ctrl> - <F10> to save the macro.

You can retrieve a zapped sentence with the <Alt>-R macro.

Mending Macros

No doubt you'll become attached to your *WordPerfect* macros, but the time may come when you want to change one or get rid of it altogether. You can simply search the directory for the appropriate .MAC file and delete it or use the Macro Def function to overwrite an existing macro file. *WordPerfect* can't edit macros, but a macro-editing utility is available from WordPerfect Corporation for \$15, and the *WordPerfect Library* also contains a macro editor. With macros at your beck and call, you'll find that *WordPerfect* is easier to use than ever. ●

Ralph Blodgett is an author in Hagerstown, Maryland. His most recent book is Using WordPerfect: Macintosh Version (QueCorp., Carmel, Indiana, 1988).

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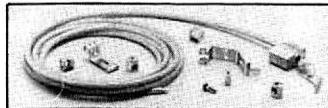
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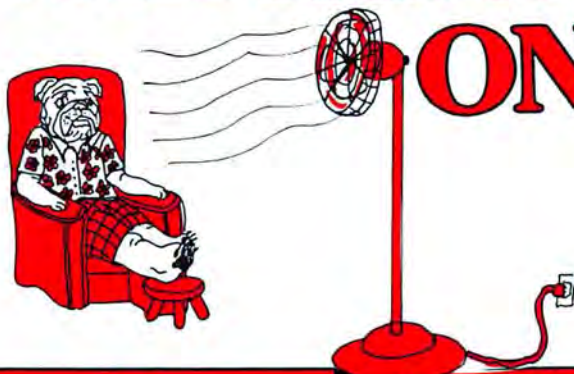
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HX12	419
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Color Display 8512	449
Color Display 8513	515
Color 8514	1150
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NEC Multisync 11	589
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Aldus Pagemaker	\$459
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Symphony 1.2	439
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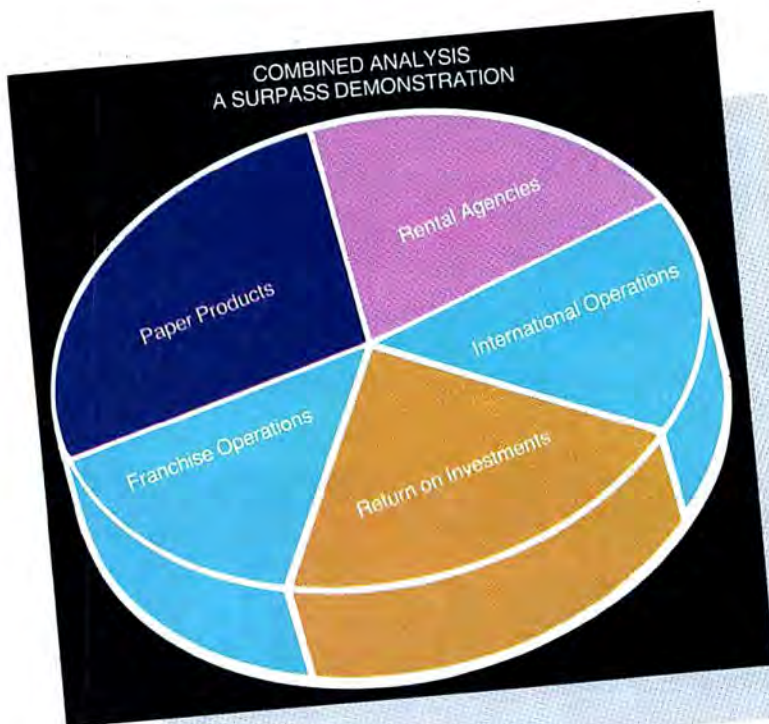
Our unique combination of additional features combined with incredible performance is what sets us apart and what makes Surpass so effective. Now, you can have all the features

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Compare Surpass Benchmarks*

TEST	SURPASS	LOTUS 1-2-3	PC EXCEL	QUATTRO
COPY TIME	2.6s	9.2s	9.5s	3:23m
RECALC TIME	1.6s	5.0s	2.2s	1:51m
@ SUM	2.7s	3.4s	5.6s	7.1s
INSERT ROWS	28.s	41.s	1:22m	1:00m
INSERT COLUMNS	25.s	2:19m	1:32m ¹	46.s
RANGE FORMAT	43.s	1:03m	2:55m	2:03m
COPY	37.s	38.s	3:56m	1:01m

Benchmarks above were performed on a 10 Mhz 80286 machine with 640K RAM, Video-7 Vega Deluxe Card, and 20 MB Hard Disc.

Test Results below with EMS 4 MB Extended Memory Card and LIM Simulator Software:

INSERT ROWS	28.s	41.s	1:55m	1:53m
INSERT COLUMNS	25.s	2:19m	8:37m	1:08m
RANGE FORMAT	43.s	1:14m	3:24m	50:52m
DATA SORT	1:01m	1:58m	9:39m	17:26m
TOTAL TIME w / EMS	2:37m	6:12m	23:35m	71:18m

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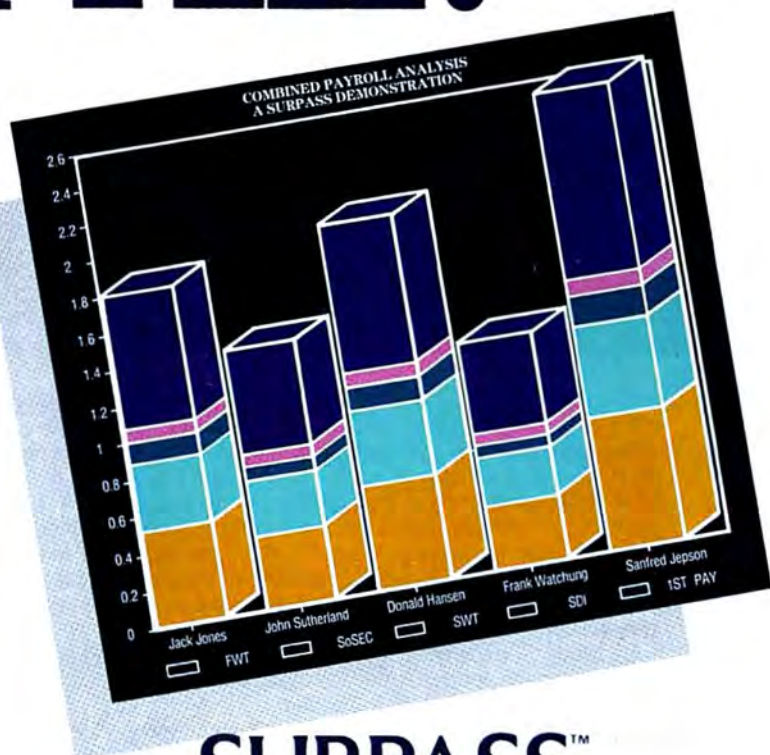
Them All!

Compare Surpass Features

ITEM	SURPASS	LOTUS 1-2-3™	PC EXCEL™	QUATTRO™
100% 1-2-3 Compatible	✓	✓	NO	✓
Hot Links™ for Formulas, Commands & Macros	✓	NO	✓	NO
Hot Links to Unloaded Files & Extended POINT Mode	✓	NO	NO	NO
Multiple Windows on Screen (up to 32)	✓	NO	✓	NO
Macro Recording, Debugging, Library and Multiple Window Access	✓	NO	NO ***	NO *
Single Key Stroke UNDO	✓	NO	✓	NO
Network Ready Out of the Box	✓	NO	✓	NO
Visual File Manager with File Search, Tree and Filter Specifications	✓	NO	NO	NO
21 Graph Types and 3-D Graphs	✓	NO	NO **	NO **
On-Screen Colors / Patterns / Fonts and Integrated Printing	✓	NO	✓	✓
Graph Data from Multiple Worksheets in a Single Graph	✓	NO	NO	NO
Slide Show Feature for Graphic Presentation	✓	NO	NO	NO
Background Recalc	✓	NO	✓	NO
Column Adjustment Range - Automatic and Manual	✓	NO	NO	NO

comparison graphics generation. A full UNDO capability and sophisticated Visual File Manager allow the user to manage the expanded work environment as an integral part of SURPASS. Intuitive pull-down menus tie the new features into the 1-2-3™ interface. A subset of SURPASS' capabilities implements 100% of 1-2-3 keystrokes, file structures, macros, commands, functions and formulas (version 1. A, 2.0 and 2.01). Keystroke Recorder, Automatic Column Range Width Adjustment, Worksheet Find, Slide-Show, Hot Links Consolidation, Comprehensive Network Capability (LAN) and, enhanced EMS Memory Support add further to the rich set of features. Surpass is also available in a 286/386 optimized version for reduced memory and higher speed performance.

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Circle 105 on reader service card



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S 300

Circle 309 on reader service card



CONSUMER WATCH

Advice and information for the computer consumer

Technical support policies run the gamut from unlimited toll-free service to pay-as-you-go contracts. What should you rightfully expect when you buy software?

Anita
Amirrezvani

The \$169,848.22 Phone Bill

Like it or not, software consumers realize that most of the financial burden for technical support has shifted to them. But from vendor to vendor, variations in support policies are the rule rather than the exception. While WordPerfect Corporation's support lines are toll-free and open to all with no restrictions, for example, Ashton-Tate limits free support to a 90-day period after product purchase and then charges for annual support plans, which are targeted at individual users or large corporate accounts.

Why this variation? One important factor is the type of product. "Word processing is easier to learn [and to support] than something like project management," points out Steven Kirk, director of training and support for Breakthrough Software, maker of the project management package *TimeLine*. Indeed, generous support policies are more common among word processing vendors than among spreadsheet or data base makers.

Other reasons for the diversity in support schemes relate to the financial status of the vendor, the size of its installed base of users, and its particular support philosophy. "When a company is growing rapidly, it always has new sales to fund support," says MicroPro CEO Leon Williams.

"But if market conditions change—say, the company's user base triples and the economy goes into a recession—the company may face an enormous liability."

Some industry spokespersons criticize companies like WordPerfect for making hay out of unlimited toll-free support policies. "It's irresponsible to make infinite claims," says Samna president Said Mohammadioun, "because the amount of support a company can provide is tied to revenues. You can't provide \$1000 worth of support for a \$200 package."

It all boils down to basic economics, says Mohammadioun. Say a typical word processing package sells for a street price of \$200. "Support costs vendors somewhere between \$5 and \$10 per call, aside from the cost of the phone call itself. If you add toll-free service, you're talking \$10 to \$20 per call." Given these figures, Mohammadioun argues, it's not financially feasible for a vendor to answer more than a few calls per package. And if market conditions suddenly change, the vendor may be faced with two options: start charging for support or subject users to long waits.

How is it possible for WordPerfect Corporation to offer unlimited toll-free support when no other major vendor provides a similar plan? (Even MicroPro, *(continues)*)

A Users' Guide to Technical Support

	Free Support Time limit ¹	Paid Support Yearly cost ²	Maximum number (or duration) of support calls	Toll-free support line	General Information Days/hours of operation (local times)	Number of support staff	Wait time (in minutes) ³	Best time to call; Worst time to call	User bulletin board; User newsletter
Aldus 411 First Ave. S #200 Seattle, WA 98104 206/622-5500	45 days	\$100	none	y	M-F 7-6	34	4-5	F after 2; W 9-12	CompuServe; y
Ashton-Tate 20101 Hamilton Ave. Torrance, CA 90502 213/329-8000	90 days	Extended \$50, Professional \$150, ⁴ LAN \$195 ⁵	15 calls 20 calls 20 calls	n y y	M-F 6-4:30, Th till 4	123	2-3	F; M at noon	direct, CompuServe, The Source; y
Breakthrough Software 505B San Marin Dr. Novato, CA 91915-1310 415/898-1919	none	\$150 per user for large accounts that need high-priority support	none	n	M-F 8-5	4	6	F after 2; M a.m.	direct, CompuServe, The Source; y
ButtonWare P.O. Box 5786 Bellevue, WA 98006 206/454-0479	1 yr.	half the product cost	none	n	M-F 9-4	6	7	Th & F p.m.; M & T a.m.	direct, CompuServe, The Source; n
Crosstalk 1000 Holcomb Woods Pkwy. #440 Roswell, GA 30076 404/998-3998	none	n/a	n/a	n/a	M-F 9-5	15	7	none; none	direct, CompuServe; n
Lotus Development 55 Cambridge Pkwy. Cambridge, MA 02142 617/577-8500	none	\$150 individuals, \$110-\$140 volume users	15 calls none	y y	M-F 8:30-8, closed W 12-1:30	80	3½	M-F 9:30-11:30; W 12-1:30	CompuServe; y
MicroPro Int'l 33 San Pablo Ave. San Rafael, CA 94903 415/499-1200	toll-free ⁸	n/a	n/a	n/a	WS 2000 3.0 M-F 7-4, weekends 8-1; WS 4.0 M-F 7-4	70+	1-3	Th & F 8-10 & 2-4; M & W 11-1	CompuServe; y
Microsoft 16011 N.E. 36th Way Redmond, WA 98073 206/882-8088	none	⁹	n/a	n/a	applications M-F 6-6, languages M-F 8-5	250	less than 1	early or late in day; midday	CompuServe; n
Paperback Software 2830 Ninth St. Berkeley, CA 94710 415/644-8249	90 days	\$50	10 calls, 5 hrs. max.; then \$1 per minute, \$5 min.	n	M-F 9-5	2	7	after noon; M 9-10, F late p.m.	none; y
Samna 5600 Glenridge Dr. Atlanta, GA 30342 404/321-5006	30 days	\$125 individuals, free to volume users (100+) if support is through a corporate support department	20 calls none	n	M-F 8-8	16	1 or less	M-F 8-10, 6-8; M-F 12-3	The Source; y
Software Publishing 1901 Landings Dr. Mountain View, CA 94043 415/962-8910	none	n/a	n/a	n/a	M-F 8-4	16	1½	M-F 12-4; M-F 8-12	CompuServe; y
WordPerfect 1555 N. Technology Way Orem, UT 84057 801/225-5000	none, toll-free	n/a	n/a	n/a	M-F 7-6, S 8-12	190	2	none; none	direct, CompuServe, The Source; n
Xerox 9745 Business Park Ave. San Diego, CA 90245 800/822-8221	60 days	Basic Plus \$50, Priority \$150, Priority Plus \$2000	none 6 hrs. no limit	n y y	M-F 8-7	40+	1	early a.m.; lunchtime	independent; y

¹Registered user pays for call unless otherwise noted.

²Many paid support plans provide high-priority access to support staff and significant extras ranging from discounts to free training.

³These estimates were provided by the vendors.

⁴Special services and pricing are available for government and corporate accounts. For \$450 annually, users can purchase unlimited toll-free support; \$925 buys a dedicated support technician.

⁵Recommended for network administrators only.

⁶One-third of the calls are answered immediately; callbacks are made within 2 hours.

⁷Immediate answer or busy signal.

⁸Support is free for the life of the release plus six months.

⁹Microsoft's DIAL plan is geared for software developers and engineers.

which offers toll-free support for *WordStar 2000 3.0*, limits it to six months after the next release is issued.) WordPerfect customer support manager Stan Mackay says that instead of spending a lot of money on advertising, the company pours funds into support. "We've paid for support as we've gone along and put its cost into our pricing scheme," he says. "Our philosophy is that if you help people, word of mouth will sell the product."

Late in 1987, WordPerfect Corporation placed an ad in PC publications. Instead of focusing on products, the ad touted WordPerfect's monthly technical support phone bill—a whopping \$169,848.22.

Great Expectations

Just what should users expect of vendors? Whether or not it's toll-free, prompt technical support should be available, support staff

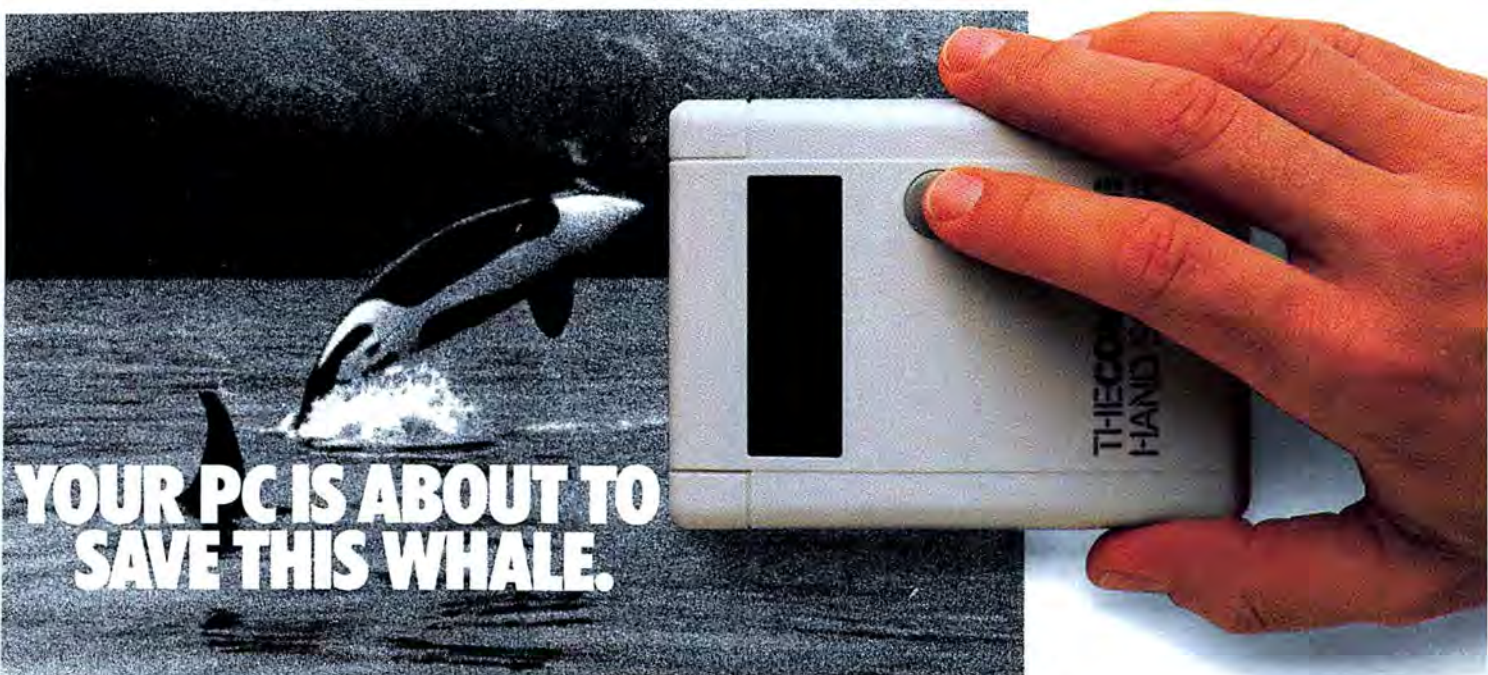
should be trained well enough to handle complex questions, and users shouldn't have to pay for support to compensate for bugs or lame, incomplete documentation. Writes *PC World* reader Paula Williams, who bought a LaserJet Series II and soft fonts to use with *MultiMate Advantage II*: "My gripe is that I had to buy a \$50 support contract for the opportunity to make a call that was not toll-free in order to ask about information not included in the program's documentation. It would be nice if Ashton-Tate issued a credit in such circumstances." Some vendors stress the importance of flexibility. "If a customer is reporting bugs or asking compatibility questions, we don't charge," says Paperback Software technical support supervisor Brad Bechtel.

Users should also expect vendors to build support into their products. Documentation and product updates should be thorough and clear. Software should be designed with a relatively in-

tuitive user interface, have a minimum of bugs, and provide good on-line help. With *Excel*, for example, Microsoft went the extra mile by providing extensive on-line tutorials and help files. Finally, users who need information on other support resources—newsletters, bulletin board forums, user groups, and training experts—should be able to get referrals from the vendor.

Some vendors have made a point of providing special support services to user groups. Lotus publishes a quarterly user group newsletter; better yet, Aldus allows user groups to purchase one copy of *PageMaker* at a reduced price—\$150—and throws in one year of toll-free technical support. "User groups are grass-roots, influential organizations," says Aldus customer service manager Colleen Byrum, "and we want them to use our products and give us feedback."

In an industry where many products offer similar price/per-
(continues)



formance benefits, consumers who keep support costs in mind will come out ahead. For information on how 13 companies handle support issues, see the table "A Users' Guide to Technical Support." This resource guide offers price and policy information, lists time limits on support, indicates whether support calls are toll-free, and delivers tips on the best and worst times to call.

SHOP TALK

Less Than Scientific

Early this year *Consumer Watch* received eight complaints about Quantus (and related company Scientific Storage Technology), two mail-order concerns in Spofford, New Hampshire. Most of the complaints concerned long delays in shipment of computers, ranging from six weeks to three

months after a promised shipping date. Readers also complained about late refunds, and most griped about false promises, excuses, and a feeling of getting the runaround.

Consumer Watch forwarded all complaints to Quantus. Three readers received refunds from Quantus sales manager Susan Winter before the company was put under temporary receivership.

"Asking the court to appoint a receiver and to issue a temporary restraining order was a very strong stand for our office to take," says Don Feith, assistant attorney general for New Hampshire. "But we felt it was necessary because of the increasing number of consumer complaints and the fact that the company's suppliers were not being paid."

Soon after the receivership, both companies filed for reorganization under Chapter 11 of the federal bankruptcy code.

Dissatisfied Quantus customers who purchased products using a credit card should write their credit-card company and indicate that the charges are in dispute. Consumers should also send a documented copy of their complaints to Office of the Attorney General, Consumer Protection and Antitrust Bureau, 25 Capitol St., Concord, NH 03301.

The Hard Facts About Insurance

In May 1987 I ordered a hard disk drive for \$919 from Shamrock Computer, paying by U.S. postal money order. Shamrock sent the order and insured it for the maximum allowed by the U.S. Postal Service—\$500. Unfortunately, the package was lost. Since then I've been trying to recover my money, but to no avail.

Gerald D. Boggiano
Brussels, Belgium



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Shamrock Computer re-

sponds: After tracing Mr. Boggiano's package, the postal service confirmed that it had been lost and sent us a check for the insured amount, which we returned to Mr. Boggiano.

When people order by phone, we tell them that overseas parcel post insurance is limited to \$500. However, Mr. Boggiano mailed in his order—at which point we sent him the hard disk instead of making him wait two extra weeks to receive a letter about postal insurance policies.

We're sorry that Mr. Boggiano got burned. What he doesn't mention is that we offered to sell him another disk at our cost, but he didn't accept that.

Mark Malloy
President

Editor's note: To get more insurance for overseas packages, you can use a commercial carrier like Federal Express. However, because Mr. Boggiano had the goods shipped to an APO (army

post office) address in New York, he was required to use the U.S. Postal Service.

According to a U.S. Postal Service spokesperson, parcel post insurance is indeed limited to \$500 for most of Europe (the limit is \$1200 for Great Britain). But if you're sending a package worth more to a domestic address, even an APO, you can insure a package up to \$25,000 using registered mail.

Reaching Out to AST

In December 1986 I returned two Reach modems to AST Research because they didn't work with my AT. I had called AST's service department several times and was told that the company would send the necessary replacement chips to make them work, but I never received them.

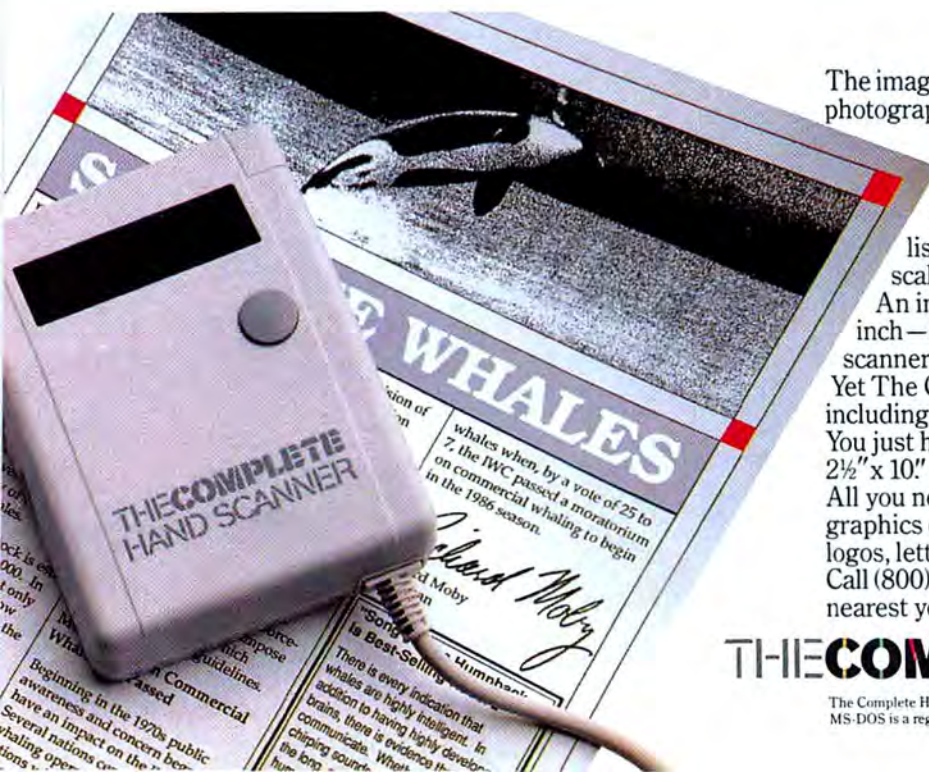
Don Ames
Westminster, California

AST Research responds: The information our support group provided was inaccurate. The Reach modem will not operate reliably at any clock speed faster than 4.77 MHz, the processor speed of the PC and XT. However, the Reach modem was never marketed by AST as capable of functioning in an AT.

The promised chips were unreleased EPROMs, developed with the intention of resolving the problem. Unfortunately, this effort was unsuccessful and abandoned. The Reach modem has since been removed from the market.

It is AST's practice to make refunds to dissatisfied customers, usually through our authorized dealers. However, since we provided inaccurate information, Mr. Ames will get a refund directly from AST.

Bob Sullivan
Director, Product Support
(continues)



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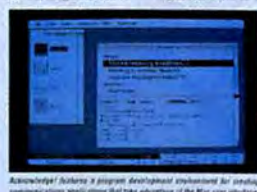


Users hail Mac-to-VAX link; DEC has even bigger plans

BY DAVID L. KATZ
SAN FRANCISCO—The long-awaited and long-delayed agreement between Apple Computer and DEC was finally announced last week. The deal, which calls for the two companies to develop a joint Macintosh-to-VAX link, was hailed by many as a major step in the integration of the two companies' technologies and products. In a letter to press, DEC president Kenneth H. Olsen, making a last public appearance, praised the agreement as a "major step in the integration of the two companies' technologies and products."

Communications program adapts Mac interface to remote systems

BY DAVID L. KATZ
SAN FRANCISCO—Apple Computer's new communications program, AppleLink, has been adapted to work with remote systems. The program, which was originally designed to work with AppleLink's own Macintosh-to-Macintosh network, now allows users to connect to remote systems via a variety of protocols, including X.25, TSP, and others.



Apple's LU 6.2 seen in show spotlight

BY DAVID L. KATZ
SAN FRANCISCO—Apple Computer's new LU 6.2 operating system, which was unveiled at the recent MacWorld Expo, is expected to be a major selling point for the company. The new system, which is based on the same code as the Macintosh operating system, is expected to offer a more powerful and flexible environment for developers and users alike.

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MultiFinder, HyperCard highlight Expo

250 vendors offer multitude of new Macintosh products



shows off innovative system software

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1. Industry (check only one)

Noncomputer-related businesses

- ☐ 1. Aerospace
- ☐ 2. Agriculture, mining, construction, oil
- ☐ 3. Business consulting (noncomputer-related)
- ☐ 4. College/university
- ☐ 5. Elementary/high school
- ☐ 6. Engineering/architecture
- ☐ 7. Finance, banking, accounting, insurance, real estate
- ☐ 8. Government
- ☐ 9. Health/medical services
- ☐ 10. Legal services
- ☐ 11. Manufacturing
- ☐ 12. Military
- ☐ 13. Other business services
- ☐ 14. Publishing/advertising/public relations
- ☐ 15. Research and development
- ☐ 16. Retail/wholesale
- ☐ 17. Transportation, communications, utilities
- ☐ 98. Other (specify) _____

Computer-related businesses

- ☐ 18. Computer consultant
- ☐ 19. Computer retail
- ☐ 20. Distributor/wholesaler
- ☐ 21. Manufacturer (computers, software, peripherals)
- ☐ 22. Service bureau
- ☐ 23. VAR/systems house/integrator
- ☐ 99. Other (specify) _____

2. Title (check only one)

- ☐ A. Chairman/president/owner/partner
- ☐ B. Vice president
- ☐ C. Controller/treasurer/accountant
- ☐ D. Director/supervisor/manager
- ☐ E. Project manager/chief/group leader
- ☐ F. Art director/writer/chief/group leader
- ☐ G. Engineer/scientist
- ☐ H. Administrator
- ☐ I. Consultant/advisor
- ☐ J. Microcomputer specialist/manager/analyst
- ☐ K. Programmer
- ☐ L. Educator
- ☐ M. Professional (lawyer, doctor, etc.)
- ☐ Z. Other (specify) _____

3. Department or function (check only one)

- ☐ A. Accounting/finance
- ☐ B. Administration/management/personnel
- ☐ C. Consulting
- ☐ D. Education/training
- ☐ E. Engineering/R&D
- ☐ F. Manufacturing/production
- ☐ G. Microcomputer center/office automation
- ☐ H. MIS/DP
- ☐ I. Purchasing
- ☐ J. Sales/marketing/distribution
- ☐ Z. Other (specify) _____

4a. Does your company own or lease any mainframe computers at this location?

☐ Yes (indicate quantity below) ☐ No

- | | Existing
(quantity) | Plan to buy
(quantity) |
|--|------------------------|---------------------------|
| ☐ 1. IBM | _____ | _____ |
| ☐ 99. Other (specify) _____ | _____ | _____ |

4b. Does your company own or lease any mini-computers at this location?

☐ Yes (indicate quantity below) ☐ No

- | | Existing
(quantity) | Plan to buy
(quantity) |
|--|------------------------|---------------------------|
| ☐ 1. IBM | _____ | _____ |
| ☐ 2. DEC VAX | _____ | _____ |
| ☐ 3. Sun/Apollo | _____ | _____ |
| ☐ 99. Other (specify) _____ | _____ | _____ |

5. Does your firm have or plan to buy any of the following types of personal computers or microcomputer systems at your location?

☐ Yes (indicate quantity below) ☐ No

- | | Currently
own | Plan to buy
within 1-12 mos. |
|---------------------------|------------------|---------------------------------|
| 1. Macintosh 128/512 | _____ | _____ |
| 2. Macintosh Plus | _____ | _____ |
| 3. Macintosh SE | _____ | _____ |
| 4. Macintosh II | _____ | _____ |
| 5. IBM or compatible | _____ | _____ |
| 6. Sun/Apollo workstation | _____ | _____ |
| 99. Other (specify) _____ | _____ | _____ |

6. Please indicate your involvement with each of the following types of personal computers or microcomputer systems (check all that apply)

- | | Macintosh | Software | Networks &
Peripherals |
|---|-----------|----------|---------------------------|
| A. Approve purchase | A. _____ | A. _____ | A. _____ |
| B. Develop/manufacture | B. _____ | B. _____ | B. _____ |
| C. Evaluate/select vendor | C. _____ | C. _____ | C. _____ |
| D. Own one | D. _____ | D. _____ | D. _____ |
| E. Own two or more | E. _____ | E. _____ | E. _____ |
| F. Purchase or acquire | F. _____ | F. _____ | F. _____ |
| G. Establish specifications | G. _____ | G. _____ | G. _____ |
| H. Recommend to others | H. _____ | H. _____ | H. _____ |
| I. Sell | I. _____ | I. _____ | I. _____ |
| J. Train people to use/
or provide support | J. _____ | J. _____ | J. _____ |
| K. Use | K. _____ | K. _____ | K. _____ |
| L. No involvement | L. _____ | L. _____ | L. _____ |
| Z. Other (specify by
name and quantity) | Z. _____ | Z. _____ | Z. _____ |

If you have no involvement with any of the above, skip to question 8.

7. Do you recommend, buy, specify or approve microcomputers, software, and/or peripherals?

☐ Yes ☐ No

If yes, please indicate for how many Macintosh personal computers you have this involvement. (check only one)

- | | |
|-----------------------------------|---|
| ☐ A. 1-3 | ☐ E. 50-99 |
| ☐ B. 4-9 | ☐ F. 100-499 |
| ☐ C. 10-19 | ☐ G. 500+ |
| ☐ D. 20-49 | ☐ H. None of the above |

8. How many people are employed by your entire company? (check only one)

- | | | |
|-----------------------------------|---------------------------------------|--|
| ☐ A. 1-9 | ☐ D. 100-499 | ☐ G. 2500-4999 |
| ☐ B. 10-24 | ☐ E. 500-999 | ☐ H. 5000-9999 |
| ☐ C. 25-99 | ☐ F. 1000-2499 | ☐ I. 10,000 or more |

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PC Plaudits

I have a Toshiba 321-SL printer, which I bought in part because of its ability to print single-sheet letters without requiring the user to remove the formfeed paper.

When I first used the printer, the fan-fold paper sometimes jammed during the switch from single-sheet printing, and one of the pins in the printhead broke when I was using heavy-stock paper.

Toshiba customer support suggested a simple fix for the jamming (spray a little silicone on the bar behind the platen) and sent me a new printhead and an improved printhead mask for free. The printer has worked perfectly since then.

I've never experienced this level of support except from WordPerfect. Toshiba seems to want our business.

Charles R. Carroll, Jr.
Baltimore, Maryland

Got a gripe? Want to set the record straight? Write Consumer Watch, PC World, 501 Second St., San Francisco, CA 94107, or use MCI Mail PCWORLD/179-3813, CompuServe 74055,412, or The Source STE908. Include your name, city, state, and daytime telephone number with all correspondence. All letters are subject to editing. Due to the volume of mail, we cannot acknowledge every letter. ●

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Weitek® 1167 Socket	X	
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2MB daughter card	X	X
8MB daughter card	X	
16MHz	X	X
20MHz	X	

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Circle 168 on reader service card

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THE HELP SCREEN

PC World offers answers and advice at every level

Track down BIOS upgrade chips for the original PC, format DOS 3.30 PC floppies to hold 720K, put some zip in your backups, and compare disk buffer techniques; plus updates on four-floppy controllers, PDS Reports + programs, and programmable word processors

Karl
Koessel

ANTHONY RUSSO

The BIOS Upgrade Blues

Q. *I own a vintage IBM PC with two floppy drives. A local dealer tried to install a hard disk for me, but it wouldn't work. It seems that my machine's old BIOS will not support a hard disk (the Norton SI utility tells me the BIOS date is October 27, 1982). The dealer said IBM has stopped selling BIOS upgrade chips, and that therefore I will not be able to add a hard disk to my PC.*

I like my old PC; it's dependable and has never needed repair. All I want is a hard disk. Can you help?

Thurston E. Franks
Silver Spring, Maryland

A. Because the IBM BIOS Upgrade Kit is no longer available, you must turn to a manufacturer of a compatible BIOS. But the news here isn't much better. The clients of compatible BIOS manufacturers are the makers of PC compatibles, and most BIOS firms sell only to original equipment manufacturers (OEMs). Furthermore, these BIOS's come in 28-pin ROMs, not the smaller 24-pin packages used in the original IBM PC. (The upgrade mentioned in "The Little Chip That Couldn't" in March's *Consumer Watch* is for IBM XTs and PC compatibles that use 28-pin ROMs.)

Many owners consider themselves betrayed. They feel that IBM marooned early adopters—

those who gave the PC its success—when it stopped supporting the PC. But at this point in time, nearly seven years later, maybe you should consider replacing the entire motherboard with one more powerful or, even though your PC has been dependable, purchasing an XT or AT compatible.

720K Drive B: for a DOS 3.30 PC

Q. *I recently added a hard disk card and a 3½-inch floppy disk drive B: to my PC. I am also now using DOS 3.30 with no problems, save one: Although I can format 3½-inch disks to hold 360K, I can't format them to 720K capacity. (Under DOS 3.00, I used the DRIVPARM command in CONFIG.SYS as explained in "Double Your Storage," The Upgrade Path, PCW, May 1987. Under DOS 3.30, that command evokes an 'Unrecognized command in CONFIG.SYS' error message. So now I format my 3½-inch disks with my laptop, and the PC is able to read from and write to them.) I was told that installing a 3½-inch floppy drive would be a snap. Well, it was; I just can't format disks to 720K under DOS 3.30. What's the secret?*

Bruce T. Prendergast
Downey, California
(continues)

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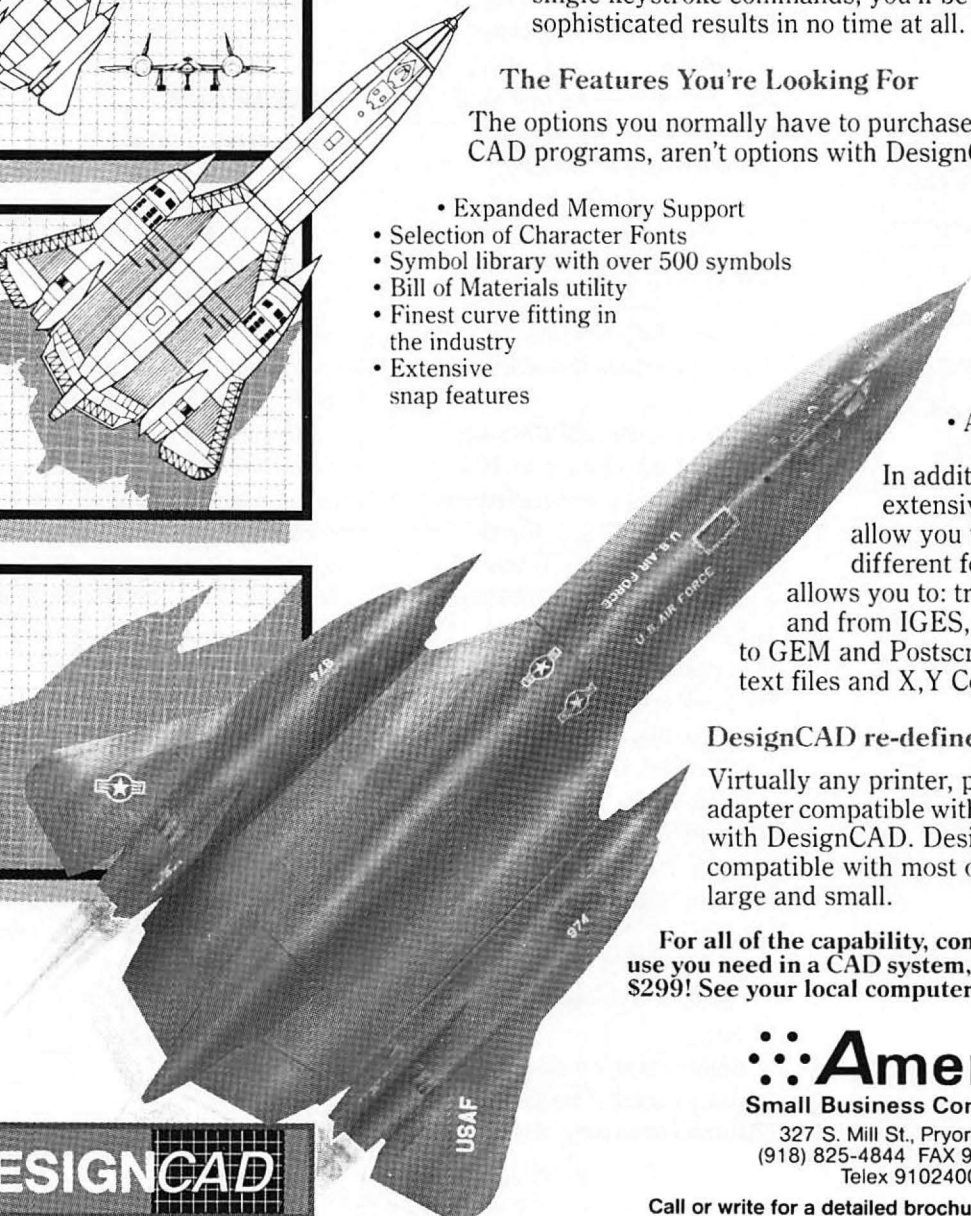
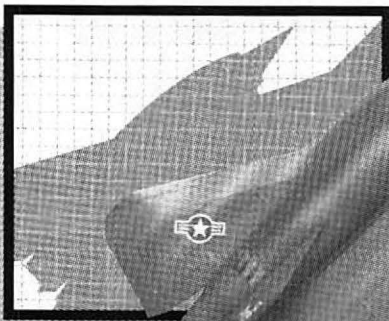
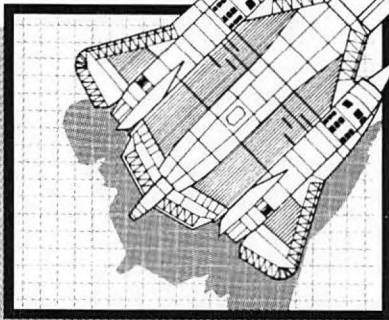
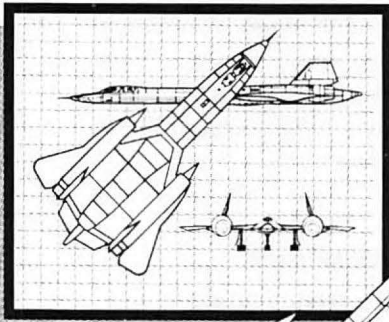
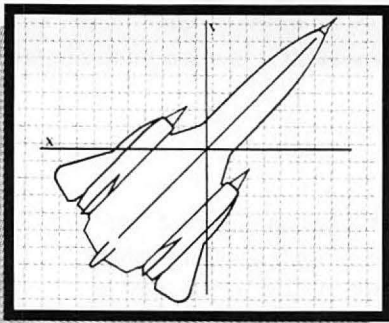
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Circle 306 on reader service card



A. Let's assume that the file DRIVER.SYS (from your original DOS 3.30 disk) is in a subdirectory called C:\DOS. You just need to add the line DEVICE = C:\DOS\DRIVER.SYS /D:n /F:2 (where *n* is the 3½-inch drive's drive number—drive B: is number 1, floppy drive C: is number 2, and so on) to your hard disk's \CONFIG.SYS file, and then reboot the PC. (If DRIVER.SYS is in some other subdirectory, use the appropriate path in the DEVICE command.)

After DOS has installed the device driver, the message 'Loaded External Disk Driver for Drive *x*' appears, where *x* is a second drive designator for the 3½-inch drive. You can now refer

to the drive by its former designator (B:) or by the new designator. Use the new designator when you want to format a 720K disk. Use the original designator for all other references to the 3½-inch drive, including formatting its disks to 360K, should the need arise.

Metro Traffic Jam

Q. Lotus's memory-resident desktop manager, Metro, places all its default data files (the phone book file, the list manager files, and so on) in the \METRO directory along with its program files. Unlike Borland's SideKick, which allows you to specify a separate data directory during installation, Metro apparently has no way to segre-

gate its program and data files into different directories. Additional data files can be created and stored in various directories, but you must specify the full path in order to use them.

Having data files in the same directory as program files seems to clash with the usual convention of storing data files separately. Furthermore, this file "arrangement" makes backing up terribly inconvenient. Normally, I back up all my data directories daily (using Fifth Generation's Fastback), but I do not back up the files in my program directories. However, the way Metro is configured, I must individually specify each data file for backup, or back up the entire \METRO directory, wasting (continues)

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Circle 137 on reader service card

time and disk space as the program files are backed up along with the data.

The Metro technical support people knew of no solution. Do you have any insights or advice?

*Randal F. Hundley
Little Rock, Arkansas*

A. I can't teach *Metro* the difference between a program directory and a data directory, but I can show you how to reduce the time needed to back up the \METRO directory. *Fastback*, like most backup programs (including DOS's BACKUP), allows incremental backups. This option lets you archive only those files that have been changed or added since the last backup; you can append that set of files to your

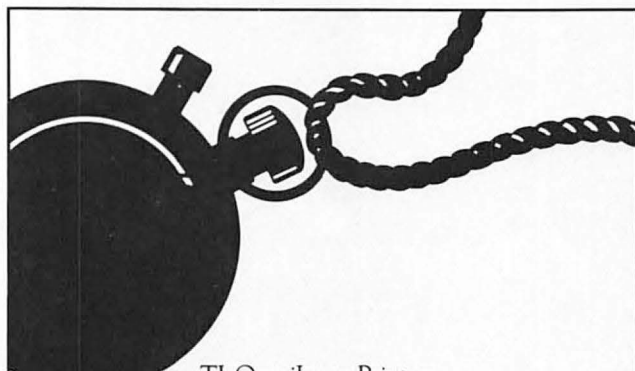
original backup disks. Once you've backed up the entire \METRO directory, you can perform just an incremental backup, which will take even less time than backing up a data directory. (Unlike *Fastback*, the current release of *Fastback Plus* doesn't allow you to append incremental backups. If you're a *Fastback Plus* user, you'll have to keep separate backup sets until another release corrects this omission.)

Cache Management

Q. I am confused about the difference between DOS disk buffers and those found in disk caching software. The DOS manual recommends assigning 20 to 25 disk buffers for a large system

(by using the command `BUFFERS = xx` in `CONFIG.SYS`). At 512 bytes each, 20 to 25 buffers use only 10K to 12.5K. According to the manual, assigning more than that will actually slow down disk access rather than speed it up. On the other hand, I am familiar with disk caching software that will allow you to allocate a buffer of more than a megabyte of RAM. (Supposedly, the larger the buffer, the faster the average disk access.)

Both techniques work by holding previously read disk data in RAM so that when that data is needed again, DOS can get it quickly from RAM rather than slowly from the disk. Why do these two disk buffering tech-



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niques respond differently to increased work space?

Gary Jones

Streamwood, Illinois

A. Why should using more RAM help one disk caching routine and hinder another? The explanation is fairly simple: DOS's disk buffering scheme is rudimentary; a good disk caching program uses algorithms that are quite sophisticated.

DOS allows up to 99 buffers, but each is small—only 512 bytes. When asked to retrieve disk data, DOS steps through the buffers sequentially until it finds the requested data or has checked all the buffers (if the data is not found, a disk read is performed). The more buffers you have, the longer it takes to

canvass them. Examining 25 or more buffers can easily take longer than simply rereading the data from disk.

Well-written disk caching programs index data as it's read from the disk. Instead of searching buffers sequentially, the caching program checks the index and then knows precisely where to go in the buffer to fetch the data (or knows to skip the buffer and go straight to the disk). With large buffers, disk caching can store entire tracks or even complete files. Since the time it takes to check the index and jump to the data is practically the same for any size buffer, having a larger buffer is an advantage since it is more likely to contain the desired data.

Manuals for disk caching programs often suggest that DOS's buffers be kept to a minimum because, compared to the speed of disk caching programs, stepping through DOS's buffers wastes time. Therefore, one should be aware that DOS buffers are set even when there isn't a `BUFFERS=xx` command in `CONFIG.SYS`. As TABLE 1 shows, the default number of buffers depends on the size of the system's disk drive(s) and the amount of installed memory. You can override the default by using a `BUFFERS=xx` command that specifies a smaller (or larger) number. Bear in mind that for computers with a hard disk or high-capacity floppy drive, you should specify at least three buffers.

(continues)

Clarification Statement

We would like to clarify an inadvertent error in our previous advertisement for "Genius Mouse" in which we compared it to the characteristics of the Logitech C7 Mouse. On the basis of information provided by Logitech to us, we confirm the following:

Characteristics of the Logitech C7 Mouse

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Menu and paint software are available from Logitech

Genius Mouse

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Circle 142 on reader service card

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Readers Respond

Let's have a round of applause for those readers who have written regarding past items. It's impossible for me to keep up with everything that happens in the ever-fertile world of personal computing, and I appreciate your comments, criticisms, suggestions, and alternatives. Moreover, although *Help Screen* answers won't leave you out on a limb, there's often more than one way to climb a tree. (Send your correspondence to the address listed at the end of the column.)

Internal Floppy Drives

C: and D:

Stephen L. Odgers of Claremont, California, informs me that Access Computers, listed in February's *Help Screen* as a

source for a floppy disk controller that supports four internal drives, is undergoing liquidation. Two similar controllers, the CompatiCard and the Com-

patiCard II, are made by Micro Solutions; they are available from the manufacturer and from distributors Micro Sense and Cen-

TABLE 1

DOS 3.30 Default Disk Buffers

If CONFIG.SYS doesn't have a BUFFERS command, system configuration determines the number of disk buffers DOS 3.30 sets.

System configuration	DOS buffers
Standard default	2
If any drive is > 360K	3
If base memory is > 128K	5
If base memory is > 256K	10
If base memory is > 512K	15

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PDS Reports + Programs on a Clone

Bernadette M. Kennelly of Pittsburgh, Pennsylvania, notes that while the technique presented in "Compatibles and IBM BASICA" in February's *Help Screen* will enable installation of IBM's PDS

series (PDS Data, PDS Plans +, and PDS Reports +), it does not solve "the more deep-seated problem of running a program in the Reports + module."

"With Reports +," writes Ms. Kennelly, "users can create ('define,' in PDS lingo) and edit BASIC programs that produce reports. However, those programs won't run unless they're very small [read insignificant]. This is because a program generated by Reports + sets aside only enough memory for IBM's BASICA, which is over 40K smaller than a clone's GW BASIC." (As explained in February's *Help Screen*, IBM's BASIC requires less user memory because it consists only of advanced routines) (continues)

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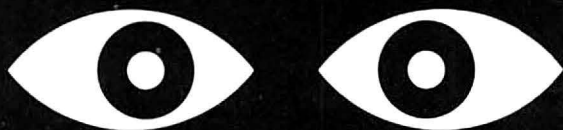


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that augment the BASIC "kernel" already residing in ROM on the IBM PC. Clones do not have this ROM; therefore their BASICs must also include the kernel code.)

"The solution?" concludes Ms. Kennelly. "Skip the interpretive 'Build Mode' in favor of Compiled Mode. You can use IBM's BASIC Compiler or any other. As an added benefit, the compiled programs run six to ten times faster than the interpretive variety."

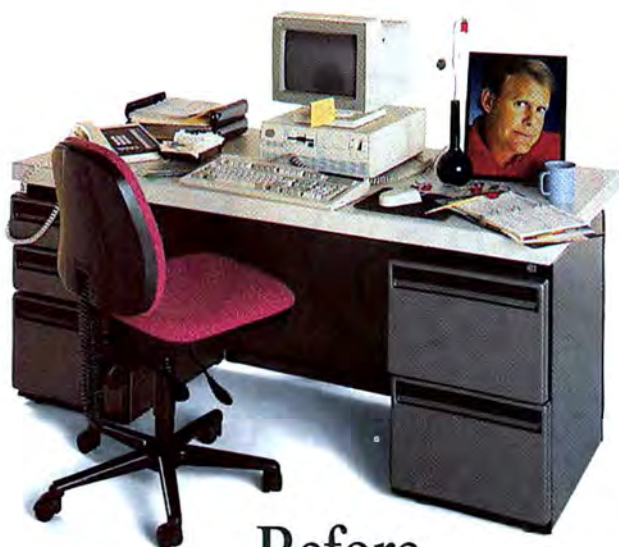
XyWrite III+—Programmable Word Processor of Choice

Christine Rivera, a New York City-based *XyWrite* trainer and consultant, advises that *XyWrite III+* is a word processor with an extremely functional built-in programming language. It supports the variables, loops, conditionals, subroutines, and GOTOs required by the February *Help Screen* correspondent ("Programmable Word Processors") looking to convert his WPL program for lawyers from the Apple II to the IBM PC. "*XyWrite* can reassign keys, enabling programs to be run by pressing a single key. Furthermore, *XyWrite*'s printer drivers and help screens are completely customizable—an important feature for those offering vertical applications to clients such as law firms."

Do you have any questions concerning the IBM PC or compatibles? Send them to The Help Screen, PC World, 501 Second St., San Francisco, CA 94107 or electronically to MCI Mail Karl Koessel/336-4141, CompuServe 74055,412, or The Source STE908. ●

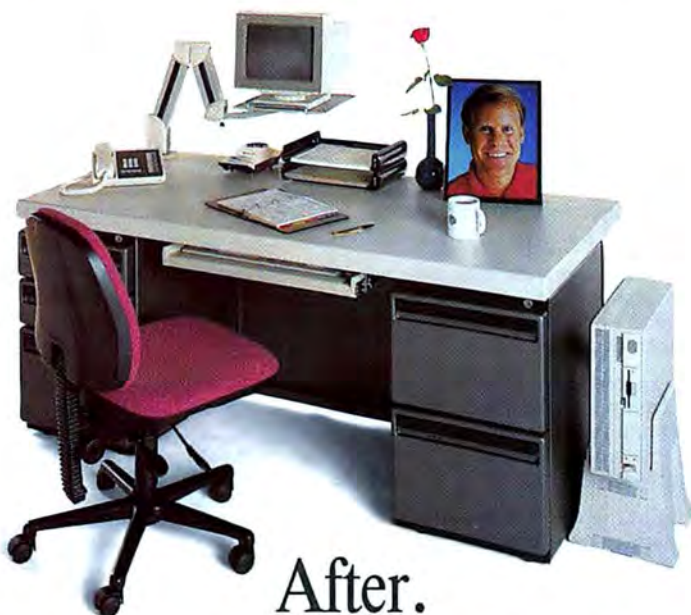
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Edited
by
Tom Swan

No Muss, No Fuss WordPerfect Envelopes

Several WordPerfect envelope-printing macros have graced your pages in the past. I've tried them all but still like mine the best.

ALTE.MAC [see FIGURE 1] finds the start of an address by searching from the top of a document for four hard carriage returns. The macro then turns on block mode and hunts for the end of the address by searching for two more hard returns. This technique automatically selects the entire address no matter how many lines it contains and without requiring the user to place the cursor at the beginning of the address.

The macro then copies the address to document 2, sets the envelope's margins and "page" length, prints the address, and exits document 2 without saving. The envelope is complete and the original document unchanged—no muss and no fuss.

Larry Robertson
Gooding, Idaho

Editor's note: To create ALTE.MAC, first load or type a sample letter. Be sure four <Enter>s precede the recipient's name-and-address block, and two more follow it. (If you use fewer than four hard returns before the address block, modify the macro appropriately.) Then enter the macro shown in FIGURE 1. The comments to the right of the key-strokes will help you to adjust

the margins and page lengths for your envelope size.

Making a Point With 1-2-3

It always frustrates me to have to insert decimal points when entering a list of dollars-and-cents values into 1-2-3. As a solution, a co-worker suggested a macro [see FIGURE 2].

After starting the macro with <Alt>-C, I simply type in a value (for example, 12345) and press <Enter>. The macro automatically inserts a decimal point two places in from the right (which would turn the example into 123.45) and moves the pointer down a cell to await the next entry. When you're done with your list, <Ctrl>-<Break> ends the macro.

This simple macro may be a small step for sophisticated 1-2-3 users, but it's been a giant help to me.

L. D. Mashburn
Marietta, Georgia

Editor's note: To create the macro for use with 1-2-3 release 2, enter the text for columns A and B as shown in FIGURE 2. (Note that \C is entered by typing '\C. Also, if you want to use a different name for the macro, be sure the last letter in cell B2 matches the macro name in cell A1.) Then with the pointer on cell A1, issue /Range Name La- (continues)

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<Ctrl>-<F10>	Turn on macro recorder
<Alt>-E	Name macro
<Home><Home><Cursor Up>	Move to top of document
<F2>	Turn on search forward
<Enter><Enter><Enter><Enter>	Search for four hard returns
<F2>	End search
<Alt>-<F4>	Turn on block
<F2>	Turn on search forward
<Enter><Enter>	Search for two hard returns
<F2>	End search
<Ctrl>-<F4>2	Prepare to copy block
<Shift>-<F3>	Switch to document 2
<Alt>-<F8>	Display Page Format menu
5	Top Margin
18<Enter>	Set top margin to 18 half lines
4	Display Page Length menu
3	Select Other Length
24<Enter>	Set page (envelope) length
22<Enter>	Set number of lines
<Enter>	Exit Page Format menu
<Shift>-<F8>	Display Line Format menu
3	Set Margins
40<Enter>	Set left margin
80<Enter>	Set right margin
<Ctrl>-<F4>5	Move address to document 2
<Shift>-<F7>2	Print page (envelope)
<F7>-NY	Exit document 2 without saving
<Ctrl>-<F10>	Turn off macro recorder

FIGURE 1: ALTE.MAC, an envelope-printing WordPerfect macro, automatically locates a letter's address.

	A	B	C	D	E
1	\C	{ONERROR CLR_ERR}			
2		{?}{edit}/100{calc}{down}/XG\C~			
3	CLR_ERR	~			
4					
5					

FIGURE 2: This macro, <Alt>-C, facilitates entering lists of dollars-and-cents values by automatically placing the decimal point and moving the cell pointer down to await the next entry.

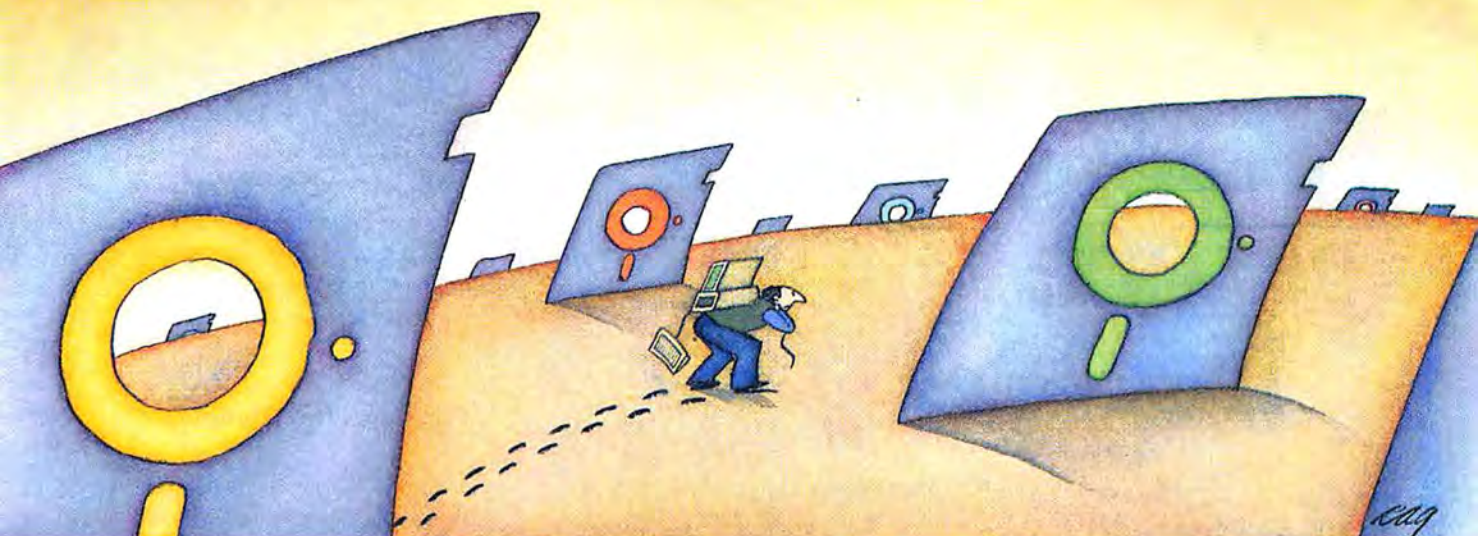
bels Right, press <Cursor Down> twice, and press <Enter>.

Release 1A users can create a similar macro using only two cells: With the same macro name in cell A1, place the macro string shown in cell B2 into cell B1. With the pointer in cell A1, issue /Range Name Labels Right and press <Enter>.

Paradoxical PACK

Borland's *Paradox* does not have an equivalent to dBASE III's PACK command, which removes records marked for deletion. PACK.SC [LISTING 1], which executes *Paradox*'s Restructure command without changing a file's field characteristics, fills the gap.

(continues)



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```
ClearAll
(Tools) (Info) (Inventory) (Tables) ()
X = nrecords("list")
Y = 1
Array C(X)
Scan
  Moveto (Name)
  Copytoarray B
  C(Y) = B[2]
  Y = Y + 1
Endscan
ClearAll
Y = 1
While Y <= X
  ClearAll
  (Modify) (Restructure) Typein C(Y)
  Enter
  Do_it! ClearAll
  Y = Y + 1
Endwhile
```

LISTING 1: PACK.SC is a Paradox script that duplicates dBASE III's PACK command.

The script restructures every data base file in the active directory, optimizing file storage and recovering disk space. Run the script periodically as part of your regular data base maintenance.

Kenneth Olsen
Staten Island, New York

Editor's note: To create PACK.SC from the Paradox menu, select the Scripts, Editor, and Write commands. Type **PACK**, press <Enter>, and type in the script shown in **LISTING 1**. When done, press <F2> to save PACK.SC and return to the main menu. Alternatively, because Paradox scripts are plain ASCII text files, you can use any text editor, such as WordStar in non-document mode or the SideKick notepad, to edit scripts.

To run the script, select the Scripts and Play commands, type **PACK**, and press <Enter>.

PACK.SC runs invisibly, as do all Paradox scripts, except when the ShowPlay command is in effect. When the disk drive stops, all deleted records have been packed off to oblivion.

Pop Goes the Window

I enjoyed Michael Fang's Turbo Pascal pop-up windows ["Pascal Pop-Ups," *Star-Dot-Star*, PCW, February 1988]. I use a similar approach with several enhancements. My program, WIN-DOWS.PAS [**LISTING 2**], displays multiple overlapping windows and then restores the screen by popping each window off the others, like removing dishes from a stack.

This method relies on an array of bytes. Before each new window is opened, the text it will cover is inserted, or pushed, into the array along with the window's size in bytes and its screen coordinates. Removing the windows simply reverses the process, redisplaying the saved text for each window removed.

WINDOWS.PAS uses Turbo Pascal's window procedure to keep Write and Writeln text output within a window's boundaries. This lets programs display text inside windows without any danger of overwriting other information on screen.

Stephen R. Brazzell
Charlotte, North Carolina

Editor's note: I modified WIN-DOWS.PAS to run under Turbo Pascal 4.0. If you have an earlier version, remove the line that begins with 'uses'. This new Turbo command links precompiled library modules (called units) to programs. When you call procedure push_screen in your own (continues)

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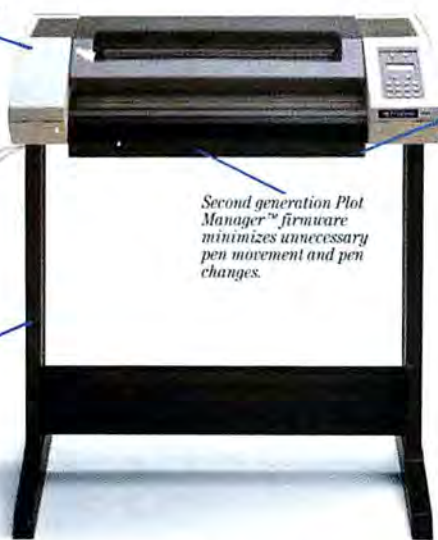
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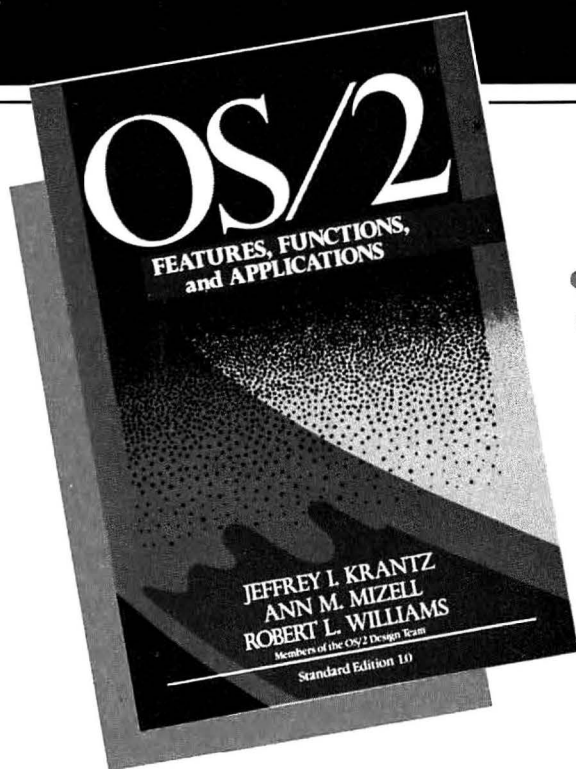
```

program windows;
uses crt, turbo3; ( Turbo 4.0 only; remove for earlier versions. )
const
  top_ss : integer = 0;
  scr_seg = $b800; ( use $b000 for monochrome )
var
  screenstack : array[ 1 .. 10000 ] of byte;
  j : integer;
  cc : char;
procedure dobox( x1, y1, x2, y2 : integer );
var
  ul, ur, ll, lr, h, v : integer;
  x, y : integer;
  procedure putchar( char_num, x, y : integer );
  begin
    gotoxy( x, y );
    write( chr( char_num ) );
  end;
begin
  ul := 201; ur := 187; ll := 200; lr := 188; h := 205; v := 186;
  putchar( ul, x1, y1 );
  putchar( ur, x2, y1 );
  putchar( ll, x1, y2 );
  putchar( lr, x2, y2 );
  for x := x1 + 1 to x2 - 1 do
    begin
      putchar( h, x, y1 );
      putchar( h, x, y2 );
    end;
  for y := y1 + 1 to y2 - 1 do
    begin
      putchar( v, x1, y );
      putchar( v, x2, y );
    end;
end;
function firstbyte( x, y : integer ) : integer;
begin
  firstbyte := ( x-1 ) * 2 + ( y-1 ) * 160;
end;
function lastbyte( x, y : integer ) : integer;
begin
  lastbyte := ( x-1 ) * 2 + ( y-1 ) * 160 + 1;
end;
procedure push_screen( x1, y1, x2, y2 : integer );
var
  a, x, y : integer;
begin
  window( 1, 1, 80, 25 );
  a := 0;
  for y := y1 to y2 do
    begin
      for x := firstbyte( x1, y ) to lastbyte( x2, y ) do
        begin
          a := a + 1;
          top_ss := top_ss + 1;
          screenstack[ top_ss ] := ( mem[ scr_seg:x ] );
        end;
      a := a + 5;
      top_ss := top_ss + 1; screenstack[ top_ss ] := ( x1 );
      top_ss := top_ss + 1; screenstack[ top_ss ] := ( y1 );
      top_ss := top_ss + 1; screenstack[ top_ss ] := ( x2 );
      top_ss := top_ss + 1; screenstack[ top_ss ] := ( y2 );
      top_ss := top_ss + 1; screenstack[ top_ss ] := ( a div 256 );
      top_ss := top_ss + 1; screenstack[ top_ss ] := ( a mod 256 );
      dobox( x1, y1, x2, y2 );
      window( x1+1, y1+1, x2-1, y2-1 );
      clrscr;
    end;
end;
procedure pop_screen;
var
  x, y, a, b, x1, y1, x2, y2 : integer;
(CONTINUES)

```

LISTING 2: WINDOWS.PAS displays multiple pop-up windows.

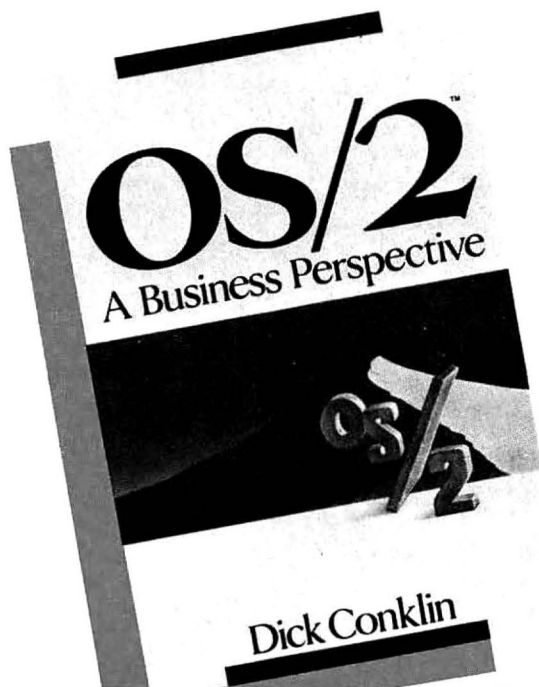
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```
begin
  if top_ss <> 0 then
    begin
      b := ( screenstack[ top_ss ] );
      x1 := ( screenstack[ top_ss-1 ] );
      b := x1 * 256 + b;
      a := top_ss - b - 1;
      x1 := ( screenstack[ top_ss-5 ] );
      y1 := ( screenstack[ top_ss-4 ] );
      x2 := ( screenstack[ top_ss-3 ] );
      y2 := ( screenstack[ top_ss-2 ] );
      top_ss := top_ss - b - 1;
      for y := y1 to y2 do
        begin
          for x := firstbyte( x1, y ) to lastbyte( x2, y ) do
            begin
              a := a + 1;
              mem[ scr_seg:x ] := ( screenstack[a] );
            end;
          end;
        end;
      if top_ss <> 0 then
        begin
          y2 := ( screenstack[ top_ss-2 ] );
          x2 := ( screenstack[ top_ss-3 ] );
          y1 := ( screenstack[ top_ss-4 ] );
          x1 := ( screenstack[ top_ss-5 ] );
          window( x1+1, y1+1, x2-1, y2-1 );
        end
      else window( 1, 1, 80, 25 );
    end
  else window( 1, 1, 80, 25 );
end;

begin
  clrscr;
  for j := 1 to 21 do
    begin
      write( 'ABCDEFGHIJKLMNPOQRSTUVWXYZ*STAR-DOT-STAR*' );
      write( 'abcdefghijklmnopqrstuvwxyz*star-dot-star*' );
    end;
  delcrlf;
  writeln;
  write( 'Hit any key to begin seeing windows.' );
  read( kbd, cc );
  delcrlf;
  push_screen( 2, 2, 67, 8 );
  writeln;
  write( 'Here is the first overlapping window.' );
  writeln;
  write( 'Hit any key to continue.' );
  read( kbd, cc );
  push_screen( 25, 1, 77, 20 );
  writeln;
  writeln;
  writeln;
  writeln;
  write( 'This is an example of another' );
  write( 'overlapping window.' );
  writeln;
  write( 'Press any key to continue.' );
  read( kbd, cc );
  push_screen( 10, 18, 68, 24 );
  writeln;
  write( 'Here is yet another window.' );
  writeln;
  write( 'Hit yet another key to continue.' );
  read( kbd, cc );
  read( kbd, cc );
  read( kbd, cc );
  gotoxy( 1, 25 );
  writeln;
end.
```

LISTING 2: (continued)



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programs, ensure that the values for *x1* and *y1* correspond to the top left corner of the new window and that *x2* and *y2* correspond to the bottom right corner. To remove the top window, call `pop_screen`. Be sure to call `pop_screen` once for every time you call `push_screen`. If you ever receive run-time error 201 (Range Check Error), increase the size of the screenstack array from 10,000 up to 32,767 for Turbo Pascal 3.0 and as high as 64,000 or so for Turbo Pascal 4.0.

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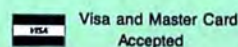
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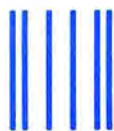
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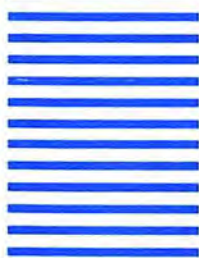
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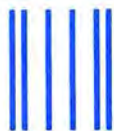
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The Hype of Hypertext

Hypertext promises radical treatment of text through the PC equivalent of free association.

Recent products notwithstanding, that promise is proving difficult to keep.



Robert M.
Carr

Although a pretty hang-loose crowd by nature, we IBM partisans can't help but notice that Apple polishers manage to get exercised about some new subject every year. The hot topic this season is the Macintosh's starring role in transforming hypertext from a vision into a product family.

Hypertext has been kicking around for almost two decades—chiefly as a concept, sporadically as a specialized implementation, and virtually never as a commercial product. So the fanfare now greeting Apple's *HyperCard*, which has issued from users and developers alike, would seem to bode well for the future of hypertext—whatever that is.

That last remark isn't facetious. The problem with this genre has to do with clear definitions. When those in the know speak of hypertext as a radical new way to link words and ideas, heads nod. But as much as *HyperCard* is whetting appetites and tickling imaginations, it isn't likely to dictate the direction of hypertext. What it may do best, ironically, is illuminate the fundamental differences between publishing and programming.

A quick review of recent history is in order. In 1985, a small number of CD ROM applications and a PC product from OWL International called *Guide* began

incorporating genuine hypertext techniques. A few esoteric markets responded. Last August, when Apple began bundling *HyperCard* with every Macintosh, the Mac market embraced the product with predictable fervor. Whether or not *HyperCard* endures, the product clearly launched personal computing into the hypertext age; the following November, to no one's surprise, IBM responded by trumpeting *Hyper Document* for the PS/2.

Popping the Question

But what is hypertext, really? Ted Nelson, commonly credited with coining both the term and the concept, describes it elegantly as "nonlinear text." The characterization is apt: Hypertext is so broad that it's often best defined by what it isn't—linear—than by what it is.

Put more affirmatively, hypertext marries the computer's power to the written word—a mode of communication whose structure hasn't budged in a millennium. Sentences follow sentences and paragraphs follow paragraphs, all (ideally) in logical order. Until hypertext was developed, computer designers and software engineers accepted (*continues*)

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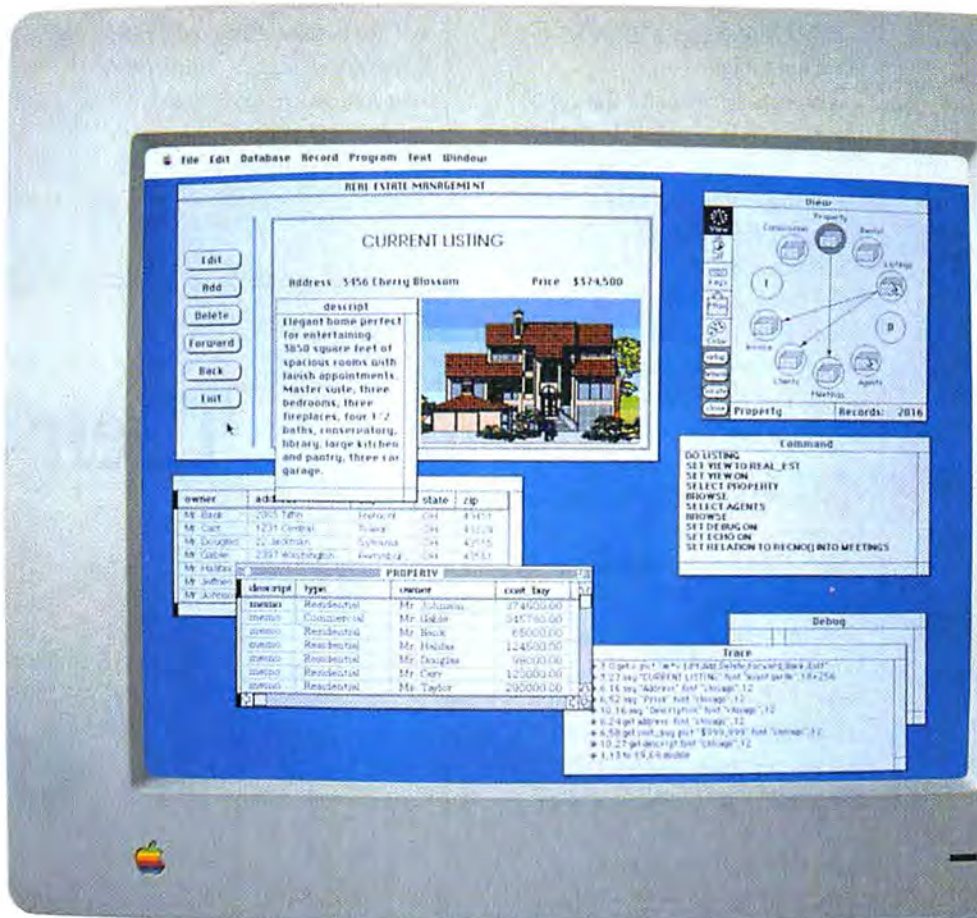
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this linear orientation without a peep. The computer's immense searching and indexing talents—which should enable textual elements to intersect endlessly—remained idle.

Hypertext rewrites the rules, placing you in control. It enables you to interlace hundreds, even thousands, of conceptual threads into any weave you like. The user (as reader) can follow associative links between elements of nonsequential text in cases where the only junction is a particular word or phrase. The user (as author) can draw such connections, leaving associative links for readers to pursue later, as their interest warrants.

In some hypertext systems, the linking process is so simple that any reader can cut a path through text and forge new links. Other systems require intricate indexing best suited to skilled hypertext authors. In either case, a single document no longer needs to reside in a single file; rather, a hypertext document can consist of fragments of files automatically retrieved at the drop of a specific reference. Subsequent edits of any fragment ripple through to any and all documents that include it.

Such a potent means of assembling and reading information does have its costs. Because hypertext documents must be read on line, they turn PCs into "reading devices"—hardly as practical as thumbing through the latest Tom Clancy. Moreover, being a hypertext author may be demanding enough to merit its own cottage industry. Although such an industry is probably a few years away from attracting venture capital, surely *HyperCard* has brought its advent closer.

Text by Association

The closest many of us have come to hypertext is the electronic outliner—which is to say, not very close. Programs like Living Videotext's *ThinkTank* and *Ready* are erroneously regarded as hypertext because they offer multiple views of a

document, collapsing and expanding outline headings. The essence of hypertext, however, involves traversing multiple paths through a document. For this, you need the jump capability that outliners lack.

A hypertext system can provide *hardwired* and *indexed* jumps. With a hardwired link, the author specifies the launch

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point (where you jump from) and the destination of the link (where you jump to). A computed, or indexed, link is much more like a word search command: Once you specify a search term, the hypertext system finds recurring instances and takes you there. To ensure peak efficiency, many hypertext systems require that

documents initially pass through an exhaustive index creation phase. From that point on, the document consists of both the text and the associated index.

In recent years, a variety of CD ROM systems have been built around indexed links. The best example may be KnowledgeSet's *Grolier's Encyclopedia* on CD ROM, which lets a user

highlight just about any word, obtain a list of the articles in which the word occurs, and jump to one of them. This is possible because even the skimpiest CD ROM disks deliver a prodigious 540MB—enough to hold a massive index of the text.

Hardwired links, by contrast, are established by an author who painstakingly links launch points and destinations. Unlike computer-generated indexed links, hardwired links are products of a meticulous editing process, in which many trains of thought and sources of argument carefully intersect.

The benefit of this hand-crafted approach is that hardwired links don't eat up the disk and RAM space that thorough indexing consumes. The editor simply places the hardwired links where they will be of most interest to the intended audience. While full indexing is most appropriate for CD ROM-based texts, hardwired links can live comfortably on any XT-class machine.

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Apple's Hypergraphics

As the name suggests, hypertext has a definite bias for words. That was particularly the case before *HyperCard* made its debut. Text documents could have graphic images embedded in them, but the text emphasis was indisputable.

In introducing *HyperCard*, Apple remolded hypertext to suit the Mac's strong graphics capabilities. *HyperCard* is a hardwired link system that adopts the metaphor of a stack of 3-by-5 cards. The cards represent discrete information containers for modest graphics and unlimited
(continues)

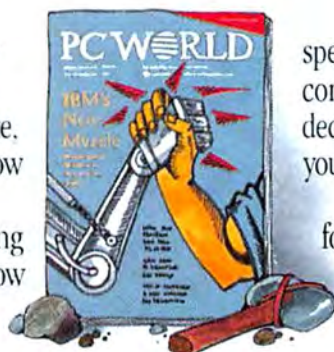
Circle 106 on reader service card



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The best ad for Key Tronic keyboards is a close look at the competition.



Last spring a certain quality conscious consumer purchased what he thought was a Key Tronic KB 5151 Professional Series keyboard from a local retailer.

This same consumer later returned the keyboard to Key Tronic with a letter of complaint. The product, shown above, was used for just over a year, though it looks like it was abused for much longer. Some of the keycap legends had worn away, and had to be replaced by the stick-on labels you see here.

Truth is, while the above product was sold as a Key Tronic

keyboard, a Key Tronic label never appeared on the product. There is no way it could have. Because only keyboards bearing the leading name in keyboard technology offer the quality behind that name.

Close examination will tell you immediately if the keyboard you are purchasing is from Key Tronic. First, look for the Key Tronic Professional Series label in the top left hand corner. Look also at the keyboard's legs to see if they have a rubberized non-skid

covering, just another of the Key Tronic extras that ensure better performance.

Of course there are other features, not initially apparent, that separate a great keyboard from a mediocre one. Take Key Tronic's double shot molding, for example, a process that prevents the keycap legends from wearing away (which proves that the keyboard shown above is not from Key Tronic but rather the handiwork of a lesser manufacturer). And then there is Key Tronic's limited three-year warranty: a



Double shot molding embeds the keycap legend in colored plastic, so it won't wear off.



Other manufacturers use a less permanent printing process.

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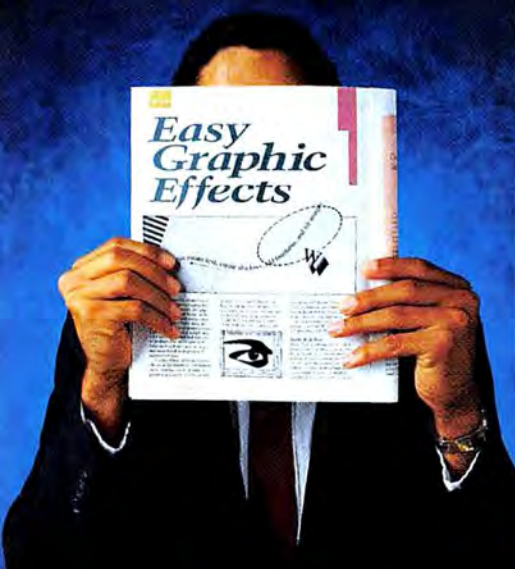
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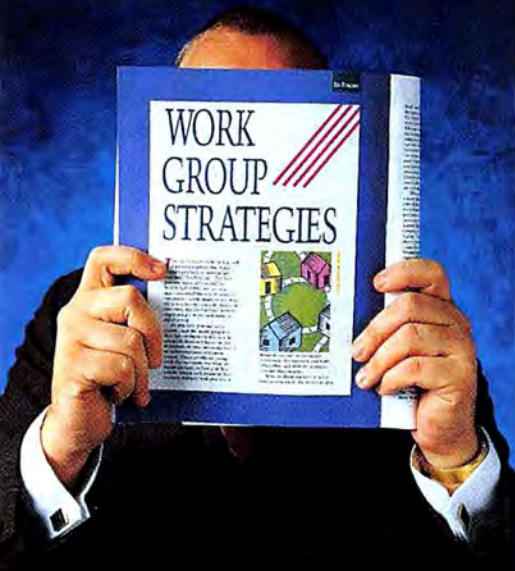
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text. Links are represented as "buttons," which can consist of any combination of text, graphics, and sound. Buttons can be linked to other cards, or—in a masterstroke comparable to 1-2-3's inclusion of macros—can trigger simple programs written in *HyperCard's* clear programming language. Think of *HyperCard's* building blocks as verbs rather than nouns.

Each stack of cards can have its own background—a kind of master overlay containing common graphic and text elements. The background simplifies card creation and conserves storage requirements by keeping these shared elements in one place. Without this key feature, the storage costs of a graphics-intensive application like *HyperCard* would render it simply unusable.

It's hard for a new product to be unconventional, especially if few tested conventions exist to be flouted. Nevertheless, *HyperCard* does break from at least the conceptual mainstream, since it lacks a number of hypertext's classical dynamic capabilities. Missing, for example, is an ability to jump to precise locations in a stream of text that may have been edited after a link was established; you can jump to a card, but not to a specific place within it. In addition, *HyperCard's* data management capabilities are limited to simple word and string searches. It speeds up these searches with "hint" indexes, but this is scarcely the kind of full indexing system you'd find on CD ROM.

Hypertext has long been touted as the ultimate information publishing medium—a description that simply doesn't fit *HyperCard*. Without question, the

product is a superb applications development environment. As such, it's more likely to become an important user programming tool than an authentic hypertext publishing medium.

Portents for PCs

If *HyperCard* turns out to be a harbinger of hypertext for the IBM world, it won't be because PC developers are about to rip a page from Apple's book. Instead, it's likely that hypertext will find a home on PCs via local area networks, which are connecting systems in ever greater numbers.

To be sure, a number of *HyperCard*-like PC products should make it to market this year. These offerings will likely consist of run-time versions of hypertext engines, complete with stacks of cards. Classical hypertext for the PC, though slower in arriving, will emerge in due course. LANs and sophisticated server technology hold the key, because they can supply the critical mass of authors and readers—and dynamic interactions—that true hypertext publishing demands.

The real forerunner of PC-based hypertext is not *HyperCard* or *ThinkTank* but Brøderbund Software's *ForComment*, which enables multiple users to annotate and append a word processing document. *ForComment* points toward a hypertext future because it allows the user to draft, edit, and revise documents more efficiently and effectively through on-line hypertext-like techniques—such as jumps, inclusions, revisions comparison, and embedded commenting.

This budding trend will enable word processors, used as group productivity tools, to evolve into hypertext systems. Hypertext

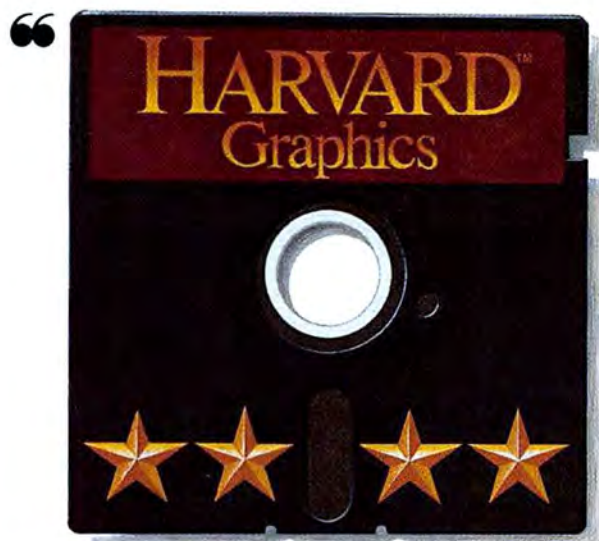
documents will accumulate on networks as a by-product of the document production process, not as its initial objective. Once these annotated, heavily indexed, cross-referenced documents are available in sufficient quantity, tools will be developed for on-line browsing, searching, and extraction. At that moment, hypertext publishing will have truly arrived.

Such on-line hypertext systems really belong in a multiuser environment. Thanks to the powerful hardware and operating system server technology that OS/2 is heralding, the right platforms are becoming available. (Although a multiuser word processor can run on a DOS 3.x machine, such a system must be linked to a file server that runs OS/2 and implements its sharing logic.)

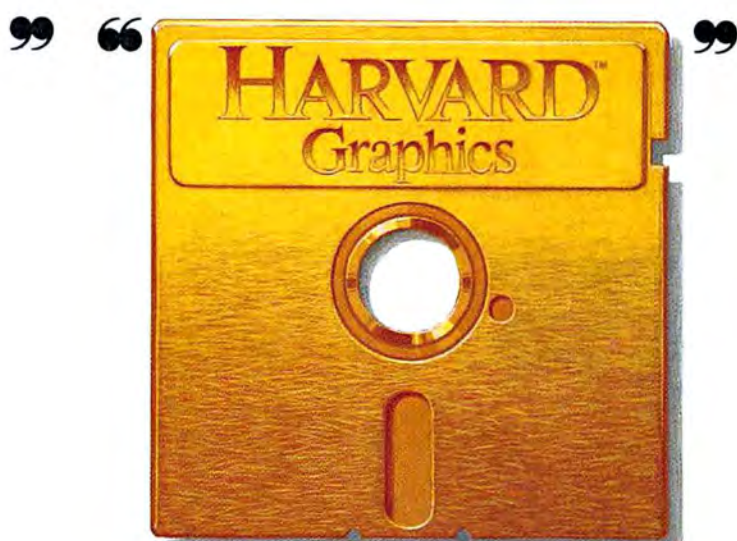
The efficiency of granting multiple users access to one file varies depending on the file's structure and the number of users seeking access. The bad news for hypertext systems is that unlike relational data managers, the text on which they thrive is unstructured; hence, it's difficult to create a solid multiuser hypertext system that permits concurrent updating. The good news is that few users are likely to want concurrent access to the same hypertext file. Although all members of a work group may need frequent editing access to a file, simultaneous editing will rarely occur.

In a bid to keep overhead and hardware requirements low, the first multiuser editing systems will lock the entire file, limiting

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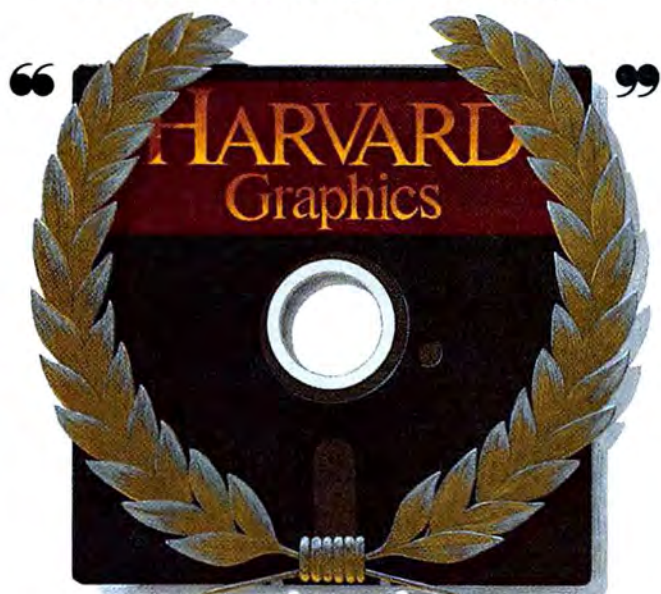


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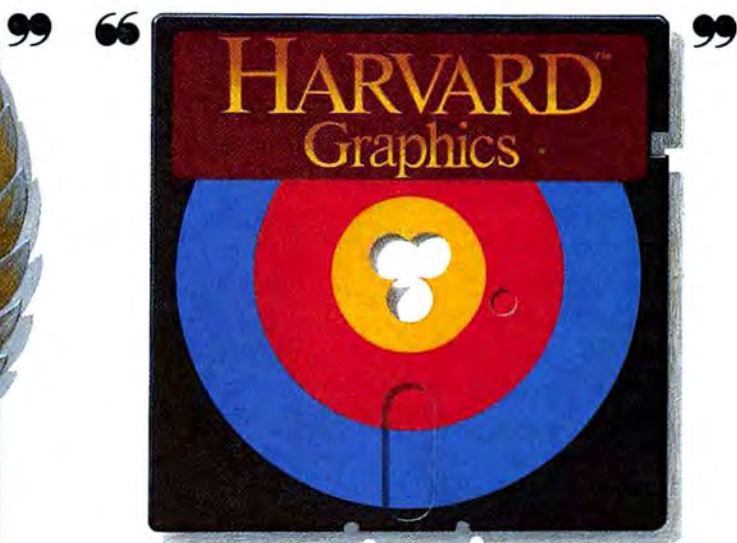


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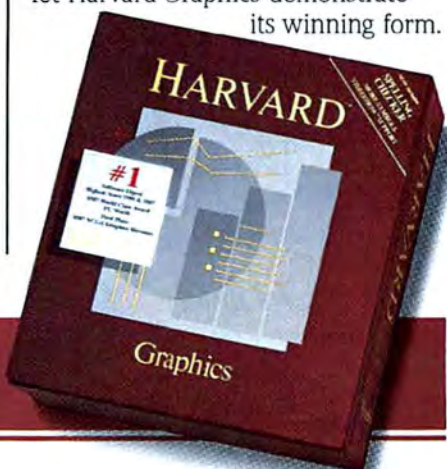
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access to just one user. Problem is, hypertext systems simply aren't svelte; any shareable word processor with ambitions toward hypertext must support word-by-word annotation and version history. This extra functionality will continue to push file servers to the limit. Storing all shared documents and preserving revision histories will necessitate big disks. And performing the indexing needed to jump through links quickly will mean hefty RAM requirements.

Aside from its other limitations, the *HyperCard* model becomes unwieldy when extended to the multiuser realm. Although *HyperCard*'s user interface is ideal for browsing information bases, its technology can't easily be scaled up to include the efficient locking mechanisms that multiuser access and updating require.

Instead, data management "back ends," such as the Ashton-Tate/Microsoft/Sybase SQL server, will likely remain the preferred vehicles for networked, multiuser reference data bases. *HyperCard*-like systems will serve as applications development tools, not as repositories for large amounts of information.

But give Apple credit for trying and for taking the discourse beyond the purely hypothetical. After all, I wouldn't want to end on a hypercritical note. ●

Robert M. Carr is the creator of Framework II and a cofounder of Go Corporation, a software start-up.

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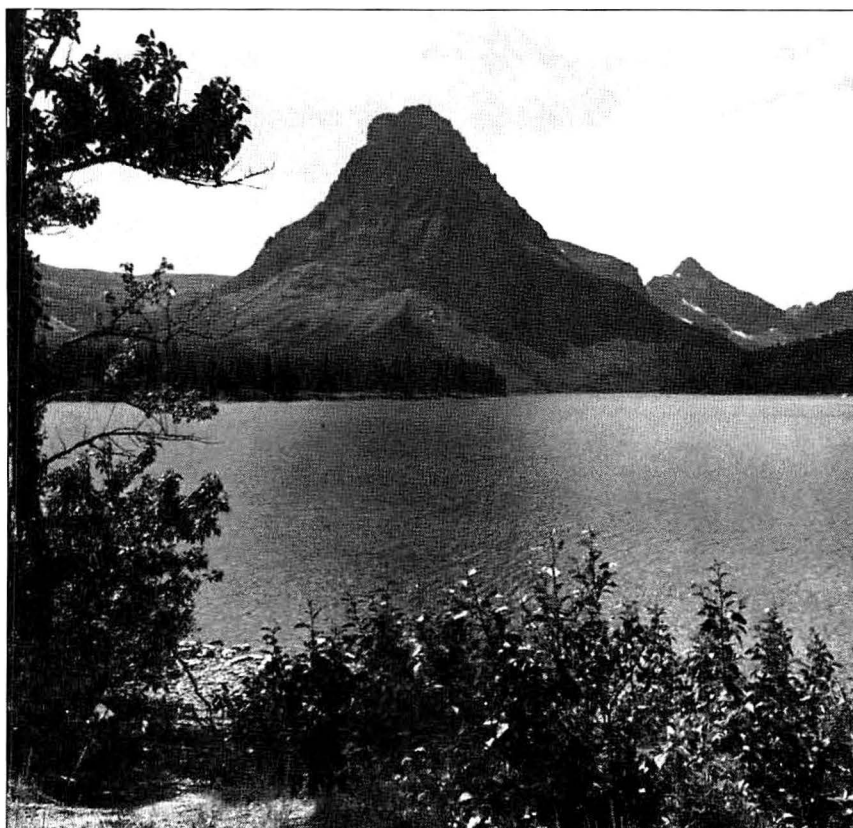
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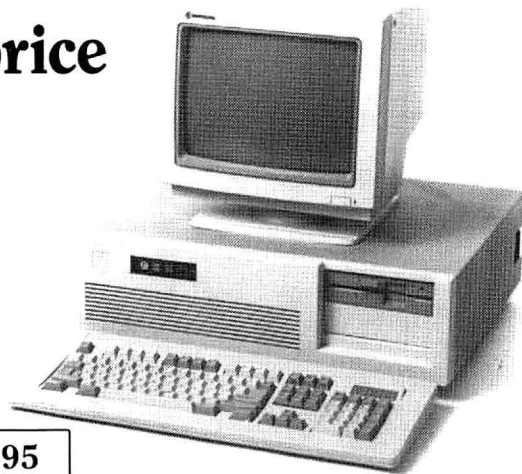
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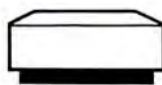
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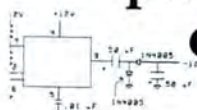
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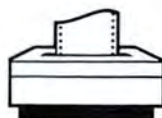
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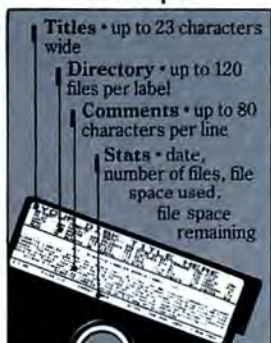
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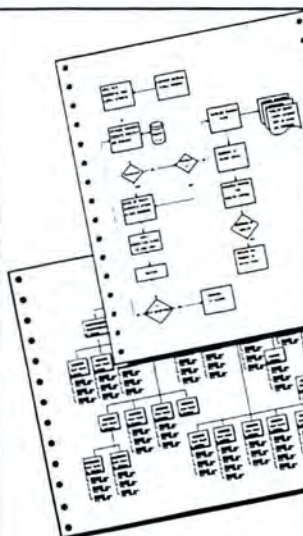
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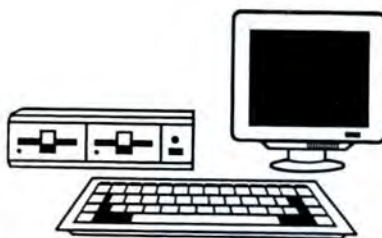
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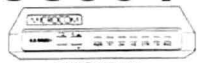
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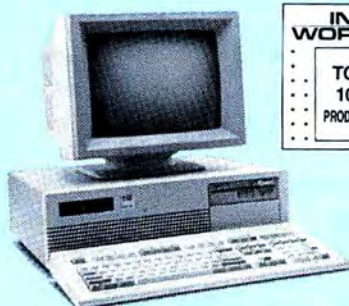
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As an MIS manager, I've been accused of overpromoting PCs as the ultimate office productivity tools. But any tool, used appropriately, can increase organizational productivity. Conversely, tools applied inappropriately will dilute the effectiveness of any team. As it happens, two common attitudes toward PCs have convinced some that *PC productivity* is a contradiction in terms—like *jumbo shrimp*.

The first attitude—that the PC is some kind of status symbol—is common among influential managers, which makes it difficult to dispel. Just as corner offices and expensive furnishings are often coveted by managers sensitive to perceptions of their relative position or authority, so too is this enigmatic talisman. This fantasy not only fosters resentment among those who think they could make better use of a PC, but also provides damning evidence for those who maintain that the PC is nothing but an expensive toy.

It's hard to suggest a solution to this problem except to say that, eventually, all groups involved will grow out of it. One way to accelerate the process is by dispelling a second common myth: The PC is the answer to every worker's problem. True,

PCs are versatile and valuable tools; so are Swiss army knives. The problem lies in the application—or, more accurately, the misapplication—of microcomputers for tasks best suited to other technologies.

For every star salesperson with a hundred clients, a hundred Willie Lomans are grinding it out with a handful of contacts. The former can justify a PC data base with an automated directory and dialer; the rest could get by with pocket calendars and memory dialers on their telephones. There's such a thing as too much technology. Remember, few people actually use those bulky jackknives with fork, spoon, corkscrew, and awl.

A year ago, our organization installed keystroke-logging software on all 123 of our far-flung PCs to track their usage. We found that only 61 were in use more than three hours a day, and 26 of those were employed as little more than glorified typewriters. Only 11 PCs were used for data base, spreadsheet, or other applications that we believe enhance managerial or technical staff productivity—and therefore justify their price tags.

If we want word processing, we have much cheaper ways to accomplish it. In fact, considering the proliferation of annoying little pictures and mixed fonts

that began appearing on memos after we discovered desktop publishing, some of us argued that this capability actually detracts from a manager's productivity.

On the other hand, our treasury department's productivity has improved manyfold since we replaced its giant ledgers with a spreadsheet. Data entry costs have plummeted—from one staff member working full time to one working an hour a day—and we get better reporting and graphics capabilities as well.

We've also learned that it isn't enough to place the right tools in people's hands; you've got to train them to use the tools correctly. A lack of training led directly to the underutilization of our PCs. During the past year we have taken pains to change that, transforming 27 of our machines (out of 158) from expensive paperweights into productive PCs. That's about 17 percent—a small step, maybe, but it's a start.

So I still champion the PC. But to make it truly productive, you have to match its talents to the task and teach people how to unlock its potential. ●

Bill L. Jacobson is micro systems analyst for the Vancouver, Washington, City/County Consolidated Computer Center.

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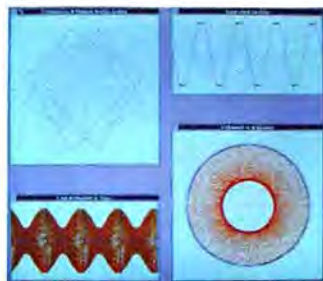
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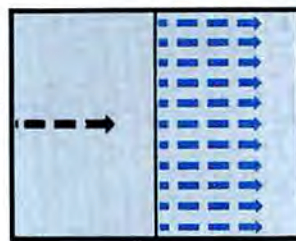


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