

ALL-HARDWARE SPECIAL ISSUE!

PCWORLD

DECEMBER 1990 \$2.95 CANADA \$3.95

HARDWARE **FOR WINDOWS**

270 Fresh Products That
Do Windows **NOW**

NEW SYSTEMS

85 Price-Busting SXs
7 Windows-Ready SX Laptops
5 Compact 386 Dynamos

NEW DISPLAYS

126 Super Boards and Monitors

NEW PRINTERS

6 Smart PostScript Buys
31 LaserJet Workhorses

PLUS

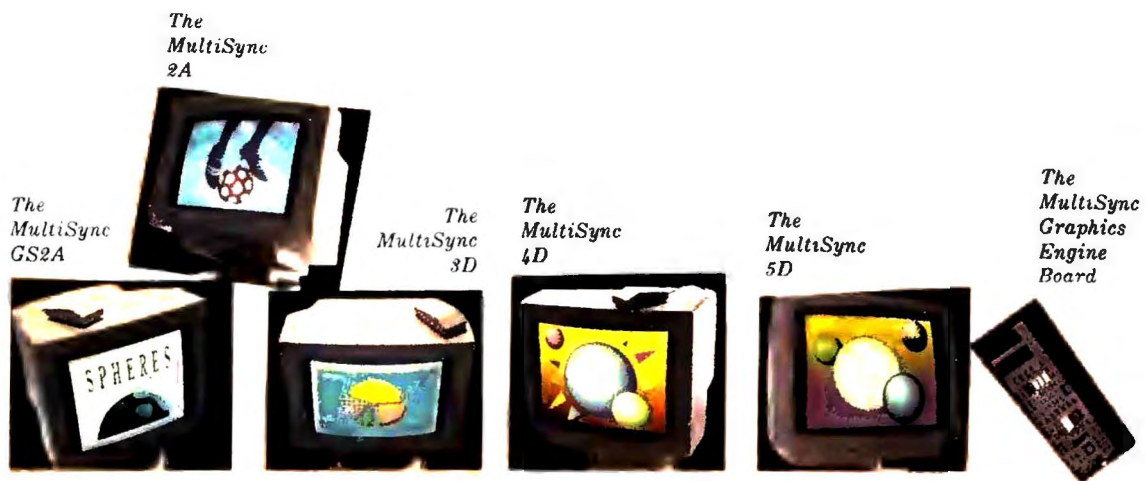
10 Top Upgrades
How to Switch to Windows



INCORPORATING

PCResource

There's really nothing to say about our monitors.



NEC

Circle 187 on reader service card

... from ports and sync timings)

PC FACT FILE
EDITOR'S CHOICE

Graphics Engine
Technologies Inc., 1255 Michael Dr. Wood Dale, IL 60191, (708) 880-9500

\$4 or higher-resolution monitor
board with built-in VGA
to accept a wide
installed and
documentation, this is
application.

READER SERVICE CARD

APRIL 10, 1990 PC MAGAZINE 163

accelerator software
dramatically boost the speed of
Windows and Presentation Man-
ager applications.

NEC

The super
MultiSync

**The
Bottom
Line**

If you use high-resolu-
tion graphics and win-
dowing environments, NEC's
monitors won't disappoint.

The user-friendly Swiss army knife of multiscanning
monitors, the NEC Multisync 3D displays bright, true
colors and very sharp text and graphics. All controls
are conveniently mounted up front, including micro-
processor controlled push buttons for manually ad-
justing screen size. The

Bearing this in mind, our top pick
the products reviewed here is the NE
Multisync GS24. It has an even
higher resolution than the rest, and t
NEC's large, flat screen on which
ing with superior glass protection. T
higher resolution means it
comes with the best

Seldom does a company dominate
a market the way that NEC does
with multiscanning monitors, and its
latest innovations show why.

That hasn't

The Multisync 3D,
which includes a 9-pin and 15-pin video cable, is the
best of the multiscanning monitors we tested.

PC FACT FILE
EDITOR'S CHOICE

NEC Multisync 4D
NEC Technologies Inc., 1255 Michael Dr. Wood Dale, IL 60191, (708) 880-0336
List Price: \$1,699 (cable included)
Requires: VGA Super VGA, 8514 A, or 1 024 x 768 graphics adapter
Diagonal Screen Size: 16 in
Short: The 16-inch NEC MultiSync 4D is the lowest-priced monitor in the MultiSync line to 1,024-by-768 noninterlaced resolution. It features 1 MB of digital memory.

READER SERVICE CARD

By moving graphics screens at a
blistering pace, the Graphics Engine
brings improved performance to
desktop publishing, CAD, and other
graphics applications and

**A BEST-TO-SELL WINNER
MONITOR:
NEC MULTISYNC 2A**
With high-performance, high
quality and reliability, it may be
important than price. And with
many graphics standards out t
software compatibility is a big i
The MultiSync 2A 16-inch color
rator from NEC Home Electro
(U.S.A.) delivers in all drunts.

The 4D's ap-
elegant in the e

Monitors Look to the Future

lays of NEC's new
and 5D monitors por-

MultiSync 5D offers similar

NEC MultiSync 3D



PROS: Supports all boards
"bers" screen adjustment
pitch

MultiSync 2A, MultiSync 3D

"Works

Better!"

"Looks Great!"

**The
Bottom
Line**

The MultiSync Graphics Engine has the power to put Windows or PM into the mainstream.

Overall, the NEC MultiSync Graphics Engine is powerful, versatile, and fast—it is a perfect match either for an NEC monitor or for the high-resolution monitor of your choosing.

I'd
take the crisp NEC over the fuzzy IBM im-
age any day.

een said.

If you want a monitor for VGA level and up, the NEC MultiSync 4D is an excellent choice.

Buyers of NEC's MultiSync 2A awarded that monitor the highest scores in the four top-ranked attributes—

ch to storing settings is
ne.



FINALISTS
NEC MultiSync 3D, 4D, and 5D monitors

■ Jerry Benson, Tom Grau, Wayne Hinson, Keith Schaefer
■ NEC Home Electronics (U.S.A.) Inc., 1255 Michael Dr.,
Wood Dale, IL 60191; (312) 960-9500

NEC got out in front first with the MultiSync—and stayed there. The 3D, 4D, and 5D monitors are significant additions to the MultiSync family. They add digital controls and automatic recall of user preferences for each video mode to a product line that's already won the Award for Technical Excellence and numerous Editor's Choices. The 4D monitor takes multiscanning into a new dimension: the 16-inch tube may prove to be the perfect size for high-resolution color work in cramped offices.

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NEW PRINTERS

6 Smart PostScript Buys
31 LaserJet Workhorses

PLUS

10 Top Upgrades
How to Switch to Windows



You don't have to use Windows to appreciate the 270 products showcased in our fourth annual Hardware Special Issue. But if you're planning to emigrate to Windows, you won't find a better guide to smart hardware selection than the one starting on page 148.

Cover photograph by Robert Lorenz

PREVIEWS

- 91 **Quattro Pro 2.0, the Presentation Spreadsheet** . . . *John Walkenbach*
When it comes to business graphics, the newest version of Borland's *Quattro Pro* outshines all the competition. And it's as impressive a spreadsheet as ever.
- 99 **SX Notebooks Hit 20 MHz** *Michael Goodwin*
Compaq's just-introduced LTE 386s/20 handles a whopping 10MB of RAM. Its rival, the TravelMate 3000 from Texas Instruments, boasts its own virtues.
- 105 **Word 5.5's Big Risk: A Top-to-Bottom Make-Over**
George Campbell
The influence of *Windows* is plain to see in the latest upgrade of *Microsoft Word*. But relax, *Word*'s features and functionality remain intact.
- 113 **The Hardcard Races Ahead** *TJ Byers*
Excellent-upgrade alert! At 50MB and 105MB, the newest hard disks on a board are roomier and faster than ever—and they're also cheaper.

REVIEWS

- 148 **Hardware for a Windows World**
This fourth annual Hardware Special Issue deals exclusively with the systems, printers, and displays—for every business and budget—that *Windows* likes best.
- 156 **25-MHz 386s: Great Performance in a Small Box** . . *Scott Spanbauer*
These small-footprint machines deliver the speed and memory *Windows* requires. Beyond this, they reveal a healthy trend in high-performance systems.
- 161 **Buying Smart: What to Look for in a Windows Workstation**
In a nutshell, key considerations when shopping for a *Windows* system.
- 175 **PostScript Printers: Great Fonts Faster Than Ever** *Ross Smith and Daniel Tynan*
These six printers do the double duty that business users demand: The best deliver high-quality output plus speed and durability.
- 178 **Buying Smart: Finding the Right LAN-Duty PostScript Printer**
How to select the best PostScript printer for your work group.

NEWS

- 15 **Top of the News**
Mike Hogan
Late-breaking news you can use.
- 79 **Industry Outlook**
Edited by Eric Bender
- OS/2 future clear as mud, as IBM and Microsoft agree to disagree
 - PC product outlets go gargantuan with debut of superstores
 - Users overwhelmingly prefer 386's price/performance over 486's
 - Dissatisfied with tech support, NetWare sites practice self-help

- 117 **Product Outlook**
Edited by Mike Hogan
- NEC blazes new notebook territory; Tandy takes middle path
 - New Grid laptop designed expressly for *Windows-to-go*
 - Lightweight laptop companion: the Canon BJ-10e portable printer
 - *Presentation Team* makes a bid to distinguish itself from the herd
 - Speedier, easier backups with *Back-It 4* from Gazelle Systems
 - A laptop with color VGA from Dauphin Technology
 - Desk space precious? The Infinity Desktop 386SX is extra small

- Dell introduces a pair of 486 EISA towers for the server market
- Dycam's half-price alternative to scanners for importing photos
- Symantec's *GrandView*: Is it a text outliner or a PIM? Both
- Budget bliss: Packard Bell's full-featured 386 line
- Howtek and UMAX offer affordable color DTP scanners
- Cheap connections: *The \$25 Network* and *Little Big LAN*
- 9600-bps modem prices tumble as standards settle down
- Move DOS graphics to *Windows* with *ImPort for Windows*

180 PostScript Reaches a New Level

Caution: Will your PostScript printer be upgradable to PostScript Level 2?

189 Seven SX Laptops: Windows for the Road John Diebold

Laptops have come a long way since the luggables of yore. Big hard disks, great screens, and SX power enable the best of these totables to do *Windows* with flair.

191 Buying Smart: Choosing a Windows Machine to Go

Read this before shopping for a *Windows*-strength laptop.

197 Portable Pointers

An appealing alternative to traveling with a mouse or a trackball.

FEATURES

202 On Site: Putting Windows to Work Alice LaPlante

What do a small suburb, a biotech firm, and a health products company have in common? They all switched to *Windows*. You can benefit from their stories.

209 Buyers' Guide: Displays That Outshine VGA TJ Byers and Eric Knorr

All these boards and monitors offer higher resolution and more colors than VGA. A slightly bigger investment may get you a lot more graphics impact.

210 New Monitors Reduce Eyestrain

On the horizon: reduced screen flicker, less eye fatigue, and greater productivity.

228 Buyers' Guide: 16-MHz SX Systems Susan Lusty

You don't need the slickest 386 machine to run *Windows*. Price-busting SX systems do nicely. Here's where to look and how to pick them.

240 Buyers' Guide: LaserJet II Compatibles Daniel Tynan and Cathy Smith

No need to grieve the passing of Hewlett-Packard's LaserJet II. A number of alternatives offer equal or better bang for the buck—especially for LANS.

HOW TO

261 Instant Reference Card

Windows, from start-up to creating PIF files.



These 386 desktop dynamos aren't just fast, they're compact, page 156.



Are video boards and monitors keeping up with the demand for sharper screen images? See for yourself, page 209.

DEPARTMENTS

11 In This Issue

Eric Knorr: He does it all for you.

21 Richard Landry

How the PC industry can avoid a slump in 1991.

27 Letters

Borland's courtroom fight with Lotus inflames reader passions.

41 Help Screen

Karl Koessel

Prevention of dreaded parity check errors made easy.

59 Network Q&A

How to reclaim workstation RAM.

65 Consumer Watch

Roberta Furger

Concerned about VDT radiation? Don't just sit there, do something! Here are your best options.

66 Rate Your Satisfaction

What's the favored source of software? Probably not what you think.

251 Star-Dot-Star

Edited by Tom Swan

Faster keyboard response; extension-free *Windows* file launching.

269 Developer's Toolbox

Convert BAT files to EXE and COM executable programs.

322 Taking It Home

Lawrence J. Magid

It makes good sense to build your own integrated applications.

INFORMATION

272 PC World Catalog

A convenient buying guide to PC products and services.

293 Advertiser Index

294 Products Featured in Editorial

297 PC World Mail-Order Shopping Guide

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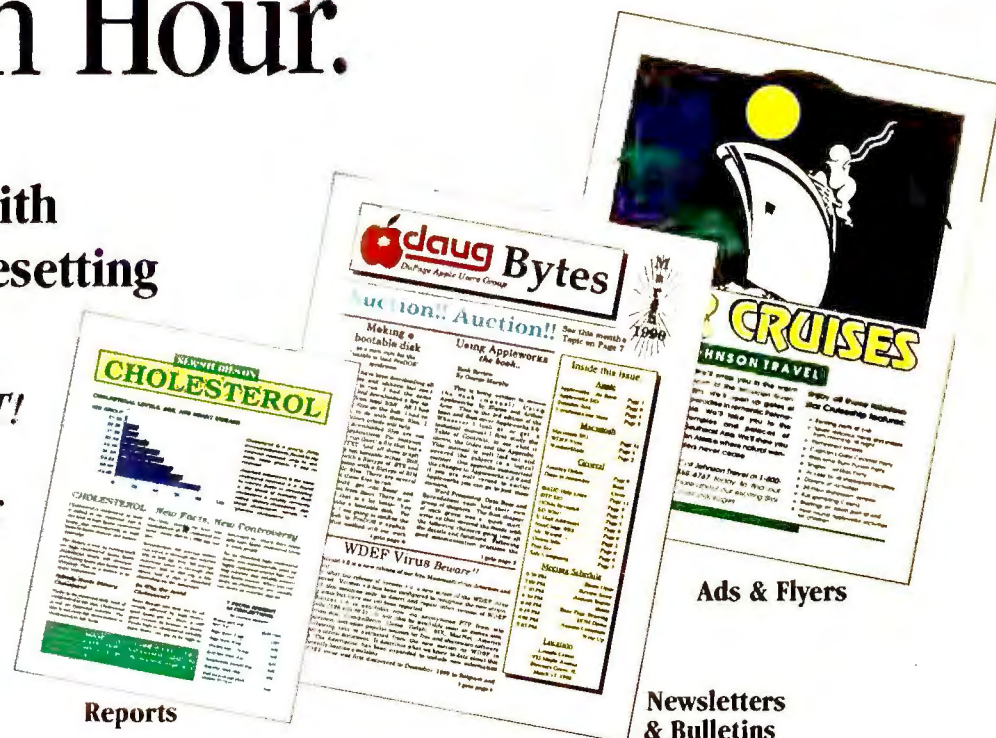
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Circle 260 on reader service card



This issue marks
Eric Knorr's debut as
editor of *PC World*.

Eric Knorr—the *K* is silent, like the powdered soup mix—is a fanatic. He's not dangerous, but he is obsessive—he's driven by a compulsion to find out everything there is to know about PC hardware and technology. And you, our readers, stand to benefit from Eric's quest, because this issue marks Eric's promotion to editor of *PC World*.

No one's sure when Eric's attraction to hardware and technology first surfaced. We do know that it was already quite developed by the time he joined the editorial staff of a slim film and video magazine called *Moving Image* in the early eighties. In 1985, Eric found his way to *PC World*. Soon after arriving, he introduced the concept of a special hardware issue and established himself as the staff expert on graphics hardware. More important, he seized every opportunity to push *PC World*'s mission to the limit. To Eric, that mission can be described in one word: *clarity*. He doesn't mean just clear writing; he means clear everything. At story meetings, for example, Eric exhorts assigning editors to defend their proposals by articulating the benefit for the reader. If a staffer's explanation doesn't measure up, Eric jumps right in. "It's not *clear*," he'll say. "Let's talk about how to focus this concept."

Eric's emphasis on clarity and his innate passion for PC hardware are great assets in his new job. But they alone do not qualify him for the position of editor. Nor was he promoted because of his management and communications skills, his history of 12-hour workdays, or his softly spoken but wry and always appreciated sense

of humor. These and other traits and skills are not trivial; they are essential. But the main reason Eric Knorr was named editor was his uncompromising devotion to your needs and interests. Whether he's making time to represent *PC World* reader perspectives by participating in VESA (the Video Electronics Standards Association), sitting down with our infographics specialist, Jeff Glines, to fine-tune a diagram, or critically inspecting some new hardware device, Eric Knorr knows he works for one master, the reader. This has always been true of the best editors. And it has always been true of Eric Knorr.

What have Eric and his colleagues wrought in this special issue? No surprise: mainly hardware (though with the usual front-and-back battery of product news, technology trends, management advice, and hands-on technical assistance). All of the durables featured here are particularly suited to running *Windows*, which is not to say their usefulness is limited to *Windows*. The roundup of new 25-MHz small-footprint 386 systems, for example, will appeal to anyone who values compactness but doesn't want to sacrifice performance. Ditto the seven SX laptops reviewed. Just about everyone is interested in output, whether this refers to how applications look on the monitor or how work looks when printed. Our Buyers' Guides address both angles, with monitors and boards that outshine VGA, plus LaserJet II compatibles. You'll also find a review of six networkworthy PostScript printers.

I hope you enjoy this fourth annual Hardware Special Issue. I know it's just the beginning of many good and useful things from *PC World* editor Eric Knorr. ☺

Richard Landry
Editor in Chief

If you think the HP LaserJet III is great,

ASTRONOMY IS
LOOKING UP
THE HIRSCH REPORT OF THE SKIES VOL. 8 NO. 4, FALL 1990

STAR SHORTS

Reported by The Star

Every day billions of dust particles enter into Earth's atmosphere. Now scientists are working to make me-

teor-burst communica-
tion a practical and
economical alternative
to the use of tele-
(continued on page 2)

You Can't See the Great Wall from the Moon!

Everyone has heard that you can see the Great Wall of China from the Moon. Or from Earth orbit. Or even from Mars. Certainly you cannot see the Great Wall from the Moon. According to

an astronaut, it's diffi-
cult even seeing conti-
nents. You may be able
to see the Great Wall
from orbit, but, in gen-
eral, it's difficult even
to see familiar objects,
the planet's swift mo-
(continued on page 3)

NO BLACK HOLES?

Scientists are still unable to confirm the existence of even a single black hole, despite widespread belief that such things should exist. Tracking down these invisible objects isn't easy, because they can only be studied indirectly by the effects they have on their surroundings. There are several types of pieces that
(continued on page 3)

MIRROR, MIRROR

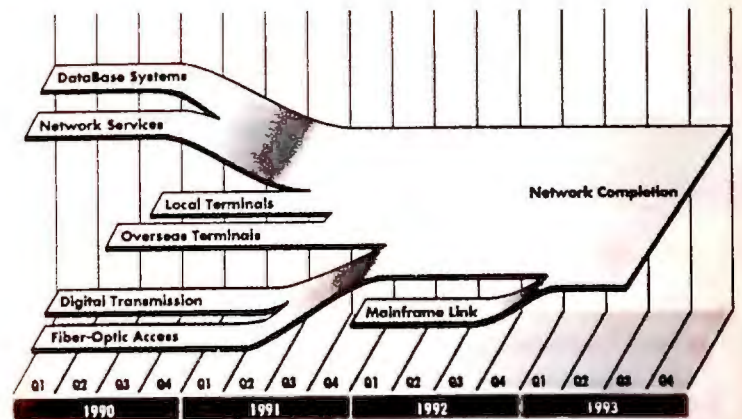
It's a chore, but all reflecting tele-
scopes require cleaning their reflective
mirrors. Eventually, the aluminum coat-
ing on their mirrors deteriorates and
needs replacing. For large instruments,
the process requires removing the tele-
(continued on page 3)

More on planetary explosions inside.

Voyager's Last Picture Show
When Voyager 2 was launched 12 years ago, who could have imagined these photos at this point in time



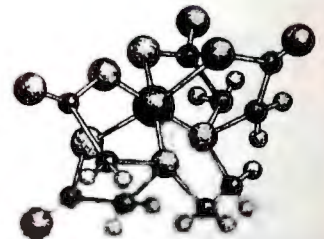
LONGUST NETWORK INTEGRATION PROJECT PROPOSED TIMELINE



CHAIN REACTION

AUGUST 1990

JUNE 9, 1990
VOLUME FOUR
ISSUE THREE



New Leaps in Metal-
Organic Chemistry

What's New in
Superconductivity?

Antimatter Bottled

Fifty Years Ago

Metal-organic chemistry bridges the gap between organic and inorganic chemistry. It can lead to important new products (for example, poison antidotes). A chelate, such as EDTA (above) complexing carbon, hydrogen, oxygen and nitrogen atoms) can surround ions of metals and remove them from unwanted places. (continued next page)

It was almost exactly three years ago that a ceramic material that superconducts above liquid nitrogen temperature was discovered. Within days of the discovery, electronics, power transmission, and transportation were being redefined in everyone's imaginations. Yet superconductivity was not a new phenomenon. The effect was first observed in mercury in 1911, and, since then, more than 6000 elements, alloys, and compounds have been found to superconduct. (continued next page)

A device tested may give investigators a glimpse of what an antiter world might look like. The device cools antimatter to a temperature a few degrees above absolute zero and stores it for several days at a time. (continued next page)

Remember that before WWII, our chemists were asper-
a distilling process to lower the calories of ordinary beer.
the research at the onset of world war, researchers then
development of a shelf-stable C ration. Don't believe all ru-



Introducing the new HP LaserJet IIID printer. The LaserJet that combines all of the advanced capabilities of the exciting LaserJet III with all of the paper-handling features required by today's busy office.

There's a lot to like. Like two paper trays for different types and sizes of paper. 200-sheet

capacity in each of those trays for less reloading. And two-sided printing that lets you easily condense your output. Even an optional automatic envelope feeder that eliminates manual feeding.

Equally impressive is HP's Resolution Enhancement technology.

Pioneered in the LaserJet III, this technology actually varies the sizes of dots. So curves really curve. Lines are never jagged. And you get resolution never before seen in a 300 dpi printer. Output has never looked so good.

Documents can be made even more elaborate thanks to our en-

you'll automatically like the new HP LaserJet IID.

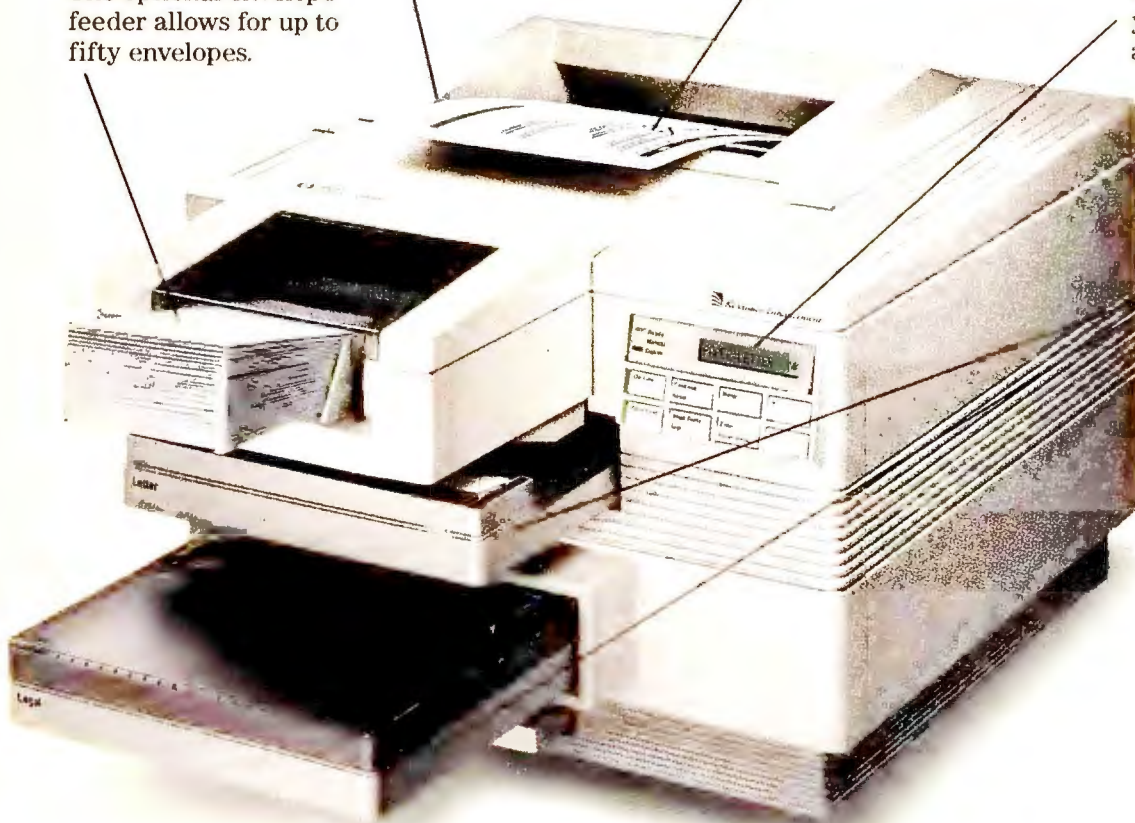
Two-sided printing means better paper usage and more professional-looking documents.

Resolution Enhancement technology actually shrinks dots to handle the finest curves.

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Enhancements to our HP-GL/2 language allow you to reverse, scale, and shade output.

Two paper trays allow for regular or legal correspondence while also increasing paper capacity.



hanced PCL5 printer language, which includes HP-GL/2 graphics language. You can print regular or reverse type. Shaded text. Even portrait and landscape on the same page.

Beyond this, all types of options are available for all types of users. Which means you can customize with Adobe® PostScript® software. Add memory. Or better express yourself with our MasterType

library of fonts and typefaces. You can even connect a Macintosh.

The best part is that the \$2,395* LaserJet III and \$3,595* LaserJet IID are both easily within any budget. So call 1-800-752-0900, Ext. 1586. We'll tell you where to find your nearest authorized HP dealer.



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It's easy to see why LANtastic™ PC Network sales have skyrocketed — enough for 39th in *Inc Magazines* "Inc 500".

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*Based on manufacturer's suggested retail price for a 10-computer LAN using LANtastic 2Mbps adapters. Cost is slightly higher for smaller networks. ©1990 ARTISOFT LANtastic is a trademark of Artisoft.

Circle 6 on reader service card

IBM SHIPS 486s

Downsized OS/2, Graphics Standard Debut

IBM rolled out its first full-blown 486-based PCs in late October along with a downsized version of OS/2 and a faster, higher-resolution graphics adapter intended to replace VGA (see "IBM Pushes Graphics Higher"). Although appearing later than similar entrants from clone makers, IBM's 486 tower and desktop models run the most demanding applications.

Designed for network service and other power-hungry jobs, the Model 95 XP 486 combines Intel's most powerful CPU with fast I/O and an unusual amount of expansion room. The tower comes in 33-MHz and 25-MHz versions



and ships with 4MB of memory (expandable to 32MB on the system board) and a 256K memory cache option. The system has six available 32-bit Micro Channel slots and a cached SCSI adapter and holds up to five internal disk drives of 80MB, 160MB, or 320MB capacity. A desktop version, the Model 90 XP 486, offers three available slots and takes three internal drives.

All models are scheduled to

ship in November, but prices were not available at press time. Also missing was IBM's "Super Server," the dual-processor network server shown in prototype for a year, and a long-awaited laptop. IBM still hasn't produced a sub-20-pound portable, although several competitors sell 20-MHz 386SX notebooks.

However, IBM did release the much-discussed OS/2 1.3, which works up to 25 percent faster than earlier versions. The Presentation Manager alternative to Microsoft's *Windows 3.0*, OS/2 1.3 can run one DOS and two OS/2 applications in as little as 2MB of memory. It's the first major PC environment to provide true WYSIWYG fonts—bundling in *Adobe Type Manager* for the same scalable PostScript fonts on both screen and printer. The release also sports a friendlier interface.

IBM SHOWS INK JET

Wide-Carriage Model First in Series



IBM has introduced a wide-carriage ink jet to provide an

upgrade path into nonimpact technology for its dot matrix customers. The \$1099 ExecJet is billed as a replacement for wide-carriage, 24-pin dot matrix printers that are primarily dedicated to spreadsheet applications.

But like Epson, whose wide-carriage EPI-4000 serves CAD users who need quick drafts, IBM doesn't intend to stop there. The ExecJet reflects IBM's intention to develop an ink jet business without competing head-on right away with Hewlett-Packard's popular DeskJet series.

Both IBM and Epson are making forays into a market that will bloom as users adopt color printers for desktop publishing and other graphics-oriented applications.

In the short term, the laserlike print quality of the ExecJet (with 360-dpi resolution and 18 resident bit-mapped fonts) makes it a good candidate to steal sales from 24-pin dot matrix printers. But in the long run—given fast-falling prices for laser printers—desktop color is the most promising avenue of growth for ink jets. Personal laser printers from Hewlett-Packard, Epson, and others are now priced as low as \$850 on the street. Users are turning to these alternatives so rapidly that InfoCorp recently revised its projections for 1990 U.S. ink jet printer shipments down 41 percent to 430,000 units.

IBM PUSHES GRAPHICS HIGHER

XGA Seen as Replacement for Popular VGA



IBM wants to replace its VGA graphics adapter with a faster, higher-resolution Extended Graphics Array (XGA) designed with graphic environments such as *Windows* in mind. IBM hopes to avoid the mistakes made with the 8514/A high-end adapter by offering a cleaner design and, more important, publishing hardware specifications so other suppliers will rally around to create a broad standard.

XGA hardware will first appear in Big Blue's new 486 machines. Unlike the 8514/A, XGA will be built into the motherboard and will work with noninterlaced monitors,

which don't have the flicker problem that plagues interlaced displays. XGA runs VGA software faster and supports 256 colors at 640 by 480 VGA resolution and 16 colors at 1024 by 768 (or 256 colors with added memory). A special 16-bit color mode allows 65,536 colors on screen. XGA enhances *Windows*, OS/2, graphics, engineering, and desktop publishing software. It's also "a necessary and strategic product for IBM's multimedia plans," says Dataquest analyst Michel Castro.

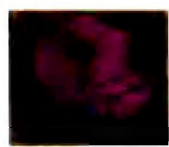
While VGA is enormously popular, the 8514/A (which debuted alongside VGA three years ago) remains an expensive specialty. Its sophisti-

cated silicon is very hard to clone, and few suppliers did. With only IBM supporting 8514/A before this year, the hardware stayed pricey, and software developers passed it by. "It was a bomb," concludes International Data Corporation analyst Joan-Carol Brigham. If IBM releases XGA specs, Castro predicts, "XGA's potential is 10 or 20 times as great."

XGA will work with IBM's 8515 and selected other monitors. It should support all applications written for *Windows*, OS/2 Presentation Manager, and the 8514/A's software interface, plus selected other packages. Its strongest competition will come from Texas Instrument's 340XX adapter chip set, which has been backed by Compaq and many board suppliers.

AMD CLONES 386

Intel Rival to Supply 386 and 386SX Work-Alikes



Computers using Advanced Micro Devices (AMD) clones of Intel 386 processors may appear during the first half of 1991, ultimately helping to bring down system prices. AMD has been emboldened by an initial ruling on its claim that Intel breached a 1982 technology-sharing agreement between the pair. AMD already has given samples of its Longhorn (386) and Shorthorn (386SX) processors to

PC makers. Spokesman John Greenagle says it plans volume production by year-end—following resolution of a brand name conflict.

AMD asks that Intel pay it \$600 million and affirm its right to clone the 386 and subsequent generations. But Intel vice president and general counsel Thomas Dunlap maintains that the arbitrator's finding suggests that it won't have to share chip technology with AMD. So Intel's likely recourse against AMD 386

clones would be another lawsuit. The courts will be sorting out the monetary issues long after AMD ships 386 chips, predicts Michael Slater, publisher of the *Microprocessor Report*.

More important for users and PC suppliers, says Slater, is a second suit AMD filed earlier this year to affirm its rights to Intel microcode. If it wins, AMD could more easily clone Intel parts with 100 percent compatibility. AMD executives admit that Longhorn and Shorthorn parts already

employ that microcode.

AMD now claims more than 50 percent of the worldwide 286 market, a share garnered largely by price cutting. AMD could drag down 386 prices as well, says Slater, but initially it will simply help make up a shortfall in Intel's 386 supply. AMD has also announced the AM286ZX, the first chip to put almost all of a computer's basic components on a single piece of silicon, which makes possible motherboards as small as 4 by 6 inches.

EPSON OFFERS POSTSCRIPT

Adobe Signs Up Licensees, TrueType Is Delayed



Epson America has become the latest big name to produce an inexpensive laser printer with Adobe's PostScript page description language (PDL). Scheduled for January shipment, Epson's EPL-7500 is a 6ppm printer with 35 scalable fonts. Product Manager Carolyn Perrier says it will be priced under \$3500, making it competitive with PostScript models unveiled recently by Texas Instruments, Apple, NEC, and QMS.

The EPL-7500 is one of two new releases with a Minolta engine (rather than the TEC engine of Epson's Hewlett-Packard IIP-compatible EPL-6000). It includes a 16-MHz RISC-based controller of Epson's own design and accommodates a 250-sheet paper tray with room for a second tray under the printer. It comes with 2MB of memory and can reach 6MB with the use of a daughterboard.

A near-identical second release, a LaserJet II compatible called the EPL-7000, can be

upgraded to the EPL-7500 just by replacing its controller with a PostScript upgrade and adding the necessary memory for page description. The sub-\$1500, 14-font EPL-7000 ships with 512K of memory, upgradable in half-megabyte increments to 2MB.

After nearly five years of being limited to the highest-priced devices, Adobe's PDL standard suddenly can be found even on personal lasers. "Adobe is getting more and more aggressive with licensing," explains Epson's Perrier. "It realizes that it is going to have competition from not only [Microsoft's] TrueImage but more PostScript clones as well."

Adobe won't have to face Microsoft's TrueImage/TrueType PDL/font-scaling technologies for a while. Although Microtek and LaserMaster announced TrueImage printers in September; broad support for the associated TrueType font scaling (originally slated to debut with the printers) won't appear until mid-1991 with *Windows 3.1*.

386SX NOTEBOOKS DEBUT

Toshiba, AST Offer Fast CPUs, Low Prices



Toshiba America and AST Research will add to the flood of 386SX, 286, and even 8086 notebooks debuting at Comdex/Fall in November. The 386SX offerings from both system leaders give users 32-bit power and VGA graphics but trade advanced options like expansion units—and CPU speed, in Toshiba's case—for low prices.

While AST's Premium Exec 386SX/20 is a 20-MHz entry comparable to the just-announced Texas Instruments and Compaq systems (pre-viewed in this issue), Toshiba's T2000SX, like Epson's new NB3 notebook, is driven by a 16-MHz 386SX.

The Premium Exec is 6.5 pounds and measures 11.4 inches wide by 9 inches deep by 2.5 inches tall. The 6.7-pound T2000SX measures 12.2 by 10 by 1.9 inches. Both come with 3½-inch internal floppies and 40MB drives. Toshiba prices were not set at press time, but AST's \$3395 40MB system is available in a 20MB version for \$2995—the closest comparable configurations from Compaq and Texas

Instruments cost about twice as much.

All models are equipped with 2MB of memory and VGA-quality backlit LCDs and employ extensive power management tricks. The Premium Exec is a little thicker than most, says AST portable marketing director Genelle Trader, because it employs size D nickel-cadmium batteries rather than the usual size Cs.

Toshiba's solution to the 386SX/VGA power-draw problem is to include the first nickel-hydride batteries in a portable. Toshiba product marketing director Tom Sherard puts the battery life of the T2000SX at 3 hours. The ASTs achieve battery life of 3½ to 4 hours, says Trader. All these machines can quickly recharge in 3 hours.

AST also is debuting the 12-MHz Premium Exec 286/12 in 20MB (\$2495) and 40MB (\$2895) versions, which can be upgraded to a Premium Exec 386SX/20 for under \$700. At the low end, Toshiba is introducing the 8086-based T1000LE with both 3½-inch floppy and 20MB hard drives for \$2499. ☛

IN ATLANTA, GEORGIA...



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You'll find Gateway 2000 computers in all 50 states and in over 70 foreign countries.



everywhere know a good value when they see one. In all 50 states and in over 70 foreign countries, thousands of people are comparing price, quality and service – and choosing Gateway 2000.

In Atlanta...

ZSoft, the well-known graphics software company, often demonstrates its software at trade



ZSoft employees Dave Steier, left, and Don Womick, Jr., with Don's Gateway 2000 20 MHz 386 system.

shows on Gateway 2000 computers. Dave Steier, ZSoft code librarian and software demonstrator, said he prefers showing products on Gateway systems. "They're terrific," Dave remarked. "I just got back from a show where I was using Gateway

33's and they're screamers." Don Womick, Jr., a programmer for ZSoft, bought a Gateway 2000 20 MHz 386 for his personal use because he liked the Gateway systems at work. "With Gateway," said Don, "I was able to get the performance I need at a price I could afford."

Don and Dave both commented on the excellent service they received from Gateway. "Everyone is uniformly polite, friendly and helpful," Dave said.

At the Grand Canyon...

Papillon Grand Canyon Helicopters uses Gateway 2000 computers in its operation. Rick Carrick, chief



Rick Carrick, Papillon Grand Canyon Helicopters, and his indestructible Gateway 2000 286.

pilot, started using PC's a few years ago to run point-of-sale software and to perform weight and balance calculations on aircraft, a critical

safety and efficiency procedure. Initially he experimented with several computer firms. "I called Gateway because I liked their ads," Rick admitted. "But I've become a loyal customer because their machines are indestructible and they have excellent customer service."

Papillon Helicopters has another Gateway 2000 computer now – a 25 MHz 386 – and Rick said he's in the process of replacing all of the company's PC's with Gateway 2000 systems.

In Zurich...

Michael Paravicini runs a Gateway 2000 33 MHz 386 system. Michael is a management consultant for Price Waterhouse in Zurich. "I was impressed by Gateway's price-features comparison," he remembered. "My system cost far less than you'd expect to pay for a comparable computer."

Michael Paravicini, Price Waterhouse, and his Gateway 2000 33 MHz 386 system.



Continuing, he said, "It was also the responsiveness they showed when I sent a fax request for a quotation. Out of ten U. S. companies

Choose Gateway 2000!

I contacted, Gateway was the most prompt and efficient in responding. I still haven't heard from some of the others."

PC Magazine's survey about service and reliability confirms what these customers are saying:

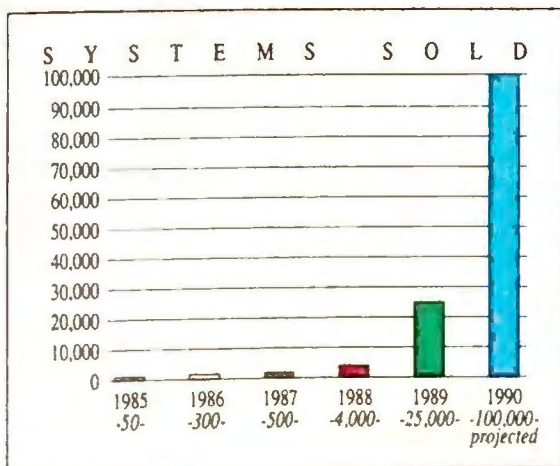
"Gateway shared top billing with such heavy-weights as Compaq, IBM, and HP for those who would buy their products again...Overall, Gateway's high marks bode well for the company's future, as does its commitment to customer service."



PC Magazine
September 25, 1990

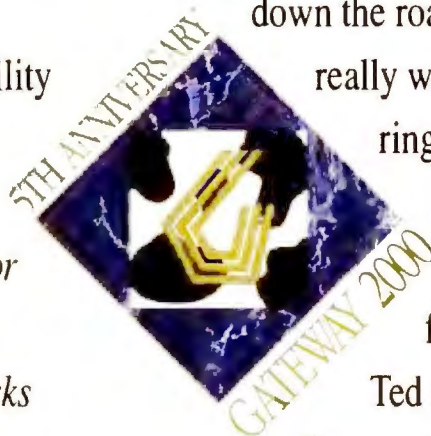
From the Heartland

The combination of price, quality and service makes Gateway 2000 the best value in the industry. But value alone doesn't explain how a little company in the Midwest, just celebrating its fifth anniversary, managed to outdistance hundreds of other companies, selling more systems through the direct market channel than any other PC manufacturer in the



Gateway 2000 sells more computers through the direct market channel than any other PC manufacturer in the country.

Computer magazine readers will remember the company's early ads featured a picture of the Waitt little farm with the headline, "Computers from Iowa?"



"In the computer industry, longevity should be measured in dog years."

"We can't run that ad anymore," continued Ted, grinning, "because we built a new plant 14 miles down the road in South Dakota. But the cows really worked for us. They made the phones ring. From then on, though, we built our business on value – good prices on quality systems with old-fashioned, personal service."

Ted mentioned another reason for Gateway's success. "We take a long-term approach to customer service," he said.

"When you buy a computer from Gateway 2000, you become part of our family and we're going to be there for you as long as you own that machine."

As Ted talked about the company's fifth anniversary, he laughed again. "In the computer industry, longevity should be measured in dog years," he chuckled, "because everything's moving so fast. That makes Gateway 35 years old! But seriously, we've come a long way in five years. And I owe it all to the great people at Gateway and to our customers."



Gateway 2000 will be there for you 'til the cows come home.

When you add it all up, you'll understand why you've got a friend in the business at Gateway 2000.



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How to Avoid the PC Slump of 1991

Recession chills the heart of the most fearless PC vendors. Here are five simple ways they can keep you buying in the coming year.

Want to give your favorite PC vendor a good scare? Tell him you're going to put your buying plans on hold while you wait out the recession of 1991.

After getting hooked on years of hypergrowth, PC companies are noticeably fearful that a slumping economy may pull them down a notch or two. But not everyone's got reason to be afraid. Intel, Microsoft, and Compaq are among a few leaders showing record-breaking profits just at a time when others are beginning to feel the pinch.

What's their secret? Simple. Each of these companies played an indispensable role in defining the standard business-class computer most users want today: a 386 system with a classic AT-style bus and *Windows*. For those of us who ducked out of sight while the superpowers conducted their bus and operating-system wars, it comes as a sudden relief to know that at last it's safe to buy a PC again.

But you never know when industry agreement might veer wildly once more into turf wars and general chaos. So to keep things straight in the new year, here's a list of ways to keep the PC industry's motor humming even if the rest of the economy stalls. Of course, nobody's obligated to listen to my advice, but...don't say I didn't tell you.

1. Open Chips

Thanks to IBM's fateful decision to choose the 8088 processor as the soul of the original PC, Intel set the pace of innovation for three successive generations of PC technology—286, 386, and 486. Meanwhile, thanks to a wise cross-licensing agreement with Intel's rival chip maker AMD, PC clone manufacturers got cheap and plentiful 286 chips throughout the AT's heyday. As a result, Intel established the most potent standard ever in computer technology—over 40 million PCs strong.

Now, of course, Intel is embroiled in deep legal maneuvers to keep AMD from producing next-generation 386 and 486 chip technology, and clone makers, who can't seem to get their hands on enough 386s, are ripping mad about it all. Just think—if Intel had kept AMD from producing the 286 chip, we'd probably all be buying overpriced ATs today instead of cheap 386 powerhouses. Now, can someone explain how that would have been good for users or the industry? I can think of only two companies willing to try: Intel and—you guessed it—IBM.

Let's start out the new year right: Intel should drop its legal shadowboxing and get back to developing another generation of stunning technology. Meanwhile, let AMD fill the supply gap for bread-and-butter chips.

2. Open Buses

Now that Compaq has proved it can

work with its competitors to develop the high-performance EISA bus without a major temper tantrum on anyone's part, IBM has finally taken some feeble steps to turn the Micro Channel architecture into a true industry standard. Too bad it isn't doing what the EISA group has done—set up an independent corporation to license the specification to any vendor who pays a nominal fee. In 1991, you can expect most mainstream PC manufacturers to sell EISA-based systems as standard fare. If IBM wants to keep the Micro Channel from becoming an endangered species, it needs to make a grand gesture to assure clone makers they won't get locked out the next time a chill, proprietary wind blows through Big Blue's halls.

3. Open Fonts

TrueType: PostScript's evil twin? Maybe so, judging from the nearly identical descriptions that Microsoft and Adobe pin on their respective creations. Microsoft got into the font and page-description-language business because it didn't want to pay big-time royalties to Adobe for a technology it needs to make *Windows* easy to use. Without a built-in font/graphic standard, displays look ugly, and simple printing can be a tedious and error-prone chore.

Action item: Hey, let's get together, guys! Adobe thinks it has the easiest standard to implement; Microsoft thinks it has the most powerful one. If

(continues)

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both technologies worked alike, then developers could choose the one they liked best, and users wouldn't have to worry about the problem at all.

4. Open Networks

Everybody knows that Novell has the lion's share of the LAN operating system market, but that doesn't mean it has the lion's share of the good ideas. In particular, Banyan Systems, with only about 5 percent of the network market, has established a number of important technical standards that make it easier for developers to create network applications. Without these standards, groupware would go the way of madras shirts and—dare I say it?—Micro Channel clones. Novell, Microsoft, and IBM should jump on the Banyan bandwagon right away.

5. Open Windows

Even as it proclaims *Windows* an industrywide standard, Microsoft is busily finding ways to make its application programs "special." Take BASIC, for instance. This innocuous little language is finding its way into every *Microsoft Windows* application, so where's the specification that allows other software developers to take advantage of it too? One of these days we're likely to find that BASIC has become the "standard" macro language for *Windows*. Who gets hurt if you can find "macro BASIC" only in Microsoft programs?

Of all the companies that have benefited from the open standard set by the IBM PC and DOS, Microsoft arguably has done so the most. That's fair—arguably, it has contributed the most. And it stands to gain—or lose—the most from the next turn of the economic cycle. Let's hope it spins the wheel vigorously in the direction of open systems.

As always, I'm interested in your opinions on this or any other subject. Write to me at *PC World*, 501 Second St. #600, San Francisco, CA 94107; fax 415/442-1891; MCI Mail Richard Landry/301-3685. ☎

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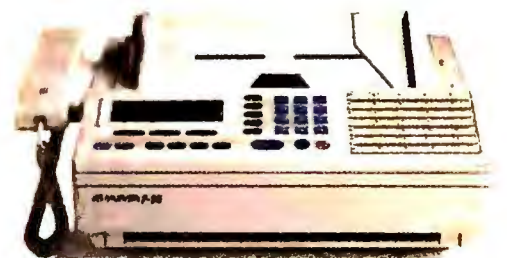
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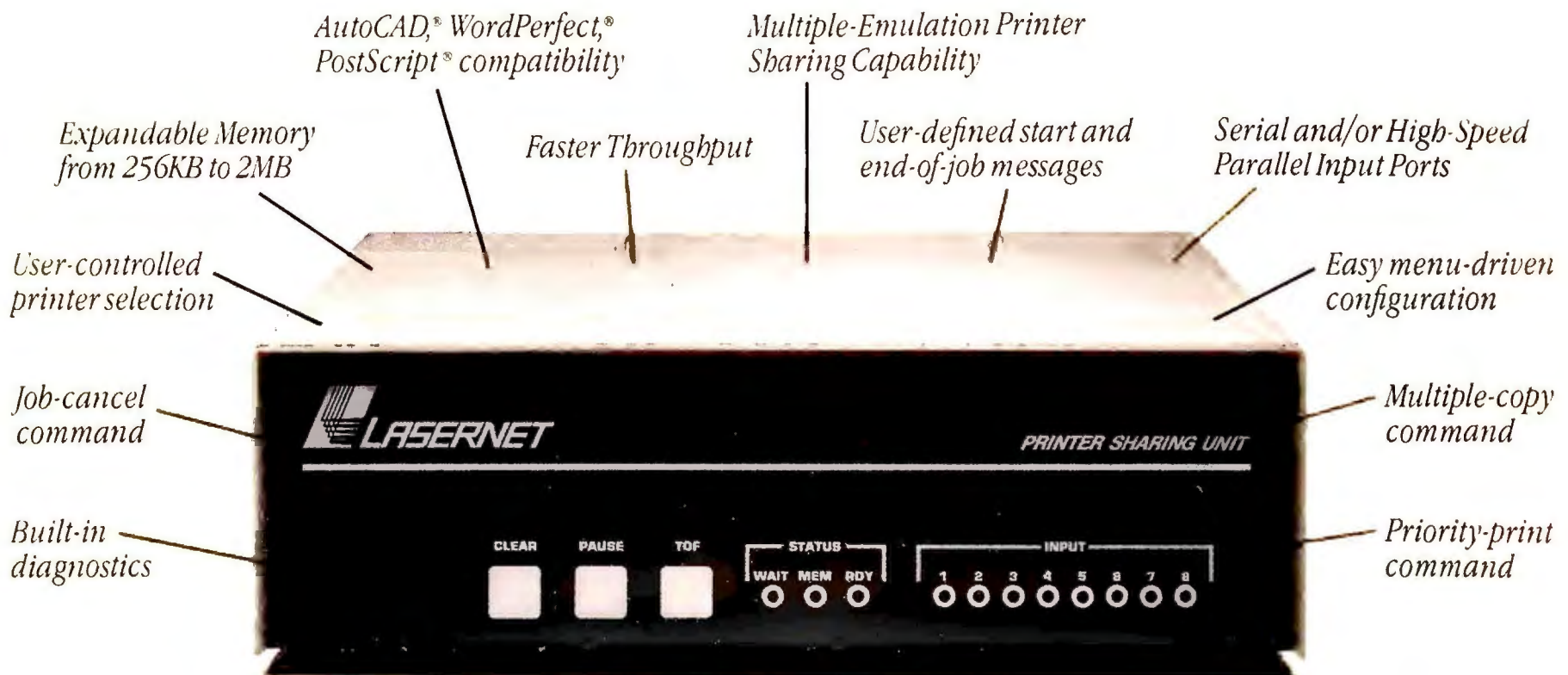
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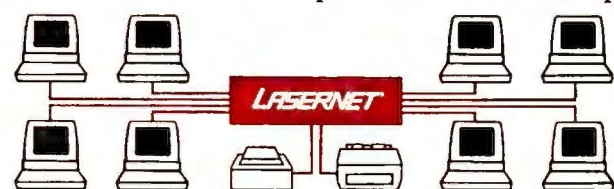
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LETTERS

Reactions and responses from the PC World community



TIM CARROLL

Risky Business Revisited

After reading Richard Landry's column "Risky Business" in September, I have to say that I'm fed up with "look-and-feel" lawsuits. I agree with Borland's Philippe Kahn that Lotus should stick to developing software and stop suing competitors. *Quattro Pro* sales do affect Lotus directly. But the real test of a product is performance—not the look and feel of its menus. A common menu/command structure allows users to take advantage of their options without having to learn a different interface every time they find a new product that better serves their needs.

Harwood W. Loomis
Woodbridge, Connecticut

As a registered user of both *1-2-3 2.2* and *Quattro Pro*, I've found *Quattro Pro* to be better. This lawsuit against Borland makes Lotus look like a big bully who is mad at a smaller company for coming up with a better product! In protest, I have removed *1-2-3* from my hard disk, and I bought some Borland shares with the money I *was* going to spend on the new version of *Agenda*.

Ralph H. Hannon
Malta, Illinois

I enjoyed reading your speculation about the Lotus-Borland suit and the calculated risk that Philippe Kahn took in adding a Lotus-like interface to his excellent spreadsheet. But consider the risk that Lotus is taking by inviting comparison of *1-2-3* to *Quattro Pro*, a superior product. Lotus's interface is no more copyrightable than iambic pentameter.

Martin Condon
Scotia, New York

"Risky Business" was interesting commentary. You didn't mention that Lotus built the *1-2-3* interface as a clone of *VisiCalc*. In fact, I picked *1-2-3 1A* precisely because the interface required no new learning.

Evans M. Harrell
Marietta, Georgia

The Price of Good Grammar

Your comments about grammar checkers in the August *Industry Outlook* ["Managers Turn to Grammar, Style Checkers"] hit the nail right on my thumb. These products may have strong sales, but I'm a disenchanted buyer who agrees with professional writers who scorn them. I've found that all three of the top programs still miss blatant er-

rors. Clear, effective writing requires two faculties that algorithms can't yet provide: good taste and sound judgment. At the moment, the price of using grammar checkers is eternal vigilance.

Gilbert Leight
Plano, Texas

Satisfaction Guaranteed

Regarding reader John H. McKinney's letter "Who's Defending the User?" in September, this shareware developer does provide users with a money-back guarantee. The software development community would do well to embrace this spirit of hassle-free returns. Loyal customers will be our reward.

Rich Levin
President
Levin & Associates
Philadelphia, Pennsylvania

Previews Make a Good Impression

I think most people write only when they want to kick about something you've written. Well, here's a pat on the back for your coverage of news and new products. I particularly appreciated your September preview of *1-2-3 3.1* ["1-2-3 Meets Windows Halfway"]. In the realm of PCs, things change so quickly that it's next to impossible to keep current. I find myself so busy that I have to restrict my reading time, and your previews give me detailed looks at important new products. They're always a must-read for me.

Will Sampson
Miami, Florida

Looking for the Right Stuff

I'm glad I read "Do Presentation Manager Spreadsheets Have the Right" (*continues*)

Stuff?" in September. I've been following PM developments right along while putting *Excel for Windows* to good use. I'm ready to switch operating systems when the switch makes sense—but your excellent article makes it clear that the time hasn't come.

Cynthia Barton
Helena, Montana

Unlimited Laser Review

After reading "Fonts Unlimited: Seven Smart Lasers for Under \$3000" in September, I have to applaud your courage. I expected you to automatically grant a Best Buy to the Hewlett-Packard LaserJet III. After all, didn't HP write the book on scalable font technology? Instead, you honored the Texas Instru-

ments MicroLaser PS17. Why? Because it's the *real* Best Buy in its class. Thanks for not limiting your accolades to the most popular products. And keep on giving us the straight story!

Andrew Denton
Wilmington, Delaware

I feel your assigning a Best Buy to the Texas Instruments MicroLaser PS17 may do disservice to the other models that were featured, especially the LaserJet III. A laser printer's value derives from its ability to produce a superior printed image. Any reader looking at the type comparisons in your article would rate the LaserJet III, despite a number of secondary deficiencies, the best product to buy.

Joseph Zmuda
San Francisco, California

Project Management in the Real World

Thanks for "Project Management Reaches the Real World" in September. I've been hungry for a realistic assessment of project management software. Mark Burgess provides a good balance of digestible information.

Anthony Carerra
New York, New York

I wish I had read "Ten Tips for Project Sanity" six years ago. If you manage projects, it should be required reading. Otherwise, you may have to learn all these things in the school of hard knocks!

Roland Edburg
Minneapolis, Minnesota

As a longtime subscriber, I know that people often find it easier to complain than compliment. But as an experienced master scheduler, I must dispute the Best Buy choice in your project management review. *SuperProject Expert's* RAM requirements are low enough to allow it to run on an XT. Unlike Best Buy *Microsoft Project for Windows*, it also provides PERT analysis (the one *(continues)*

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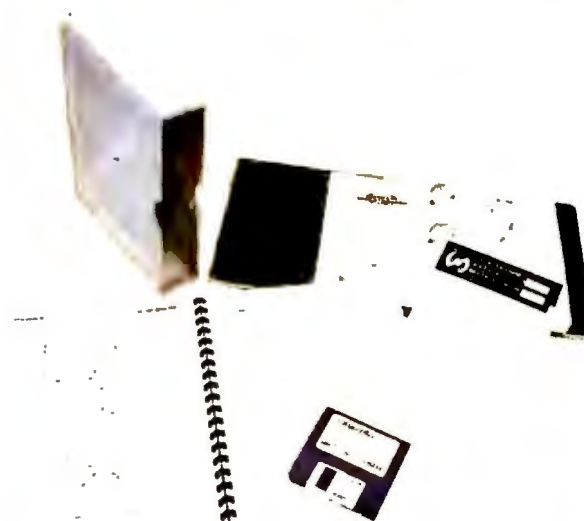
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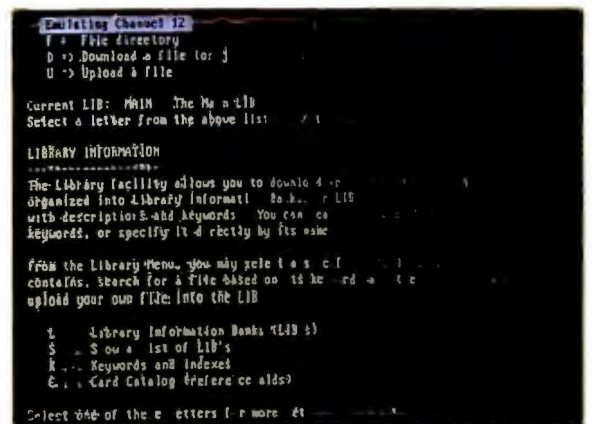
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The Entertainment Edition of The Major BBS has everything that the starter system does, plus Quest for Magic (a multi-player interactive text adventure game), Androids! (a multi-player arcade-style ANSI-graphics game), Flash Attack (a futuristic tank and laser battle for multiple players with IBM PC's), and the Action Teleconference Link-Up, which includes private "chambers", action verbs (grin, wink, nudge, etc.), the ability to link to other systems for huge multi-system teleconferences, custom entry/exit strings, user-configurable profiles, and much more. This Edition supports the Flash™ Protocol (where most of the game functionality is on the user's

Flash Attack V2

by Tim Stryker

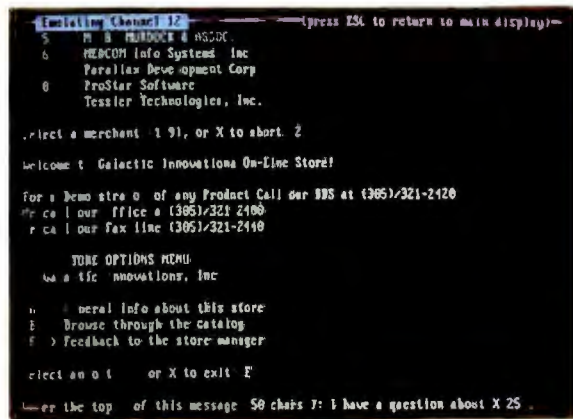
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<i>Entertainment extensions</i>	\$ 149
<i>Entertainment C source extensions*</i> ..	\$ 129

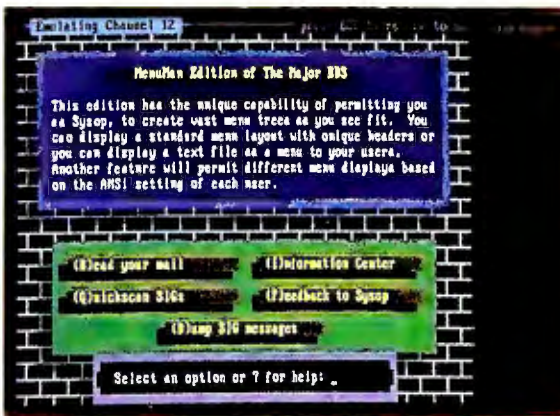
The Shopping Mall Edition of The Major BBS has everything that the starter system does, plus online shopping. Your online mall can have multiple "stores", each run by its own separate "merchant", if desired. Each merchant has control over his or her own product line, pricing, discount structure, store welcome message, sales tax handling, etc. Also, each merchant may create up to 6 different payment methods (e.g. VISA, MC, AMEX, C.O.D., "bill me", etc.), and up to 6 different shipping methods (e.g. UPS, FedEx, US Mail, etc.), each with its own rates (flat rate, percent of sale, 1st-ounce/add'l-ounce, or 1st-pound/add'l-pound). Users may browse product catalogs at no obligation, or order products and services directly online! Orders generate invoices that are posted to the individual merchant as attachments to E-Mail. To upgrade from the starter system to the Shopping Mall Edition takes only a few minutes. Prerequisite: The Major BBS Standard Edition.

Shopping Mall extensions \$ 249
*Shopping Mall C source extensions** . . \$ 189



The MenuMan Edition of The Major BBS can do everything that the starter system does, and in addition you as Sysop can create your own menu trees, with menus leading to menus leading to menus, as deeply “nested” as you like. The “leaves” of your menu trees can be ordinary ASCII or ANSI files, which are simply dumped to the user’s display (with or without automatic screen breaks), or they can be any of the built-in functions of the BBS such as scanning the user’s incoming E-Mail or firing up a SIG quickscan. Includes commands like *GO <pagename>*, *FIND <topic>*, *USERS*, and for the Sysop, the equivalent of the DOS commands *DIR*, *RENAME*, *COPY*, *DEL*, *MKDIR*, and *RMDIR*, as well as a set of privileged commands for editing and extending the menu trees, remotely, while the BBS remains fully online. Upgrading from the starter system to the MenuMan Edition takes only minutes. Prerequisite: The Major BBS Standard Edition.

<i>MenuMan extensions</i>	\$ 149
<i>MenuMan C source extensions*</i>	\$ 129



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**The C source code extensions are necessary, if you wish to combine multiple extended Editions together, or add 3rd-party software, or develop your own modifications. Prerequisites, in each case, are the Standard Edition C source code, and the corresponding extended Edition.*



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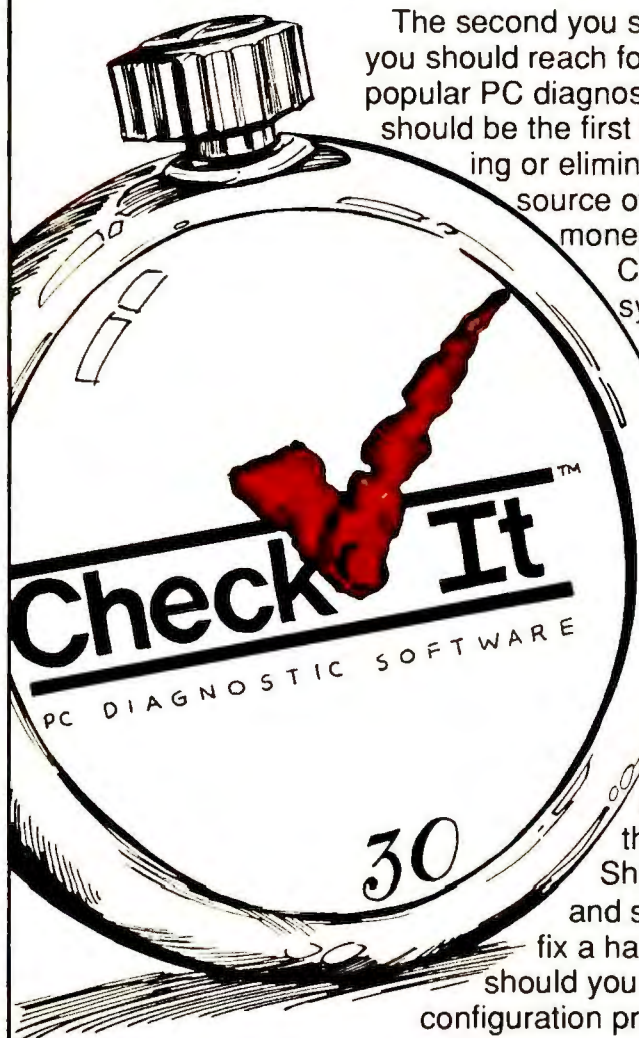
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chart that shows things the way they are). I think *SuperProject Expert* from Computer Associates is the real best buy of the group.

Steven Jay Moshlak
Tarzana, California

Looking for an Amiga

It seems to me you're leaving out an important member of the home computer industry. Commodore has a reputation for producing game machines, but the Amiga runs all the major business applications. Mainly, I want the reason you ignore Commodore.

Michael McKnight
Lewisville, North Carolina

We reviewed the Commodore PC40-III last December in "12-MHz ATs: Home-Office Alternatives." Amiga fans can check out IDG's AmigaWorld, 80 Elm St., Peterborough, NH 03458; 800/343-0728. —Ed.

Users Unite!

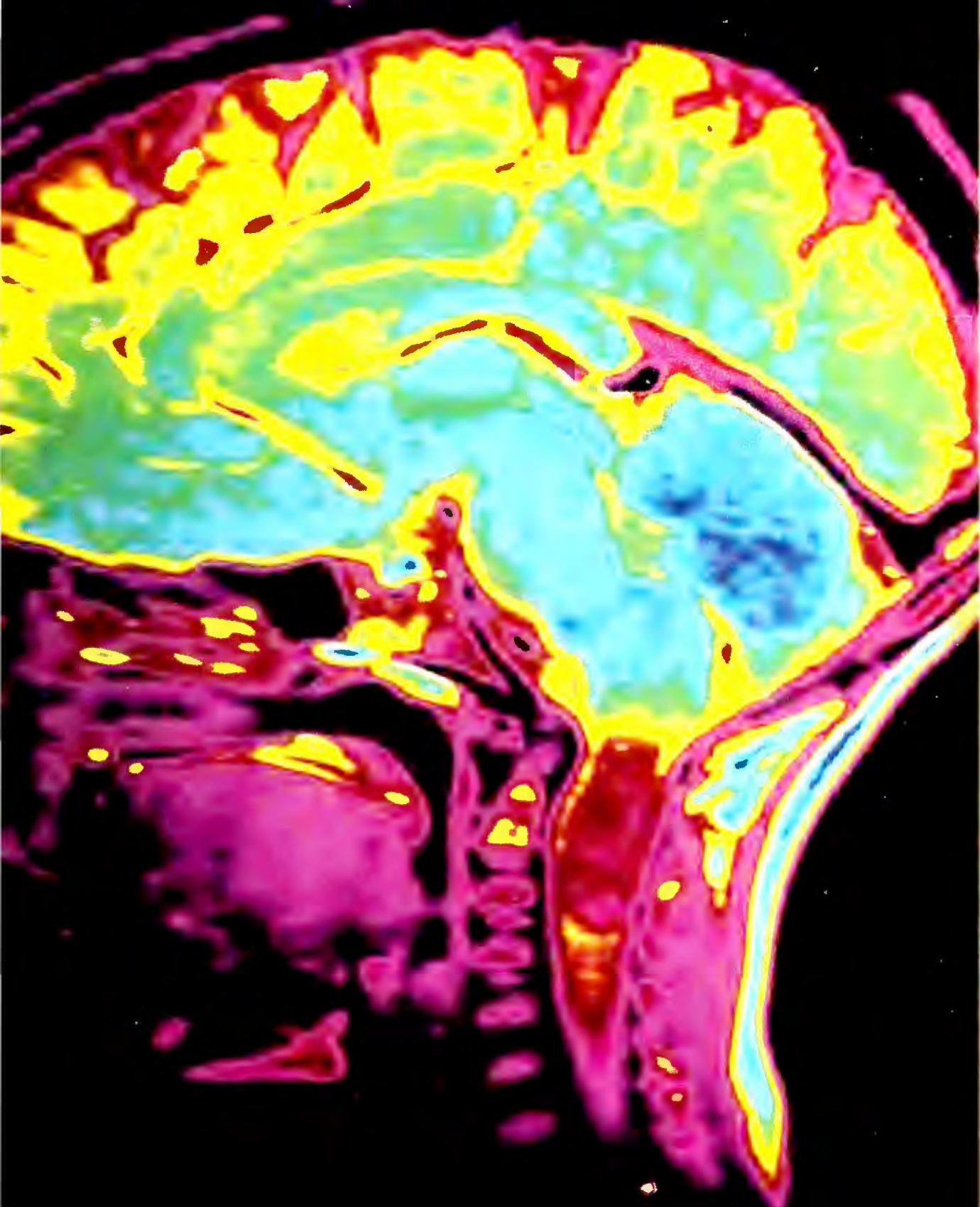
Too bad your August listing of user groups in *Consumer Watch* didn't mention our organization. The Association of Personal Computer User Groups (APCUG) is an all-volunteer, not-for-profit international organization that serves as an information network for over 140 user groups in the United States and around the world. The yearly membership fee for each user group is a modest \$25, and APCUG provides each member group with a no-cost Tymnet account for the use of its president and newsletter editor. With the account comes free worldwide access to our bulletin board service. Information on APCUG and its many services is publicly available on our BBS at 408/439-9367. You can either download a user group registration form from the BBS or write to APCUG, 1101 Connecticut Ave. NW #901, Washington, DC 20036.

Roland Cole
President
APCUG
Washington, D.C.

(continues)

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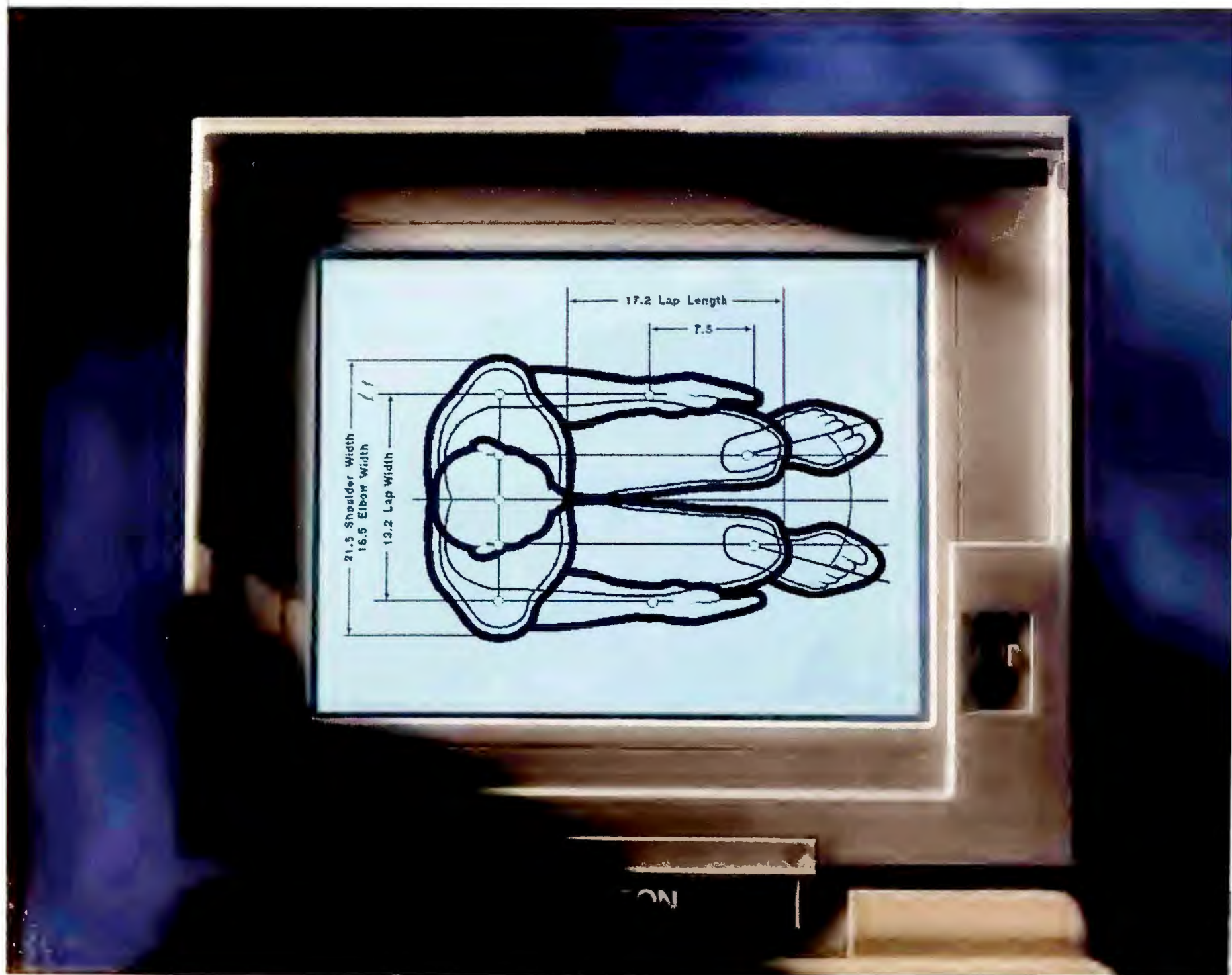
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SONY

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that while you
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capacity, and a shock indicator that alerts the user to the occasional hard knock.

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SOFTWARE SYSTEMS

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LETTERS

Marketing Moxie

I was very pleased to read in the August "14 SX Systems: Big Deals in Small Boxes" that you consider the Wang PC 350/16S "well suited for serious business computing." But the PC 350/16S is not "Wang's first new PC in nearly a decade." In fact, Wang brought out its first PC in 1982 and has introduced over a half-dozen lines of PCs in the last eight years, including a recent Micro Channel system. Since your review, we've announced the addition of a 200MB IDE hard disk. And contrary to what you've stated in the review, Wang dealers commonly give hardware discounts as well as bundling PCs with applications and services to be competitive. I believe the PC 350/16S represents a better value than the review gives it credit for on the basis of its list price.

John C. Smith

Director

Wang Microsystems

Lowell, Massachusetts

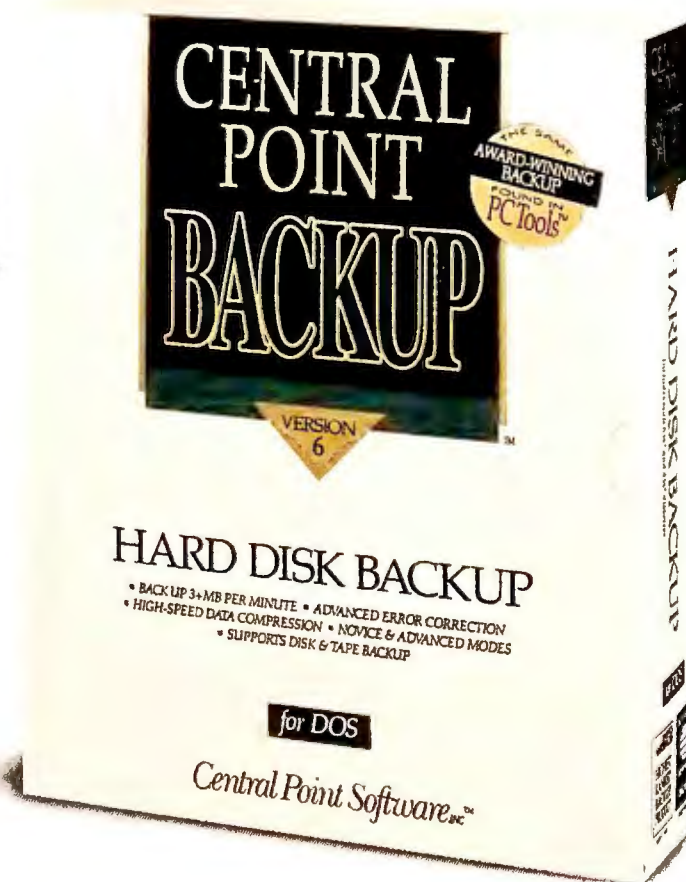
Corrections and Clarifications

In an August *Product Outlook* item about *Pacioli 2000*, we gave an incorrect phone number for M-USA Business Systems. The correct number is 800/345-4243. Also, the number of accounts that *Pacioli 2000* supports is limited only by available disk space.

September's *Star-Dot-Star* item entitled "Call Me Irresponsible, But Call Me Anyway," which dealt with calling subroutines from within batch files, contains an error. The first sentence in the second paragraph on page 250 should read as follows: "If %1 does not equal 'proc', execution continues at the command echo main %1." *PC World* regrets the errors.

Send your reactions, responses, and ideas to Letters, PC World, 501 Second St. #600, San Francisco, CA 94107; CompuServe 74055,412; MCI MAIL PC World Editorial; or 415/442-1891 (fax). Include your name and the name of your city and state. We reserve the right to edit letters. ●

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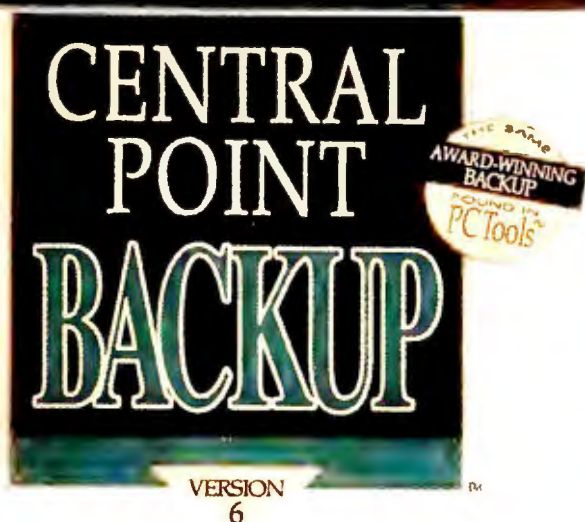
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Fastback	9:17	2:43	

InfoWorld tests on an Intelligent Data Systems PC-286 AT; National Software Testing Laboratories used a Compaq Deskpro 286s.



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President, SBT, Sausalito, CA:

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se Experts Speak E IV Version 1.1.

TONY LIMA

Author of "Inside dBASE IV," President, Pacific Systems Design Workshop Inc., San Carlos, CA:

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—Dan Gutman, Success Magazine*

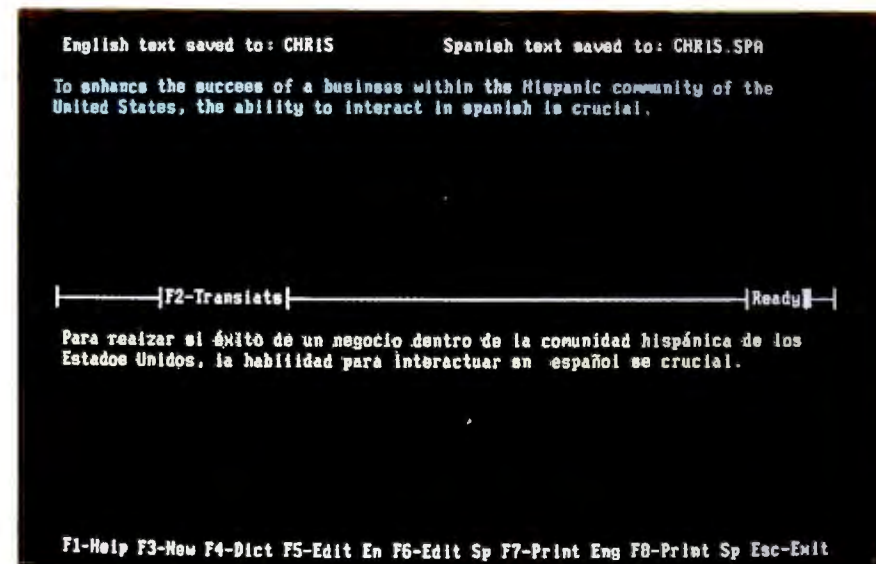
Translate 1.1 is an enormously useful tool for anyone who has to communicate in writing with America's fast-growing Spanish-speaking population.

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—Winston Roberts,
PCM Magazine

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THE HELP SCREEN

PC World offers answers and advice at every level

Make your laptop's cursor visible with WordPerfect, protect your root directory files, prevent parity check errors, find fonts for the DeskJet, learn how to free up workstation memory, and more.

Karl Koessel

Use the cursor keys to change the cursor's size. When you like what you see, jot down the command highlighted at the bottom of the screen ('CURSOR/BG', for example). Press <Enter> to return to the DOS prompt with your new cursor, and run *WordPerfect*. The cursor will remain its new size until you shut down the system or a program changes it.

To automate changing the cursor's size, place the selected highlighted command in your AUTOEXEC.BAT file after the PATH command (which must list the *WordPerfect* directory), or make a batch file that runs that command just before running *WordPerfect*.

Running *WordPerfect* in monochrome mode may also improve the legibility of the cursor; give it a try by using `wp /mono` to start the program.

A Read-Only Root

Q. *Several times I have turned on a computer only to receive the message 'Bad or missing Command Interpreter'. Further investigation revealed that all the files in the root directory of drive C: had been erased. I had to boot from a floppy disk, copy COMMAND.COM from the floppy disk to the hard drive, and restore or recreate my other root directory files. Any thoughts on what causes this or how to avoid it?*

*Stephen Lang
Boise, Idaho*

A. You can lose or corrupt files in many ways. That's why you have to back them up regularly. However, you can give files that don't change—particularly those (*continues*)

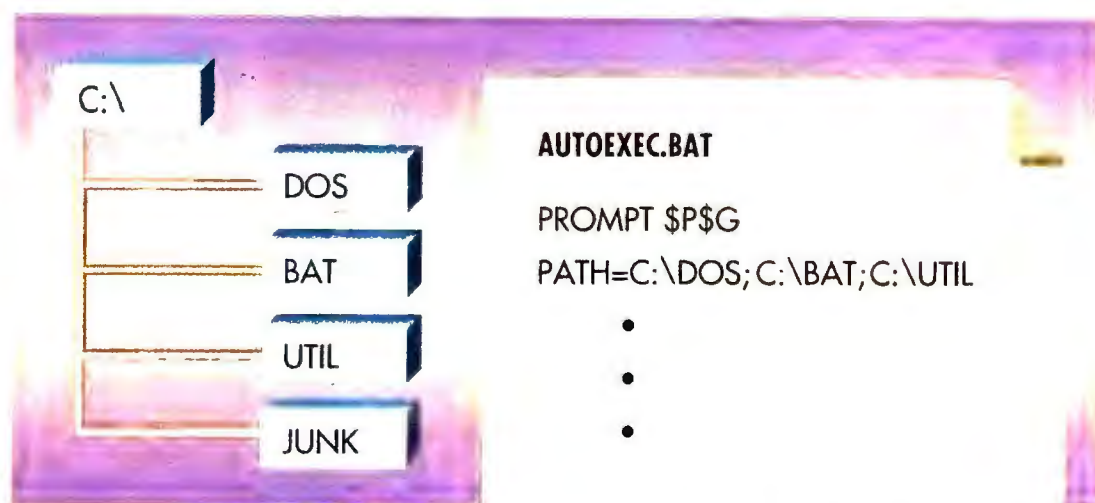
Laptop Cursor

Q. *I find that the cursor on my new Compaq LTE/286 is nearly invisible when I use WordPerfect 5.0. Is there a patch (or some alternative) that will convert the cursor to a blinking box that can be seen more readily and thus make the program more usable?*

*Roy W. Menninger
Topeka, Kansas*

A. You can easily change the cursor's size for DOS and all applications, like *WordPerfect*, that use DOS's cursor. Install the *WordPerfect* utility programs (if you haven't already), and at the DOS prompt, change to the *WordPerfect* directory and enter the command `cursor`.

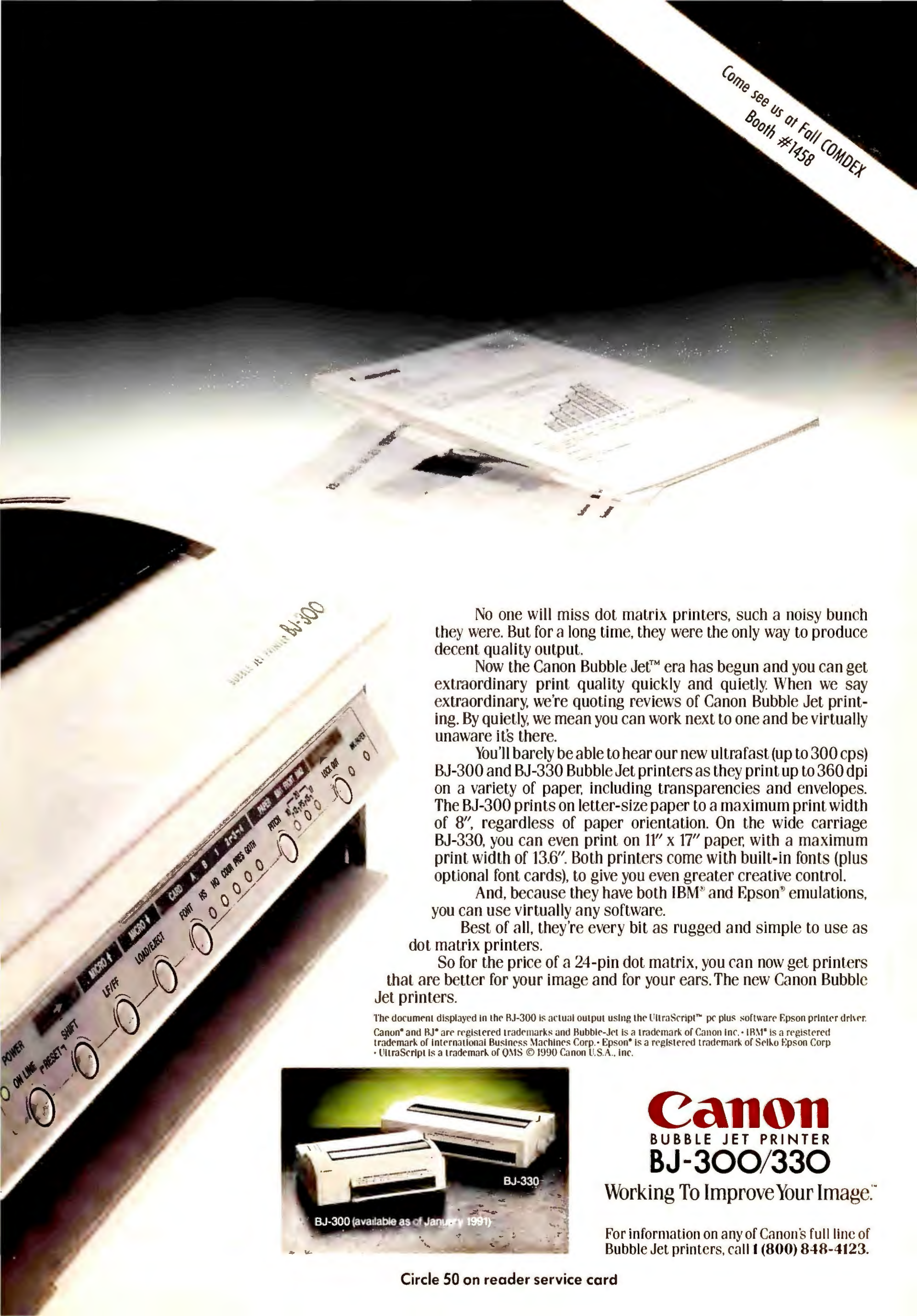
Structural Advantage



With a little directory organization and an appropriate PATH, hard disk users can easily access DOS commands, batch files, and other commonly used utilities. First create three separate directories—DOS, BAT, and UTIL. Next copy all the utilities (like `FORMAT` and `CHKDSK`) from your DOS disks into the DOS directory, put all of your batch files in the BAT directory, and keep your favorite utilities (such as `PC Tools`) in UTIL. Then make sure your AUTOEXEC.BAT file's PATH command references those directories. You'll be able to run any of those commands, batch files, or utilities from the DOS prompt, regardless of which drive or directory your system is currently logged on to. You can also help keep your directories free of clutter by creating a JUNK directory—a holding tank for files you haven't classified yet.

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in the root directory—some protection by making them read only. Use the DOS command `attrib +r drive:\path\filename.ext` (*drive:* and *\path* are optional, and wild-card characters within *filename* and *ext* are recognized). For example, to make all drive C's root directory files read only, type the command `attrib +r c:\.*` at the DOS prompt. (To remove the

read-only attribute, use the same command, but with `-r` instead of `+r`.)

Note that ATTRIB.EXE is an external DOS command; you should keep a copy of it and of all the files on your DOS disks in a single directory (C:\DOS is an appropriate name) and use the command `attrib +r \dos\.*` to make them all read only.

You can further protect files by keeping program and data files in their own directories—never in the root—and by having AUTOEXEC.BAT automatically log you into a “scrap” directory (JUNK, for example) when you turn on your PC. Hard disk files will be even safer if you partition the hard disk into two logical drives and keep programs on one (C:) and data files and your “scrap” directory on the other (D:).

Parity Check

Q. On several occasions, such as when I'm changing from one menu to another within some program, my system has crashed. The screen goes blank, the message 'PARITY CHECK 2' appears, the system freezes, and I lose whatever work I haven't saved. What does this message mean?

Miguel B. Quintos
Alexandria, Virginia

A. IBM personal computers and many compatible systems include a ninth bit for each byte of memory. Software (continues)

No more wandering mouse.



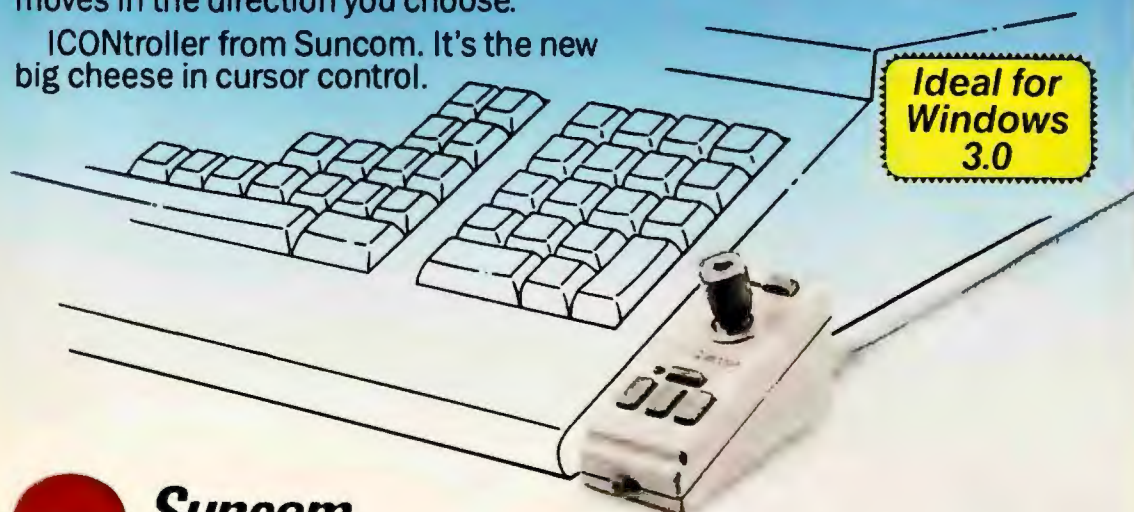
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TO: >MCIMAIL ###-####


From MCI to CompuServe:

TO: EMS

EMS: Compuserve

MBX: ####,###

Robert Lauriston
Contributing Editor



To understand
the basic
principle behind
Fastback Plus,
tear out
this page
and destroy it.

LIKE A BOLT FROM THE BLUE,

your hard disk will eventually come crashing down. Manufacturers expect it. They even give hard disks an "MTBF" rating—the Mean Time Between Failures.

Before you lose your valuable data, back it up with Fastback Plus.

BACKUPS IN A FLASH With Fastback Plus, you can do things that DOS Backup never dreamed of. Like back up all your daily file changes in less than a minute. Or blaze through your entire hard disk at three megabytes a minute on 386 machines, or 10 megabytes in four minutes on an AT. It even formats your backup diskettes – automatically.

STRIKING SIMPLICITY Fastback Plus has three user levels – beginner, intermediate and advanced. Simple menus tell you how long your backup will take, and how many diskettes you'll need. And a unique data compression feature cuts the number of diskettes you need in half. You can even automate the entire process with one-touch macros.

DAZZLING SAFETY Only Fastback plus gives you reliable Advanced Error Correction. To illustrate, we punched a hole

larger than a .22 calibre slug right through a backup diskette – and retrieved all the data! That's security. And if you need help dodging even bigger bullets, our technical support staff will surprise you with its courtesy and ingenuity. Just call, and you're guaranteed same-day service.

GLOWING REVIEWS *PC Magazine* said it best in giving Fastback Plus its prestigious 1989 Editor's Choice Award: "Fastback Plus has virtually everything a backup program needs: top-speed performance, clear menus, every imaginable option, even a built-in macro program for automating complex tasks. A superb achievement."

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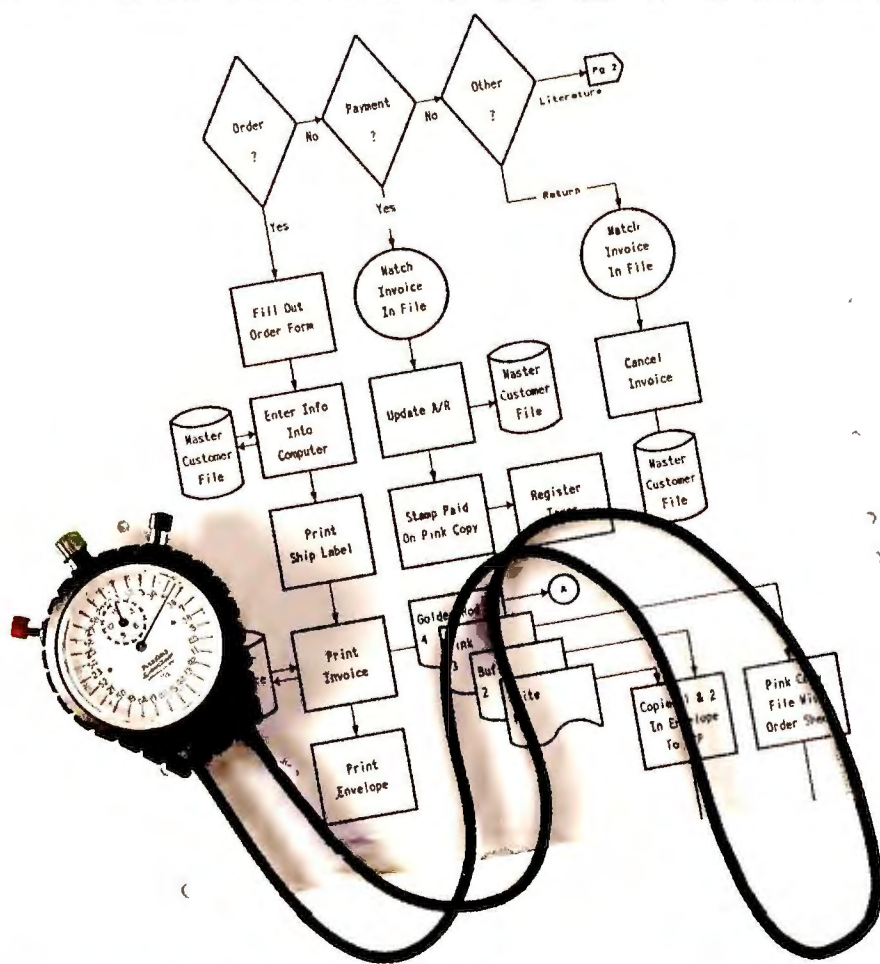
doesn't use this bit; the system sets it on or off depending on the value of the other eight bits in order to monitor unintended changes in memory. If one of the bits goes bad, or cosmic radiation or low power changes its value, the parity bit's setting will no longer be correct for that byte. To protect you from the erroneous results that might occur if you were al-

lowed to continue computing with corrupted values, the system shuts down.

Parity check 1 refers to a problem with motherboard memory; parity check 2 refers to memory on a card in a slot. If a memory chip is defective, it obviously must be replaced. However, when parity errors are intermittent, you can try to fix the problem by clean-

ing the card's edge connector with a pencil eraser and pushing the chips firmly into their sockets. Setting a heavy monitor atop a weak system unit can also cause parity errors. The weight depresses the top of the system unit onto the memory card, weakening its electrical connection to the expansion slot.

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DeskJet Fonts


Q. After reading "Font Fortune" in April's Help Screen, I wondered how I might expand my Hewlett-Packard DeskJet printer's font library. Are there any multifont cartridges (such as Pacific Data Products' 25 Cartridges in One) available for the DeskJet? Are there any soft fonts (in addition to those offered by HP) for my ink jet printer?

Robert Brockland
 Lemont, Illinois

A. HP DeskJet and DeskJet Plus owners can now gain full compatibility with HP's recently introduced DeskJet 500 (see last month's *Product Outlook*). For a mere \$225 or \$175, respectively, plus shipping, HP will replace your printer's internal electronics, stick a new label on its case, and ship it back to you. But even if you do take advantage of this great offer, you'll still want to consider the following products.

The number of fonts that a DeskJet cartridge can hold is limited by the printer's design, so producing cartridges like 25 Cartridges in One for the DeskJet isn't possible. There's also not much soft font support for the DeskJet. Koch Software Industries has a utility called *Jet>Desk* that lets you download LaserJet soft fonts to the DeskJet, but using it means investing in 128K printer memory cartridges. A better solution is Metro Software's *LaserTwin* (although the package has an annoying copy protection scheme).

LaserTwin enables you to use a dot (continues)



Now that you
get the basics,
here's why you
should get the
most popular
backup software
available.

LIKE A BOLT FROM THE BLUE,

your hard disk will eventually come crashing down. Manufacturers expect it. They even give hard disks an "MTBF" rating—the Mean Time Between Failures.

Before you lose your valuable data, back it up with Fastback Plus.

BACKUPS IN A FLASH With Fastback Plus, you can do things that DOS Backup never dreamed of. Like back up all your daily file changes in less than a minute. Or blaze through your entire hard disk at three megabytes a minute on 386 machines, or 10 megabytes in four minutes on an AT. It even formats your backup diskettes – automatically.

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A POWERFUL GUARANTEE Use Fastback Plus for 30 days, and if you're not completely satisfied, return it for a full refund. You have nothing to lose. And everything to save.

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The Joneses.



Check out the benchmarks. When it comes to speed, pure and simple, mainframes are no longer the main attraction.

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There are two reasons. The first, of course, is the 486™ chip. The other is AMMA™, Everex's proprietary Advanced Memory Management Architecture.

STEP 486/33	34,000 Dhrystones (19.4 MIPS)
CRAY-X-MP/48	17,857 Dhrystones
IBM 3083	16,666 Dhrystones

AMMA uses "write-back" cache technology instead of the "write-through" technologies used in most PC's. The write-back cache was developed for mainframes. Everex was the pioneer in developing it for the PC. And in doing so, opened a whole new dimension in desktop performance.

With AMMA, you can write directly to the STEP 486's cache in nearly all cases. With write-through techniques, on the other hand, you lose most of the performance benefit of the cache.

And how to keep up with them.



That's because write-through forces you to write to main memory much more often. And main memory is slower than the cache.

This is especially important in 486 computing, where the CPU performs as many as four times the write operations as in 386. Which makes AMMA's write-back architecture, combined with the 486's embedded cache, a powerful combination indeed.

But the STEP 486 machines give you more than just speed. They come with Programmable Drive Select. If your drive isn't listed on the set-

up table, PDS™ lets you custom-configure the BIOS. It's good for virtually any hard drive.

What's more, all STEP systems come with a one-year extendable warranty and a one year renewable on-site service contract that also covers all Everex peripherals in the system.

To find out more, call 1-800-334-4552* for the name of your nearest Authorized Everex Reseller—every one a high performance expert.

Then you can let the Joneses try keeping up for a change.



matrix or ink jet printer as though it were a LaserJet Series II printer. You tell your software that you're printing to a LaserJet and download LaserJet soft fonts (such as those available from Mephistopheles Systems and Weaver Graphics, among others) just as you would to a LaserJet. *LaserTwin* actually stores the fonts on your hard disk,

unbeknownst to the downloading program or to your applications. Your DeskJet will be able to do just about everything that a real LaserJet can, including landscape printing.

Metro even has a companion product, *SuperFonts 25/1*, that builds disk-based "virtual cartridges" emulating HP's original 25 font cartridges A through Z.

SuperFonts 25/1 is easier to use than downloading software. You simply use included software utilities to "insert" and "remove" the virtual cartridges into and from your "LaserJet."

You might also consider Atech Software's *Publisher's Powerpak* or Power Up's *Express Publisher*, which work with virtually any printer. *Publisher's Powerpak* is a scalable soft font program that comes in *WordPerfect/Plan-Perfect/Microsoft Word/Microsoft Works (PP-WP)*, *PFS:First Publisher (PP-FP)*, *Ventura Publisher (PP-VP)*, and *Microsoft Windows (PP-WN)* versions. *Express Publisher* is actually a desktop publishing program—its fonts can't be used by other programs. With either package, fonts are scaled on the fly, conserving disk space, and no additional hardware or memory is required. Each program comes with three scalable typeface families (each has several styles). Atech offers additional typefaces at \$29.95 a pair. Power Up has three *Express Fonts* packages, each with two faces, at \$59.95. *Express Publisher* also accepts any Type Director (HP-compatible) laser soft fonts.



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Koch Software Industries
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LIST PRICE: \$95
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LaserTwin

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LIST PRICE: \$179 each
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(continues)

MISSING LINKS

CHARLES DARWIN

Vol: II Page 1

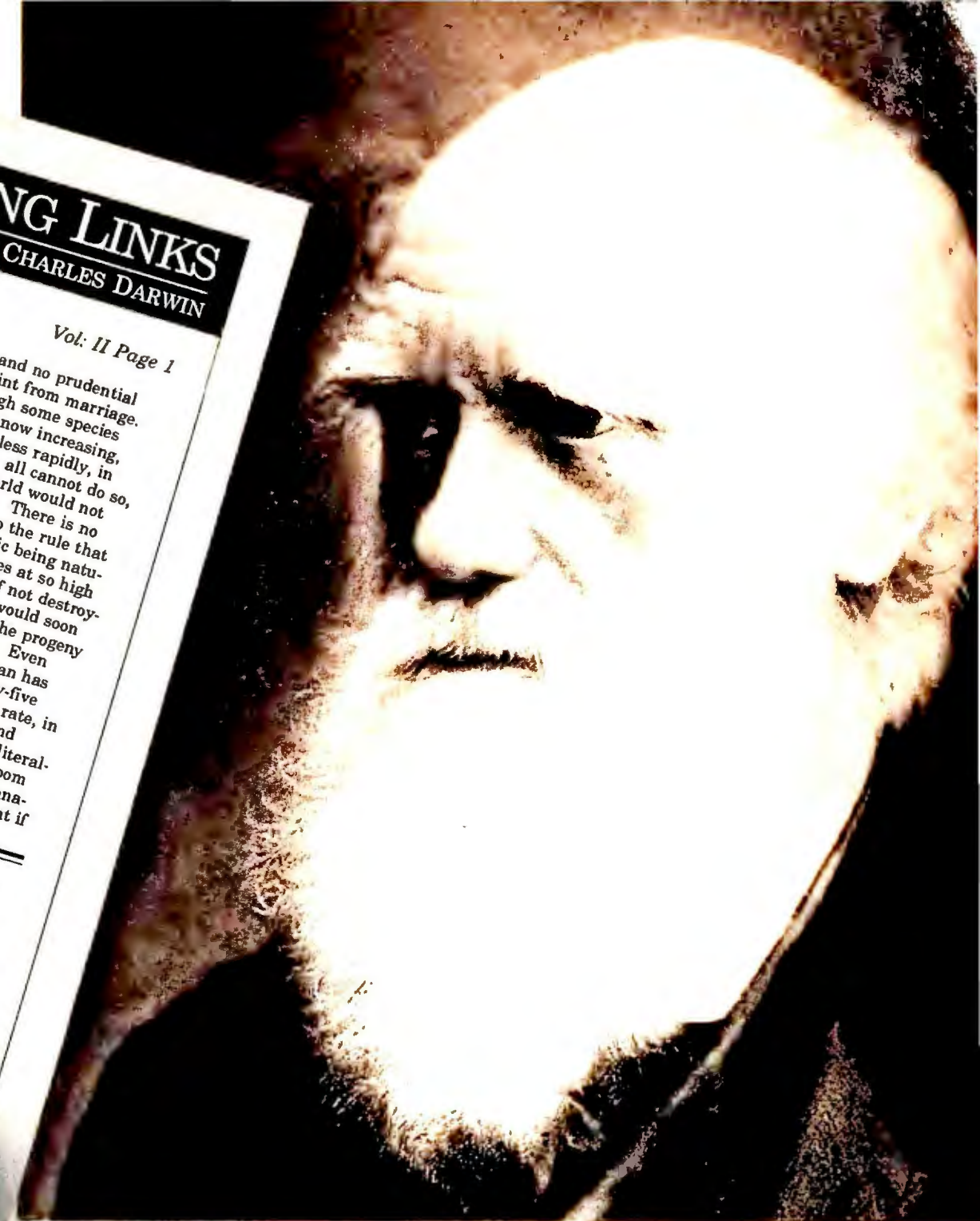
A struggle for existence inevitably follows from the high rate at which all organic beings tend to increase. Every being, which during its natural lifetime produces several eggs or seeds, must suffer destruction during some period of its life, and during some season or occasional year, otherwise, on the principle of geometrical increase, its numbers would quickly become so inordinately great that no country could support the product. As more individuals are produced than can survive, there is a very case be a struggle for existence,

either one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life. It is

Although some species may be now increasing, more or less rapidly, in numbers, all cannot do so, for the world would not hold them.

the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms; for in this case there can be no artificial increase of

food, and no prudential restraint from marriage. Although some species may be now increasing, more or less rapidly, in numbers, all cannot do so, for the world would not hold them. There is no exception to the rule that every organic being naturally increases at so high a rate, that, if not destroyed, the earth would soon be covered by the progeny of a single pair. Even slow-breeding man has doubled in twenty-five years, and at this rate, in less than a thousand years, there would literally not be standing room for his progeny. Linnaeus has calculated that if



If WordPerfect® 5.1 were there, all his theories could have descended from a mouse.

If WordPerfect® 5.1 were around in the 19th century, Darwin could have found an easier path of development.

Instead of digging through layers of documentation to get at the tools he needed, he would have loved the ease with which pull-down menus appear—all from a keystroke or the simple click of a mouse.

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So as things progressed, WordPerfect 5.1, together with our famous toll-free support, could have helped Darwin through his toughest moments. And with all the revisions,

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WordPerfect 5.1. Now that it's here, imagine the possibilities.

WordPerfect

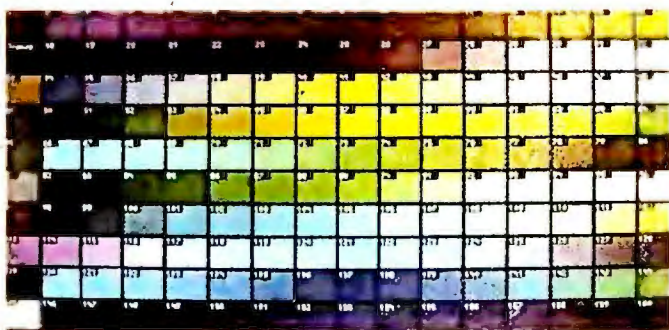
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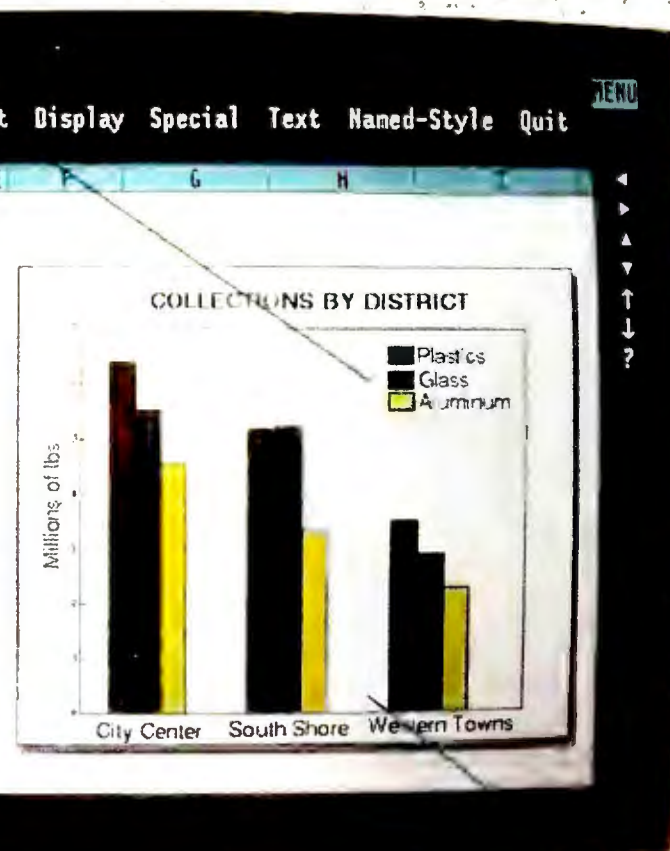
Looks like our PR efforts paid off!

Q4	1989
2,415,407	6,886,910
1,987,897	5,573,029
1,331,601	3,789,665
5,734,905	16,249,604
3,618,829	12,880,958

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<i>If upgrading from Release 1A, 2, or 2.01:</i>	_____	5.25"	XBN-9500	\$150	_____
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	_____	3.5"	XBN-9515	\$75 ²	_____
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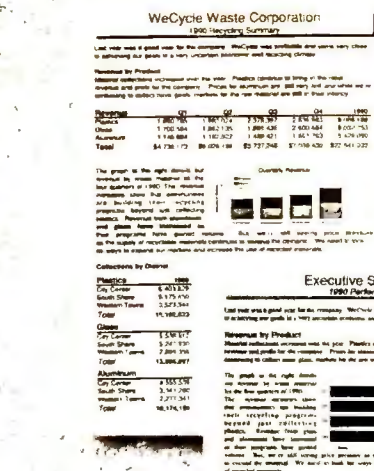
1. One original 1-2-3 System Disk, or original 1-2-3 Reference Manual Title Page per upgrade ordered.
2. Completed Order Form
3. Payment (or proof-of-purchase if applicable)

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Please allow 3-4 weeks for delivery.

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WeCycle Waste Corporation 1990 Recycling Summary

Last year was a good year for the company. WeCycle was profitable and came very close to achieving our goal in a very uncertain economic and recycling climate.

Revenue by Product

Material collections increased over the year. Plastics continue to bring in the most revenue and profit for the company. Prices for aluminum are still very soft and while we're continuing to collect more glass, markets for the raw material are still in their infancy.

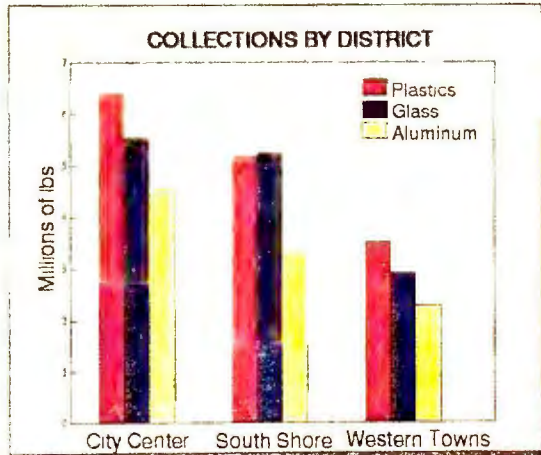
Revenue	Q1	Q2	Q3	Q4	1990
Plastics	1,890,785	1,982,024	2,378,397	2,836,983	9,088,189
Glass	1,700,504	1,862,135	1,669,430	2,600,684	8,032,753
Aluminum	1,146,884	1,182,022	1,489,421	1,601,763	5,420,090
Total	\$4,738,173	\$5,026,180	\$5,737,248	\$7,039,430	\$22,541,032

The graph at the right details our revenue by waste material for the four quarters of 1990. The revenue increases show that communities are building their recycling programs beyond just collecting plastics. Revenue from aluminum and glass have increased as their programs have gained volume. But, we're still seeing price pressure as the supply of recyclable materials continues to exceed the demand. We need to look for ways to expand our markets and increase the use of recycled materials.



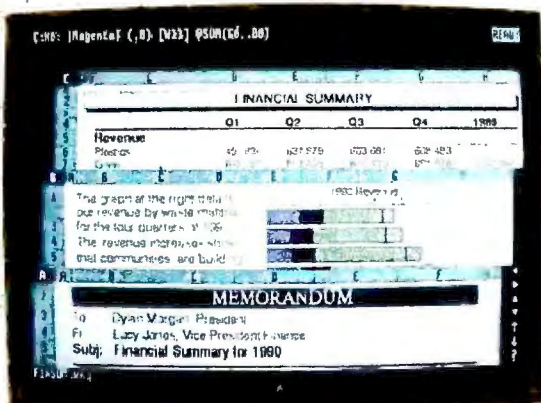
Collections by District

Plastics	1990
City Center	6,403,829
South Shore	5,175,450
Western Towns	3,523,344
Total	15,102,623
Glass	
City Center	5,538,812
South Shore	5,247,930
Western Towns	2,899,356
Total	13,686,097
Aluminum	
City Center	4,555,539
South Shore	3,341,280
Western Towns	2,277,341
Total	10,174,159



Only Release 3.1 automatically wraps text around a graph.

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3.1

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Reader service no. 790

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800/748-5657, 619/438-6883,
619/438-6898 (fax)
LIST PRICE: PP-FP, PP-VP, PP-WN, PP-WP,
\$79.95 each
Reader service no. 791

For more information about all products in this section, circle reader service no. 904.

Blanks a Lot

Q. *I tried BLANK.COM (from "Drawing a Complete Blank," Star-Dot-Star, June, 1990). It certainly blanks my PS/2 Model 55's color screen. However, I can't get back the DOS prompt or the cursor. I try pressing keys, but to no avail; I have to reboot. Any advice?*

*Kathleen J. Meyer
Fargo, North Dakota*

A. June's BLANK.COM utility does not function correctly on PS/2s and many other systems. However, you can easily fix the problem. Just rename the utility BLANKER.COM and create a batch file called BLANK.BAT that contains two commands, **blanker** and **c:\dos-\mode co80**. (Change the MODE com-

mand, which resets your color monitor, as needed if MODE.COM is in a different drive/directory. Also change **co80** to **mono** if you use a monochrome monitor.) Press <Enter> to bring back the screen.

Note that to blank the screen, you must exit your application and manually run BLANK. If you want the screen to blank automatically after a set number of minutes of keyboard (or mouse) inactivity, you should invest in a commercial memory-resident screen blanker. BLANK.COM is meant only as a temporary solution for users who have an application that is incompatible with their current screen blanker.

How does...? What can...? Should I...? Send your PC questions to The Help Screen, PC World, 501 Second St. #600, San Francisco, CA 94107-1431; CompuServe 74055,412; MCI Mail PC World Editorial; or 415/442-1891 (fax). Questions with the broadest appeal will be published. ☺

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course, they're completely compatible with all major network operating systems, including Novell, 3COM and Banyan.

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There's a lot more to know before you buy a server.

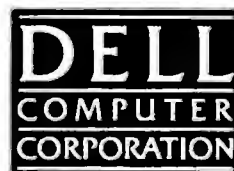
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Performance										
Drawing/editing	(150)	()	Good	Very Good	Very Good	Very Good	Very Good	Very Good	Satisfactory	Good
Tracing	(50)	()	Very Good	Very Good	Very Good	Excellent	Very Good	Satisfactory	Poor	Good
Import/export	(50)	()	Satisfactory	Satisfactory	Very Good	Very Good	Good	Good	Satisfactory	Very Good
Speed	(50)	()	Satisfactory	Very Good	Excellent	Good	Excellent	Satisfactory	Good	Good
Output quality	(100)	()	Good	Good	Excellent	Very Good	Excellent	Very Good	Satisfactory	Satisfactory
Documentation	(100)	()	Very Good	Good	Very Good	Excellent	Very Good	Good	Satisfactory	Satisfactory
Ease of learning	(100)	()	Very Good	Good	Excellent	Very Good	Satisfactory	Good	Very Good	Good
Ease of use	(125)	()	Satisfactory	Very Good	Very Good	Very Good	Satisfactory	Very Good	Satisfactory	Very Good
Error handling	(75)	()	Good	Poor	Good	Good	Good	Very Good	Good	Very Good
Support										
Support policies	(50)	()	Satisfactory	Good	Good	Very Good	Satisfactory	Satisfactory	Satisfactory	Good
Technical support	(50)	()	Satisfactory	Very Good	Very Good	Very Good	Good	Good	Very Good	Very Good
Value	(100)	()	Satisfactory	Good	Excellent	Very Good	Very Good	Very Good	Satisfactory	Very Good
Final scores			6.0	6.4	8.2	7.7	6.9	6.8	5.4	6.5

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InfoWorld reviews only finished, production versions of products, never beta test versions.

Products receive ratings ranging from unacceptable to excellent in various categories. Scores are derived by multiplying the weighting (in parentheses) of each criterion by its rating, where:

Excellent = 1.0 — Outstanding in all areas

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NETWORK Q & A

Freeing Workstation Memory

Keith Nickerson

Q. *With all of the necessary drivers, shells, and memory-resident [TSR] programs loaded into my workstation's RAM, I don't have enough memory left over to run large programs like Ventura Publisher. What can I do to regain some of my workstation RAM?*

Stan Hunter

Ventura, California

A. Your problem is endemic to LAN workstations. Until recently, NetWare users had to dedicate nearly 80K of conventional memory to the low-level network protocols (IPX) and the NetWare shell. Novell's new shell, version 3.01, lets you install most of the shell's code (but not the IPX protocols) in expanded or extended memory. The new shell uses only about 7K of conventional RAM, compared to more than 40K for the previous version, and needs 64K of expanded or extended memory.

You can get the shell (actually, there are three—one each for expanded and extended memory, and an updated conventional memory version) from CompuServe free of charge, except connect fees. Allow about an hour to download everything. Type **go ndd** at any CompuServe prompt. Four files, DSWIN1.ZIP through DSWIN4.ZIP, make up the complete shell. A text file in the NDD download forum tells you what these files are and how to install the new shells.

The new NetWare shells are a blessing, but you may need more memory than they free up. Additional steps you can take to reclaim precious RAM for application use range from the simple to the complex:

Trim TSRs Pop-up accessories are definitely convenient but can be addictive. Several utilities let you load and unload TSRs on demand, freeing con-

ventional memory. These utilities include Bloc Publishing's *Popdrop* and Marknet and Relnet (available as MRKREL.ARC in the Public Domain/Demo Library of the Novell A Forum of CompuServe's NetWire forum).

An even better, though more expensive, solution is to run TSRs in upper (between 640K and 1MB), expanded, or extended memory. For 8088-, 8086-, and 80286-based machines, you can use an add-in memory manager card such as the HiCard from RYBS Electronics or the ChargeCard from All Computers. The HiCard works with machines based on any Intel microprocessor; the ChargeCard is exclusively for 80286-based machines.

On 80386-based machines, you can use expanded memory manager software (EMMs) to emulate expanded memory. *QEMM-386* by Quarterdeck Office Products, *386-To-The-Max* by Qualitas, and *Windows 3.0* by Microsoft are examples.

Clean Up CONFIG.SYS Another RAM-resuscitation trick is to prune your CONFIG.SYS file entries down to the essentials. For example, if you rely mostly on network drives, DOS buffers are practically useless—you can reclaim the 512 bytes each buffer consumes. Put in the line **buffers=0** (don't just omit the command—DOS defaults to 2 or 3, depending on the version and type of machine).

Further, the **LASTDRIVE=** command, which sets the number of available local drives, is unnecessary. In DOS versions higher than 3.0, the default last drive is E, allowing plenty of drives for most networked users. You can omit this command and gain about 2K of RAM. Finally, most people never use the ANSI.SYS console device driver. If you can live without its fancy screen colors and prompts, you'll save 2K to 10K, depending on the version.

Move That Stack Network protocol stacks—drivers that let your computer move data onto and off of the LAN—are the last place to save scraps of RAM. LanSystems' *LANSpace* utility, although rendered partially unnecessary by the new NetWare shell, remains useful because it lets you load IPX into the first 64K of extended memory on an 80286- or 80386-based computer. IPX can hog 20K to 50K, depending on the kind of computer and network adapter you use. ☺

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RYBS Electronics
2590 Central Ave
Boulder, CO 80301
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Reader service no. 821

LANSpace

LANSystems Inc.
300 Park Ave. S
New York, NY 10010
800/458-5267, 212/995-8604 (fax)
LIST PRICE: \$495 (version 2.0 will be \$595)
Reader service no. 822

Popdrop

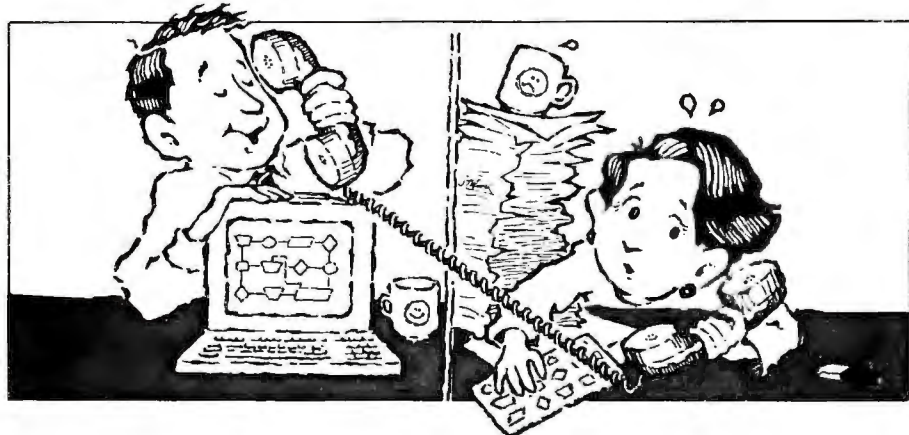
Bloc Publishing
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QEMM-386

Quarterdeck Office Systems
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(continues)

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NETWORK Q & A

(continued)

Reader service no. 825

386-To-The-Max 5

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LIST PRICE: \$130
Reader service no. 826

Windows 3.0

Microsoft Corp.
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Redmond, WA 98052-6399
206/882-8080
LIST PRICE: \$149
Reader service no. 827

For more information about all products in this section, circle reader service no. 906.

Keith Nickerson is the editor of NetWare Advisor and a member of the publishing team of Business Systems Group, a Houston-based network consulting firm.

POWER TIP NO. 151

Shrinking Your PageMaker Files

When PageMaker saves a file, it saves the changes you've made since the last two saves, enabling you to Revert to previous versions of the document but also creating a larger file. To shrink a PageMaker data file up to 50 percent, depending on the type of elements you've changed, save your file with Save as while keeping the same name. Be warned: After doing this, you won't be able to use Revert.

Ed Vavra
Winchester, Virginia

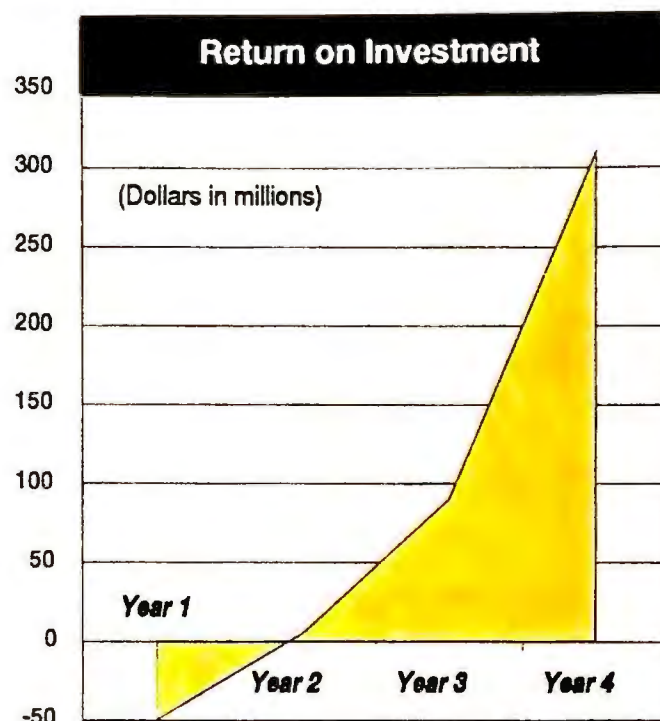
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Microsoft Excel for Windows.

"With solid spreadsheet and charting components and a comprehensive macro language integrated into a powerful graphical environment, Excel is no more 'just a spreadsheet' than a Ferrari or a Porsche is 'just a car.' "

PC Magazine

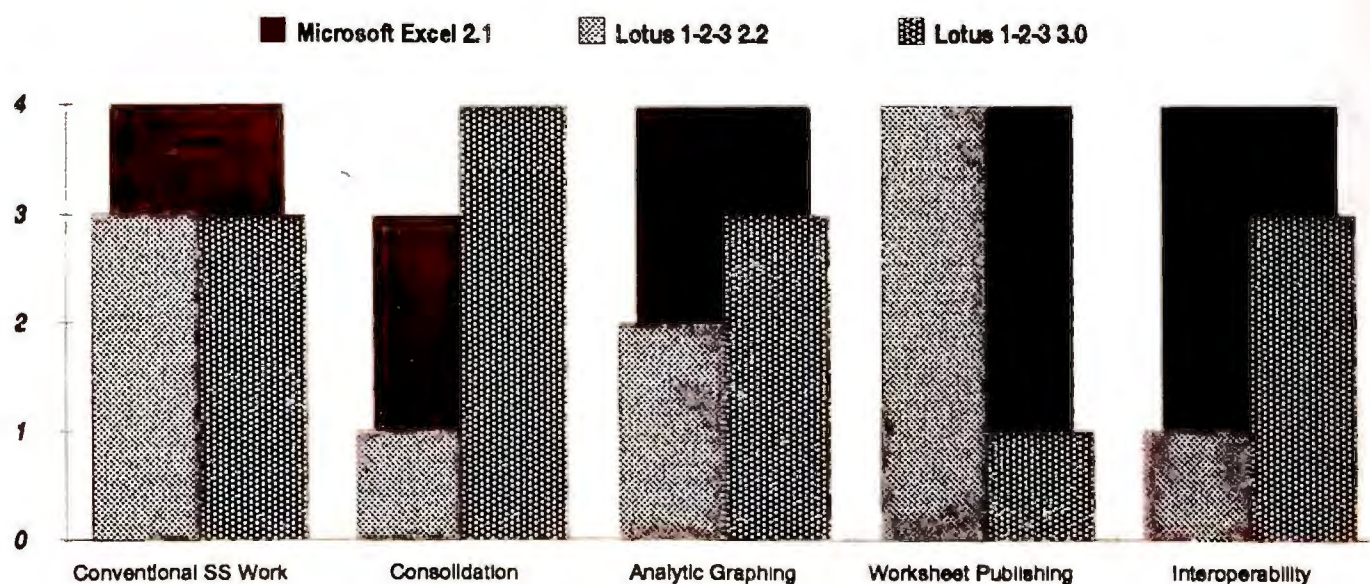
Recently, PC Magazine placed Microsoft Excel version 2.10 head to head with Lotus 1-2-3 release 2.2 and 3. They measured the essential criteria by which spreadsheets are judged. As you can see from the chart, Microsoft Excel proved to be superior in its balance of capabilities. Further evidence of the advantages of the graphical-based Microsoft Excel over the character-based Lotus 1-2-3 can be



*Based on the findings of a recent study, switching to graphical applications can yield increased productivity and can result in these dollar savings. ****

seen in a recent study.

Over the years, graphical-based applications result in significant dollar savings since they are faster to learn, faster to use and less frustrating to master.

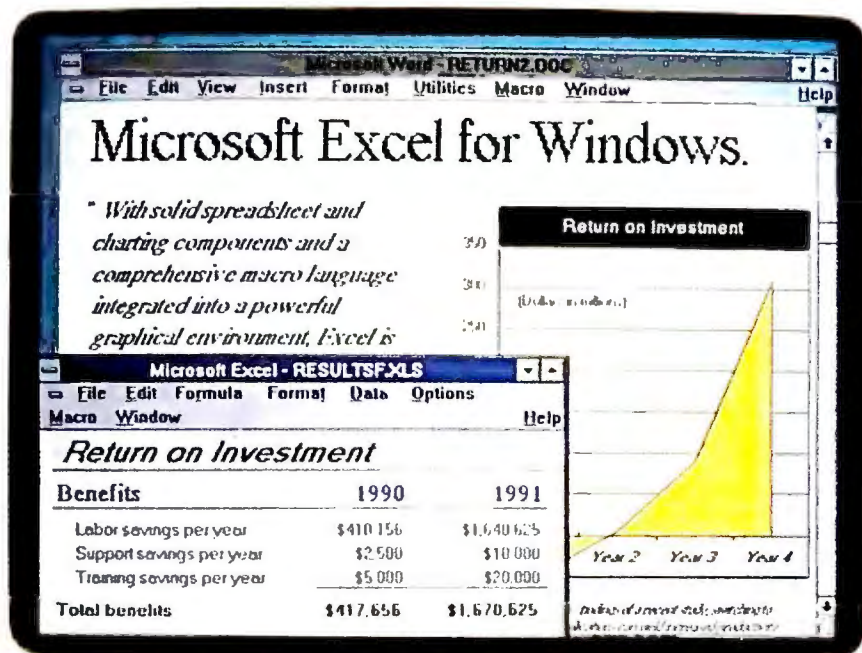


*In this chart, PC Magazine** compares the salient spreadsheet criteria of Microsoft Excel and Lotus 1-2-3. As you can see, Microsoft Excel showed its superiority.*

(Incidentally, this report was created using Microsoft Excel linked with Microsoft Word for Windows.)

If you read the report at the left, you can see in just a couple of seconds how well Microsoft® Excel for Windows™ can crunch numbers.

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Whatever analytic case you're mak-



Windows can display Microsoft Excel and Word for Windows at the same time so you can see how all elements of your analysis will go together.

ing, it's much more easily made with a comprehensible, bottom-line report than with a row and column spreadsheet.

And that's not to give up one iota of analytic power.

Fact is, Microsoft Excel gives you more power to make sense of numbers than any other spreadsheet going. Simply because whether you're analyzing or reporting, you get the power of the Microsoft Windows environment every step of the way.

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And consider it done.

Or if you want to pull data from a variety of databases, you guessed it. Point, click and done.

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Or you can chart your numbers hun-

Microsoft Excel - FINANCES.XLS

File Edit Formula Format Data Options Macro Window Help

Three-Year Profit and Loss Statement

Revenues and Costs	1990	1989	1988
Net Revenues	\$432,006	\$310,663	\$309,266
Cost of Revenues	79,809	65,570	58,344
Research and Development	79,809	52,361	33,081
Sales and Marketing	87,680	68,108	62,490
General and Administrative	27,653	18,537	12,594
Income from Operations	\$157,855	\$114,087	\$142,756
Non-operating Income	7,804	6,639	3,715
Income Before Taxes	165,659	120,726	146,471
Provision for Income Taxes	67,092	48,894	59,321
Net Income	\$98,567	\$71,832	\$87,150
Capital Expenditures	63,478	52,755	29,420
Depreciation	9,863	8,560	7,658
Assets and Liabilities			

Under the Windows environment, WYSIWYG lets you see exactly how your work will print out while you're creating it.

dreds of different ways to make them look really impressive.

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And if you're starting to worry about change, don't. Microsoft Excel reads and writes Lotus® 1-2-3® files. So making a change for the better is easier done than said.



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It's #1 in task switching software.

Software Carousel got to be a best-seller because it works. Simply and reliably. Day in and day out.

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Simply load your programs as usual in individual Software Carousel work areas (it handles up to 12). Then switch instantly from one to another with just a keystroke. Each program gets as much RAM as it needs. And all your programs look and act just like they always did.

Best of all, nearly any program that now runs on your PC will work with

Software Carousel. Even RAM resident utilities, graphics programs and network software. And Software Carousel works on all types of PCs. So you can have the kind of multi-application capability you want, without buying anything new.

Now with Print'N'Run.

Thanks to Print'N'Run, new Software Carousel is also an advanced print handler. One that quickly takes over your printing jobs by accepting all the output bound for the printer, then sending it to the printer as fast as it can take it.

While your printer keeps running, you can keep working in the same application. Or switch to another Software Carousel work area running a different application.

No more wasted time waiting for your printer. No more lost productivity.

OLE. A network idea whose time has come.

OLE is the optional Open Link Extender* for Software Carousel. And it could be the best thing to happen to networks since OS/2 itself.

With OLE and Software Carousel, you can connect to

any host or service over a network—whether it's a mainframe, a mini, etc.—then “switch away” to work on another application, and not lose your connection.

OLE even makes sure that incoming data is received, even though your PC may be occupied with another application.†

And OLE works with all kinds of connection software. Including IBM, Attachmate, and others. Without changes to your hardware or software.

Even the experts agree.

Garry Ray, writing for PC Week, said, “Of these alternative operating environments (OS/2, DesqView and Software Carousel), Carousel may be the best choice of the day.”

Barry Simon of PC Magazine concurred with, “...I find it difficult to imagine using my computer without Carousel. This package has become an essential tool and one that I strongly recommend.”

So if you really want the major benefits of Windows and OS/2, don't get grounded with high cost and mind-bending complexity.

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CONSUMER WATCH

Advice and information for the computer consumer

Research has linked video display terminals to various health problems. What can you do to protect yourself?

Roberta Furger

PC Monitors: Minimizing the Risks

If you're like most PC users, the steady stream of news stories on the potential health hazards of video display terminals has left you feeling more than a little helpless. Your job depends on the daily use of a computer, yet recent studies indicate that you may be jeopardizing your health by sitting in front of a monitor for hours on end. It's hard to imagine a more frightening issue when it comes to PC use—or one that can generate more heated debate among scientists, industry executives, and users.

At the heart of the controversy is concern about the low-level radiation that computer monitors emit—specifically, the effects of two types of low-frequency electromagnetic emissions, those at very low frequencies (VLF) and those at

extremely low frequencies (ELF). Historically, much attention has been focused on VLF emissions and their possible link to miscarriages and birth defects. But currently ELF emissions—which originate from power lines, TV sets, and many standard home appliances as well as from computer monitors—cause just as much concern.

Beginning with a series of *New Yorker* articles in June 1989, questions about monitor safety have come crashing home for users and vendors alike. The response has included everything from legislation mandating further research to a continuous barrage of products claiming to protect users from potentially dangerous rays.

Confusion Abounds

PC industry executives, especially those in companies that manufacture or sell monitors, are quick to point out that no conclusive evidence links VDTs to

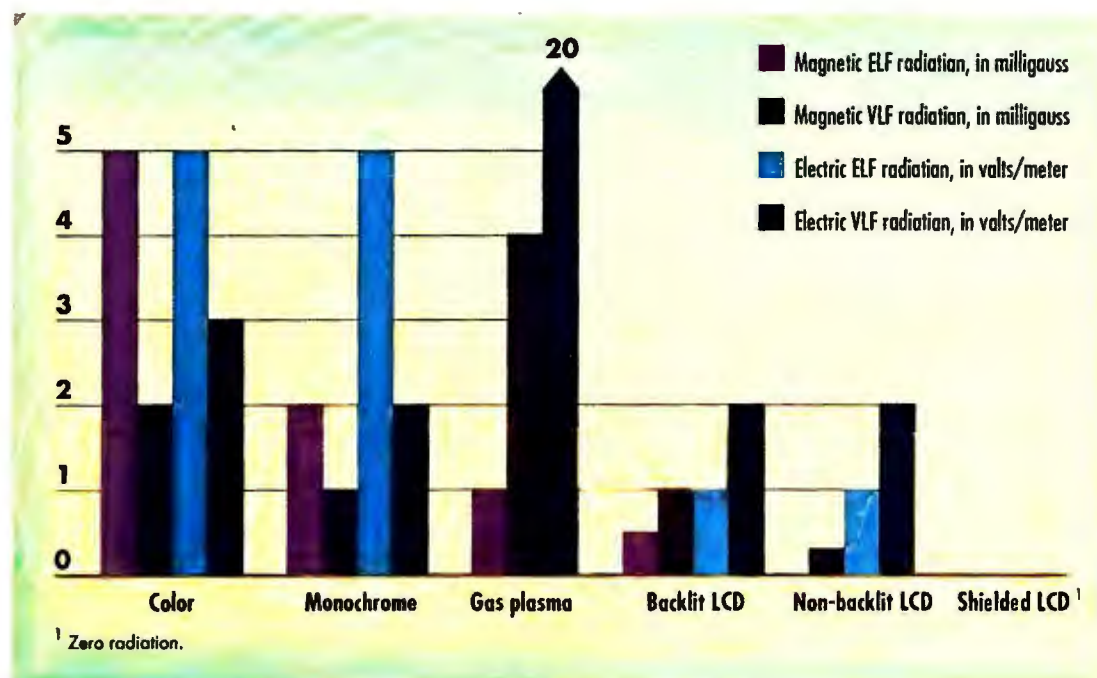
health problems—whether miscarriages and birth defects or cancer. While such statements are literally true, they tell only half the story: There is no conclusive evidence to show that VLF and ELF emissions *do not* cause any health problems. And a growing body of scientific evidence indicates that there's good reason to be concerned.

Given the lack of "proof" either way, several groups are calling on the federal government to initiate independent research that would develop guidelines for both the manufacture and use of monitors. Certainly, that's the long-term solution. But while scientists continue to study the issue, industry and users alike must act now to minimize the risks. Given the stakes, waiting for the final evidence is foolhardy.

The Industry Response

Faced with increased user concerns, *(continues)*

Know the Risks



More colors and higher resolution generally add up to higher emission levels. Monitor shields can protect against electric radiation but not magnetic. Source: Safe Computing.

several monitor manufacturers have introduced low-emissions monitors in the United States. Typically, these units were previously sold in Sweden, where regulations call for more stringent standards to guard against VLF emissions.

IBM was one of the first companies to offer a low-emissions monitor, in its 8515 Color Display last March. Big Blue introduced the unit with little fanfare, simply listing the monitor's very low magnetic field as one of several new features and noting that the "8515 Display meets the Swedish product specifica-

tion." Both the color and black-and-white displays offered for the PS/1 include similar shielding. More recently, monitor manufacturers Sigma Designs of Fremont, California, and Cornerstone Technology of San Jose began selling their large-screen black-and-white monitors with low VLF emissions in the United States. For the most part, you won't have to pay a huge premium for the added protection. The IBM monitors are priced competitively, while the low-emissions Sigma and Cornerstone models cost approximately \$200 more than the standard monitor. Unfortunately, only the IBM monitors are designed for general-purpose use.

Each of these companies cites customer demand, not safety concerns, as the motivation for offering their low-emissions products. The 8515 Display protects against VLF radiation "because customers have asked for it," according to an IBM spokesperson.

Up until the wave of press reports earlier this year, "customers had no interest at all [in the low-emissions monitor]," says Cornerstone president Tom Van Overbeek. Now, he says, the phone rings constantly, with people asking about low-radiation options.

In fact, where it once was taboo to discuss monitors and radiation, several companies are building marketing campaigns around their new-and-improved products—being careful to emphasize, however, that they don't believe users to be at risk.

Not a Complete Solution

Although a positive first step, this new breed of monitors comes from only a handful of companies. What's needed, say many, is an industrywide response. Cornerstone's Van Overbeek believes the industry should rally behind the Swedish standards until further studies are conducted in the United States. Such a move by all monitor manufacturers would make for a level playing field, he says.

But reducing VLF emissions is only a partial solution. The Swedish guidelines

do nothing to reduce ELF emissions, which many scientists suspect may be more dangerous. Workers in Sweden are calling for monitors that protect against both types of emissions.

Sigma Designs has organized a company task force to research ways of shielding ELF emissions. The company pledges to offer a low-ELF and -VLF monitor to U.S. buyers during the first quarter of 1991.

Monitor manufacturers aren't the only ones jumping on the low-radiation bandwagon. Manufacturers of antiglare shields are bombarding the market with products that they claim will protect users from harmful radiation. Experts agree, however, that the shields on the market protect only against electric emissions; they do nothing to block the more dangerous magnetic fields. Furthermore, they protect the user only from electric fields emitted from the screen—not from the more powerful ones emanating from the sides and backs of monitors.

One of the few products sold that truly addresses both VLF and ELF emissions is the Safe Monitor from Safe Computing of Needham, Massachusetts. The company claims that these backlit LCD displays produce no detectable emissions. (All LCDs emit electric and, when backlit, magnetic radiation, but at much lower levels than do CRTs. The Safe Monitor is a shielded LCD display that uses soft metals to cancel out the magnetic fields.) Safe Computing president George Lechter proposes LCD displays as the best protection against radiation, and several worker organizations agree.

Take Action

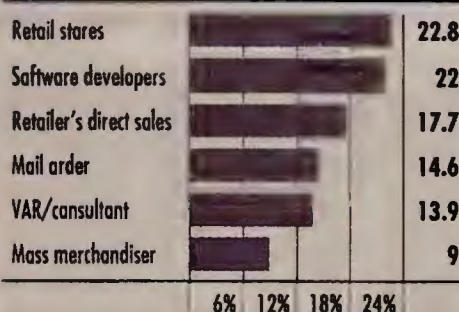
Buying a new monitor may be the safest way to go if you want to avoid electric radiation, but it's not the only solution, and for many it's not an option. Consider the following alternatives, and act now to protect yourself and your co-workers.

- Be informed. Read up on the subject and begin to cut through the jargon (*continues*)

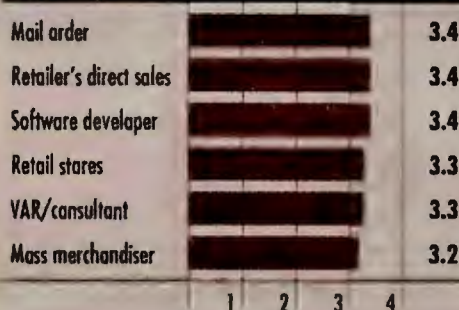
RATE YOUR SATISFACTION: Software Distribution Channels

Retail stores represent the channel of choice for software purchases, although buying directly from the developer remains popular, according to this survey of large organizations. Mail-order purchasing, which in the past accounted for a significant percentage of software purchases, is declining in popularity—perhaps due to the growing emphasis on service and support. Regardless of the channel they chose, users generally are satisfied with their method of purchase.

Distribution channels used in percent



Users rate their satisfaction 1=low 4=high



Source: International Data Corporation. From a survey of 200 large organizations, each with at least 50 PCs.

The numbers outside.

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to develop an understanding of the issues.

"The first thing we tell people interested in VDT-related issues is to read the literature and make up their own minds," says Laura Stock, associate director of the Labor Occupational Health Program in Berkeley, California.

Stock coordinates the VDT Coalition, a group of unions, VDT users, and health and safety organizations concerned about worker safety issues. For \$8 the coalition will send you a 100-page packet of information. Send a check made out to the U.C. Regents to the VDT Coalition, c/o Labor Occupational Health Program, 2521 Channing Way, Berkeley, CA 94720.

- Advocate change. Start by writing your PC and monitor manufacturers to let them know you're concerned. Ask them to clarify their position on monitor safety and to indicate what steps they are taking to address the potential health hazards.

- Then exercise your clout by letting vendors know that their responses will guide your buying decisions. Customer demand is a powerful motivation.

And while you're in the mood, send a note to your state and federal representatives. The House subcommittees on Natural Resources, Agricultural Research and Environment, and the Interior subcommittee on General Oversight and Investigations are reviewing measures to fund research on VDT hazards. Further research is the only way to resolve the health questions, so let your representatives know you consider this a funding priority.

Reducing Exposure

You also can take steps right now to minimize your exposure—and reduce the risk of harmful rays.

- Turn off your monitor. It sounds simple, but most of us leave the monitor running even when we're not using our PC. Flipping the switch may be one of

the most productive steps you can take right now to reduce your own exposure and that of your co-workers.

- Keep your distance. The farther you get from the screen, the lower the electromagnetic fields. Using the "extended-hand rule," sit at least arm's length from the monitor.

- Reorganize your office. The sides and backs of monitors give off high levels of radiation, yet in many offices workers are surrounded by the monitors of fellow employees (a standard cubicle divider does nothing to block the emissions). Take a look around your office. Could the desks be reorganized to reduce exposure? Emission levels are virtually undetectable at a distance of 10 feet. At a minimum, you should keep a distance of 4 feet from any monitor.

Over the coming months *Consumer Watch* will be following events related to this issue and will report on what companies are doing to address the potential (continues)

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to re-invent
the laser printer.



What's the Okidata OK? It's a badge of honor that every Okidata product has to earn—a symbol of our commitment to design and deliver products that offer outstanding value and performance. Products that will not only satisfy you, but impress you.

The Laserless Printhead: Warranted for 5 Years.

The performance promise behind the Okidata OK is the reason we had to re-invent the conventional laser printer. Our engineers frankly rejected the industry-standard page printer technology of laser beams, lenses and rotating mirrors. Instead, they designed and built a proprietary, solid-state LED printhead with no moving parts. It's a printing system so trouble-free, we guarantee our LED print element for 5 full years—making it by far the longest warranty in the industry.

But reliability isn't the only advantage our unique printhead offers. It also means a simpler design, resulting in a straight-line paper path that's far less likely to jam—even when feeding heavy stock, envelopes, or labels. And, since we build it ourselves, it means something else—a lower cost.

The OL400: The Only \$999 Page Printer.

Our 4 ppm OL400, for example, has the lowest list price of any page printer on the market: only \$999.* Yet that price gets you a printer that earned a PC Magazine Editor's Choice Award, with standard features—extra fonts, a full 200-sheet paper tray—that you won't find on a LaserJet® IIP selling for hundreds of dollars more. Plus a slim, low-profile design that's less bulky on a desktop.

The OL800: Twice the Output, with Room to Grow.

And the OL400 isn't the only Okidata LED page printer to offer outstanding value. For applications where greater speed is needed, the OL800 delivers 8 ppm with all the advantages of the Okidata LED printhead: straight-line paper path, 5-year

printhead warranty, and a low \$1499 list price.

Like all our LED page printers, the OL800 emulates HP® Series II for compatibility with most popular software; with its speed and selection of resident type fonts, it can handle the printing needs of a whole work group. What's more, as your applications change and your needs grow, a simple upgrade kit turns the OL800 into either a font-scaling OL820 or a PostScript®-compatible OL840.

The OL820: Smarter Than a LaserJet III.

The OL820 earned the Okidata OK by learning how to do font-scaling on the fly. Thanks to a special chip our engineers designed into the 820, it can solve complex type-sizing and positioning problems instantly—problems the LaserJet III needs to talk to its software to work out. That means the OL820 can deliver up to three pages of sophisticated text while the LaserJet III is still working on its first page.

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The OL840: PostScript and Beyond.

And for applications that require full Adobe PostScript® compatibility, our OL840 delivers it in spades. It's ready to connect to any PC or Macintosh® system, or to both at the same time—then switch between systems with the push of a button.

The Okidata OK. It's a promise that makes our job—to design and manufacture a line of page printers offering both outstanding value and performance—a hard one.

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For additional information, call us at 1-800-800-7333.



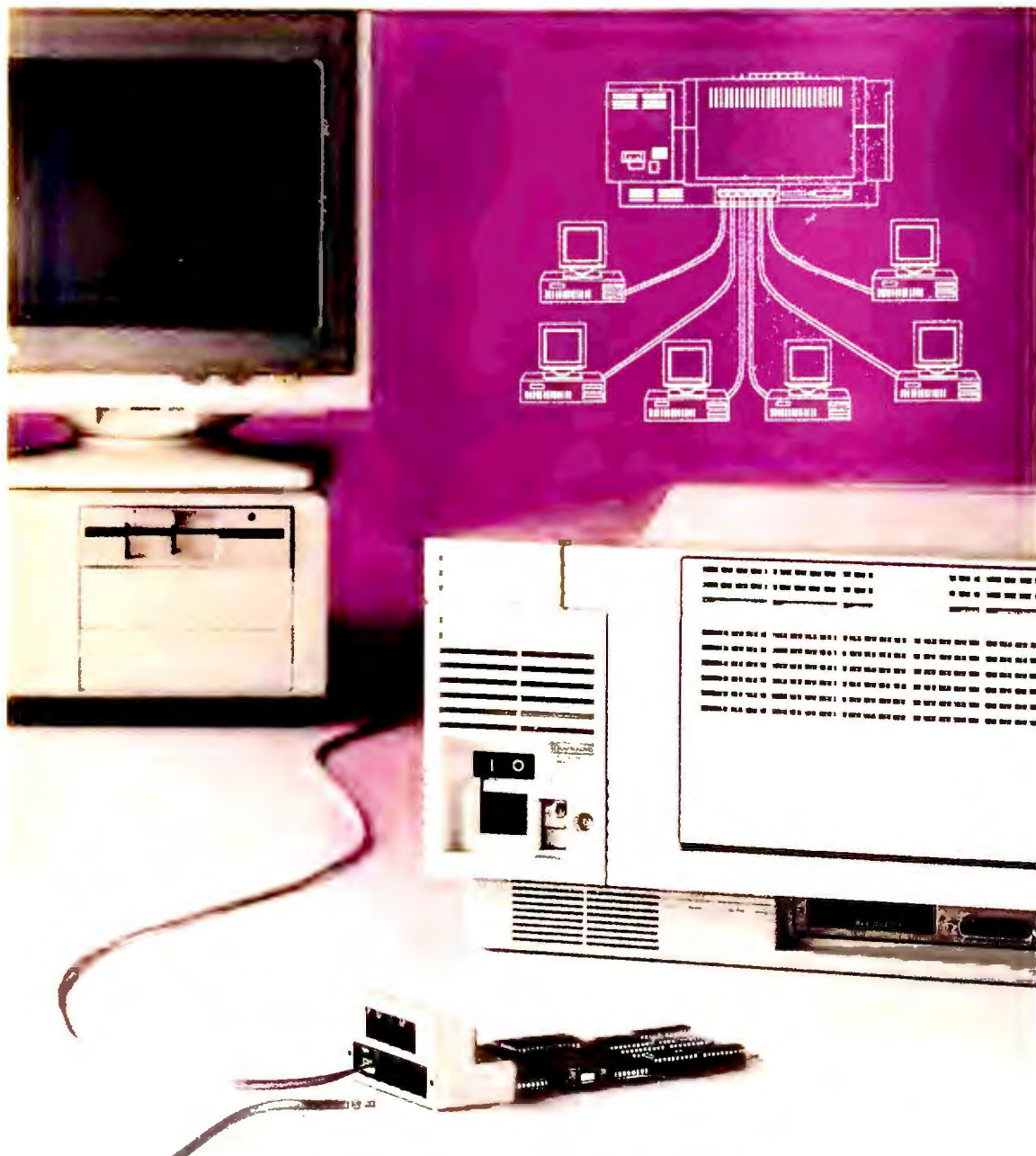
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CONSUMER WATCH

tial health risks of electromagnetic radiation. It's in everyone's best interest to confront the issue now.

SHOP TALK

Now That's Service

I recently purchased a U.S. Robotics 2400-baud internal modem from Computer Discount Warehouse (CDW) to use in my Dell System 210 with *Procomm Plus*. After installation, however, the modem and computer wouldn't communicate.

Calls to Dell and U.S. Robotics technical support lines were answered promptly and courteously. I spent approximately two hours on the phone with technical support representatives at the two companies trying to diagnose and solve the problem. Both companies agreed it was either a faulty modem or an incompatibility between the modem and the Dell System 210 and suggested replacing the modem as the most expedient solution. (Dell also offered to duplicate the problem in its laboratory to find a solution.)

I called CDW, which exchanged the modem for a U.S. Robotics external modem, and the problem was solved.

I couldn't have asked for better help from Dell, U.S. Robotics, or CDW. It's good to know these companies support their products.

C. P. Sword

Brookings, South Dakota

More Snappy Service

I bought an Epson LQ-2550 printer and found that *Microsoft Word 5.0* would not drive the two-bin cut-sheet feeder properly in mixed mode.

I sent the details of the problem to Microsoft and a week later received a phone call from a technician who walked me through a process to correct the problem. Unfortunately, the procedure didn't work.

Within a short time, however, Microsoft had acquired an LQ-2550 with a sheet feeder and had assigned a techni-
(continues)

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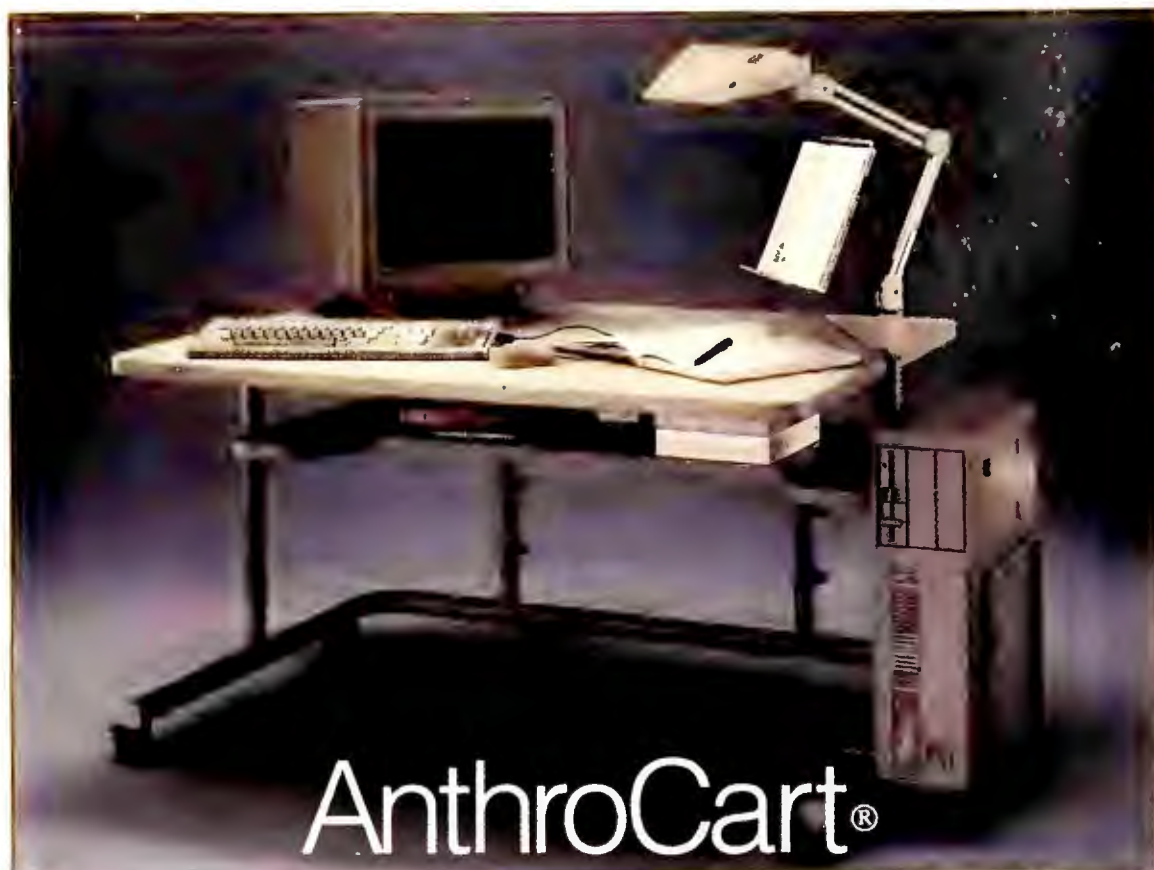
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*Henry Sostmann
Durham, North Carolina*

Hard Drive Dilemma

We purchased a Toshiba T-1200 in October 1988 and used it quite successfully until January 1989, when the hard drive had to be replaced. The laptop was still under warranty and a new hard drive was installed free of charge.

Then, 12 and a half months later, we were told that again we would need a new hard disk—to the tune of \$1088, or almost half the original cost of the laptop. Toshiba advises us that the unit is no longer under warranty.

The question is, should we have it repaired again and hope this isn't an annual event, or should we consider it a throwaway and replace it with a different brand?

*David Biddle
Golay Buschel USA, Ltd.
New York, New York*

Editor's note: Consumer Watch contacted Toshiba about Mr. Biddle's hard drive failure and requested information on the failure rate of Toshiba's T-1200 laptops. According to a Toshiba spokesperson, the hard drive failure rate on both the T1200XE and the T1200HB is less than one percent. In light of Mr. Biddle's repeated problems, however, Toshiba has agreed to refund his money for the replacement hard disk and has extended the warranty on his system for one year.

Think you've gotten a raw deal? Send the details to Consumer Watch, PC World Editorial Dept., 501 Second St. #600, San Francisco, CA 94107; CompuServe 74055,412; or MCI Mail PC World Editorial. We'll investigate your complaint and publish letters with the broadest interest. ☎

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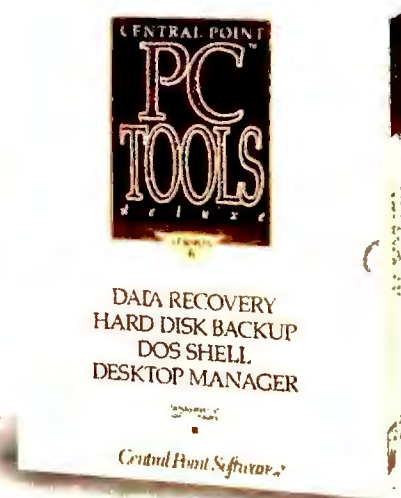


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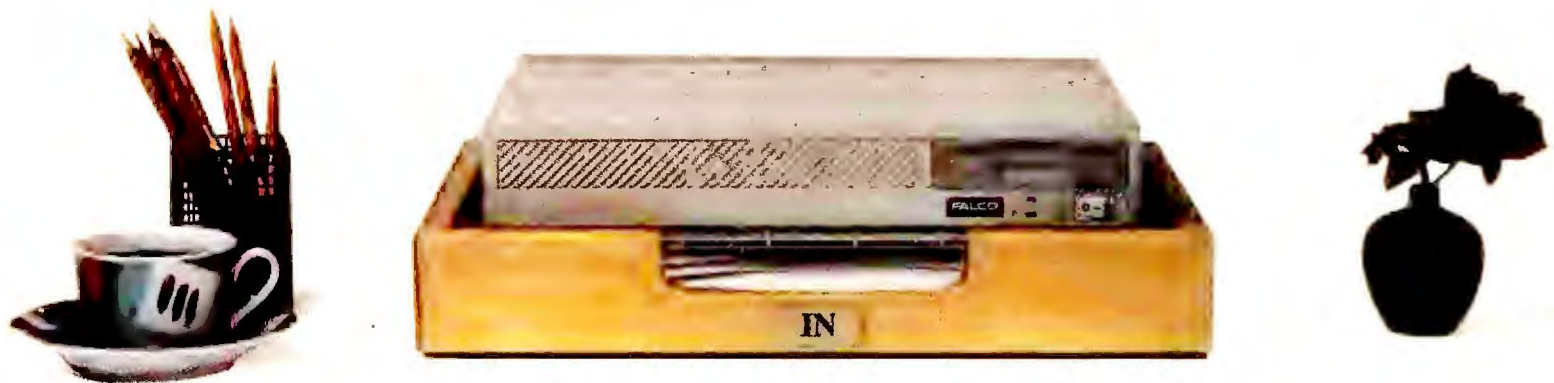
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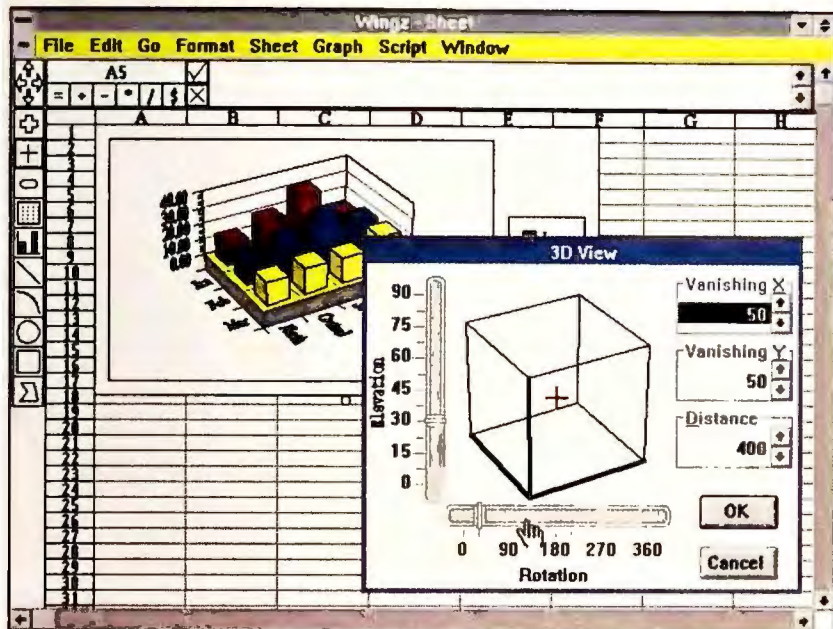


Edited by ERIC BENDER

Development Teamwork Collapses

IBM, Microsoft Conflict on Software

Is a Smooth Windows-to-OS/2 Migration Assured?



While Windows and OS/2 versions of packages like Informix's Wingz may look identical, the environments are incompatible.

The two giants in PC system software have agreed to disagree. They're steering users in opposite directions—which bodes ill for customer investments down the road.

Under a September agreement, IBM will push the OS/2 operating system, while co-developer Microsoft will drop most OS/2 work and concentrate on Windows and DOS. With a downsized OS/2 version 1.3 appearing soon, IBM and Microsoft will offer competing graphical environments with almost identical hardware requirements—realistically, a 386 with 4MB of memory and a large hard disk. Microsoft chairman Bill Gates acknowledges the obvious: "There will be overlaps between these products."

In this uneasy alliance, the two companies still jointly own DOS and OS/2 and are cross-licensed on related products—

and Windows. IBM will develop 16-bit and 32-bit versions of OS/2, with Microsoft focusing on distant "OS/2 3.0" releases for both Intel and non-Intel platforms. This switch raises many questions about what Microsoft has been telling users since 1987. It also creates problems for PC vendors who must license IBM-created OS/2 through Microsoft—a clumsy arrangement.

Since Windows 3.0 debuted in May, users have jumped on the only graphical bandwagon that carries a full suite of applications. IBM saw the Windows wave coming last November and signed Microsoft to a truce that put a ceiling on advanced features for Windows. Apparently, though, such restrictions no longer apply. Gates won't be specific, but future Windows-DOS combinations presumably could include an improved file

system, more advanced multitasking, and a cleaner memory architecture.

Developers Stay on Course

This is a tempest in a teapot for most users now, since OS/2 has met only meager acceptance. And most software developers are relatively unperturbed because their heavy bets on Windows don't appear threatened.

Still, software makers expect most users to eventually move to OS/2 and are keeping OS/2 efforts simmering. "Although Windows will be successful in the stand-alone DOS world, OS/2 will be dominant in the client-server world," says Fred Gibbons, chairman of Software Publishing Corporation in Mountain View, California.

Corporate customers are "buying machines that are capable of running OS/2 eventually, even if they are only used for Windows now," remarks Bill Cornfield, president of The Windows Support Group, a New York consulting firm. "OS/2 remains part of Microsoft's master plan. It's more a question of timing than anything else."

What's the Upgrade Path?

But how will Windows users make the transition? Microsoft reaffirmed its promise that OS/2 2.0 will run off-the-shelf Windows packages and declared that OS/2 3.0 would do so more elegantly. But the necessary cooperation with IBM will become much harder

to orchestrate.

Another user concern: Many early adopters are less than enthusiastic about IBM's versions of OS/2. "IBM's work has been slipshod," says Bob Holmes, systems evaluation manager at Southern California Gas in Los Angeles. Missing drivers, poor documentation, and inadequate technical support have plagued Holmes and other users. —Alice LaPlante

OS/2: Who's in Charge?



¹ IBM aligning product with LAN Manager.

IBM and Microsoft have broken up their joint development efforts, assigning prime responsibility for DOS to Microsoft and responsibility for OS/2 to IBM.

HARRY ALUNG

Software-Only Stores Face Greater Competition

Users Turn Toward Superstores

The marketing was clever, but large selection and low prices were what originally attracted crowds to Egghead Discount Software stores. Since 1984, when Victor Ahadeff opened his first outlet in Bellevue, Washington, the software-only store that maintains more than a thousand titles has seemed unbeatable, especially to the small-business customer. Today, however, it's being challenged by a new breed of retailer that pushes selection and pricing even further.

Besides discounting software 10 to 50 percent, Egghead has always offered a liberal return policy. Customers can return any package for any reason within 30 days of purchase—providing a safety net for buyers.

With its winning combination of price and service, Egghead grew rapidly, hitting almost 200 stores by early 1989. But then the chain faltered financially. One factor was the increased competition from

mail-order houses and other software-only stores, such as Walden Software in Stamford, Connecticut, and Software Etc. in Minneapolis. More important, Egghead was suffering the pains of such rapid growth.

However, the chain brought in new management who sharpened operating practices, and it began turning a profit again a year ago. (Egghead's direct sales group, which accounts for more than half of its revenues, also is prospering.)

Superstores Soar

Now Egghead and its rivals face another hurdle: the superstore. The size of the largest supermarkets, these warehouses—stocked with every kind of hardware, software, and peripheral imaginable—are springing up all over, from Soft Warehouse in Dallas to Micro Center of Columbus, Ohio, to Fry's Electronics in Palo Alto, California. "We watch the buildings go up and

our parking lots empty out," says a ComputerLand sales manager in Dallas.

The superstores' appeals are selection first and price second, notes Seymour Merrin, president of Merrin Information Services in San Francisco. "A superstore will have over twice as many titles as an Egghead, and they'll all be in stock," says Merrin. The pricing is likely to be a tad lower than a software-only outlet's.

On the other hand, superstores may not be as consumer friendly. "Some superstores have a hard-nosed attitude about returns and don't take products back for any reason, much less because the customer 'just didn't like it,'" points out Jerry Schneider, a Washington, D.C., small-business computer consultant and prominent user group leader.

Superstore critics maintain that the sales staffs are ignorant about the products. "People shouldn't go into one of these stores thinking they will get enough information to make a smart buying decision," says Tracy Licklider, president of the Boston Computer Society.

Some PC users turn instead to mail order, but their numbers seem to be dwindling. "I need immediate gratification," says George Yates, a Houston CPA, summing up why most users avoid mail-order houses. "The discount prices aren't enough compensation for the wait."

Software buyers are virtually unanimous in their distaste for retail computer chains. "Their prices are always higher, and their knowledge is insufficient to be of any real use," says Tom Kelly, a process engineer for Oxy-Chem in Alvin, Texas.

Egghead and its peers won't surrender to superstores without a fight. The superstore chains have yet to span coast to coast, and thus

each local software market remains just that: dependent on local influences. If a superstore has arrived in town, it's a good bet that the local Egghead store will drop prices and overstock its shelves. —Alice LaPlante

Software Superstores on the Rise

Leading software resellers



Walden Software, 225 locations



Egghead Software, 191 locations



Software Etc., 65 locations



Soft Warehouse, 18 locations



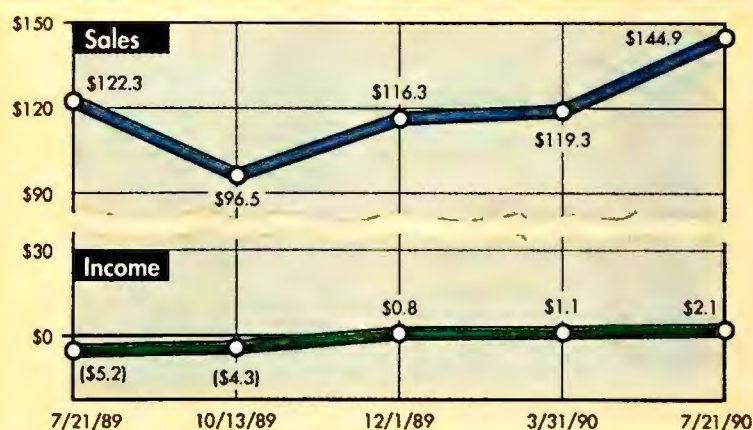
Fry's Electronics, 3 locations



Micro Center, 3 locations

Egghead Back in the Black

Sales, income in millions



After expanding too aggressively and posting losses last year, Egghead Discount Software brought in an executive team that boasted efficiency and strengthened financial controls, bringing the chain back into the black.

Existing software stores such as Walden and Egghead face a strong challenge from "superstores" led by Soft Warehouse. These supermarket-sized outlets, which aim to stock an even wider selection of software, are few in number but are spreading rapidly, says Merrin Information Services.

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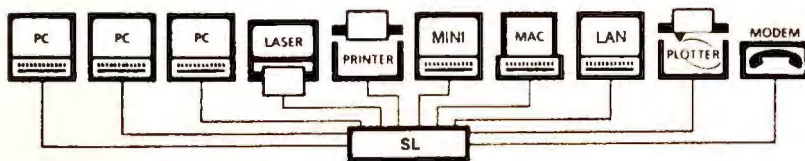
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Heavyweight 486s Remain Niche Products

Most Users Prefer Price/Performance on 386 Machines

High-end machines based on Intel's 486 chip have been shipping for almost a year, but the powerhouses haven't yet found their way into the PC heartland.

Vendors and dealers say interest in 486 systems has been confined to three principal tasks: computer-aided design (CAD), engineering, and network service. For most other business applications, 386-based PCs remain the systems of choice.

Slow Ramp Up

Everex Systems in Fremont, California, began shipping its first 486 system, a 25-MHz desktop unit, last December. Sales were slow at first but picked up over the summer and now account for one-tenth of Everex's revenues. "We can't build them fast enough," says Product Marketing Manager Steven Dougherty.

Dougherty attributes the slow initial response to the "natural learning process that goes on whenever a new processor is introduced. A few users have to have it right away, but the majority of them sit back and wait and see what happens."

There's currently a \$3000 price differential between Everex's 33-MHz 486 and a similarly configured 33-MHz 386 system, which lists for \$5399 with 4MB of RAM and no hard drive. That price jump places the 486 out of range for many users. But for some the dramatic performance advantages of a 486 make it a smart buy, says Dougherty.

"If you need the power, it's well worth the price," agrees Robert Charlton, analyst with Dataquest in San Jose. He notes that in some engineering applications, a 33-MHz 486



CitiCorp is buying 486 PCs for network server jobs, but Roger Bender says 386 machines can handle most desktop tasks.

system can be up to four times faster than its 386-based counterpart.

386 Meets Business Needs

But when it comes to mainstream business applications, the 386 still fits the bill, and the 486 hasn't created the kind of user excitement sparked by its predecessor.

"The 486 is not going to be commonplace for some time," says Roger Bender, vice president at CitiCorp in New York and former president of the Microcomputer Managers Association. Although CitiCorp has purchased 486-based systems for use as network servers, Bender believes that the need for desktop power is nicely filled by high-end 386 systems.

Most of today's software doesn't demand the power of a 486 chip, says Bender. "You hit the <Enter> button on an up-scale 386 and you get a good response," he says. But given time, Bender believes, software developers will write applications with the 486 in mind, as many now write for the 386.

shipments to total 86,000—a tiny fraction of the 3.725 million shipments projected for 386 and 386SX systems.

Another factor slowing demand, says Stephen, is that many 486 systems are so-called super servers, high-end systems designed to be alternatives to minicomputers.

Additionally, some vendors have been slow to enter this race—most notably IBM, which didn't introduce full-blown 486 PCs until this fall.

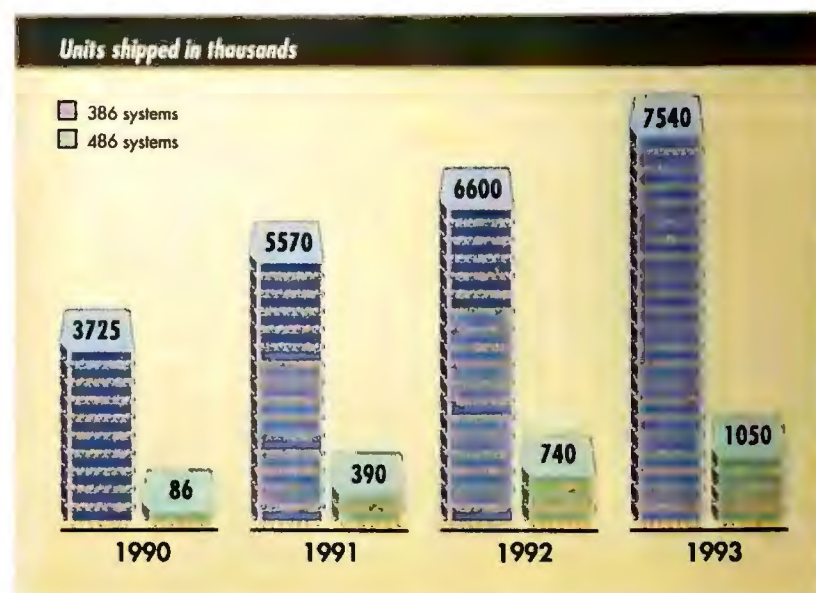
Most observers agree that 33-MHz 486s, which began to ship in volume only this fall, should boost demand. "With all the press about the 33-MHz chip, we didn't sell many 486/25s," says Keith Carter of Necad Northside, a computer dealer in Omaha, Nebraska.

Intel isn't stopping at the 33-MHz version; a 50-MHz offering—close to the limit that conventional system board circuitry can handle—should appear early next year. Despite such rapid advances, we're likely to see "mainstream PCs staying at the 25-MHz level for years to come," says Michael Slater, publisher of the *Microprocessor Report* in Sebastopol, California. —Roberta Furger

Tighter Budgets, Slower Sales

Bruce Stephen, an analyst with International Data Corporation in Framingham, Massachusetts, says the lukewarm response to 486 systems exemplifies an overall trend toward prudent purchasing. "Budgets are flat, and [customers] are more careful now about how they spend money on systems," says Stephen. IDC expects this year's 486

486 Sales Take Off Slowly



Computers based on Intel's 486 chip will continue to be used almost exclusively as network servers and high-end workstations, and sales won't top 1 million until 1993; 386 and 386SX systems will rapidly become general-purpose PCs. Source: International Data Corporation.

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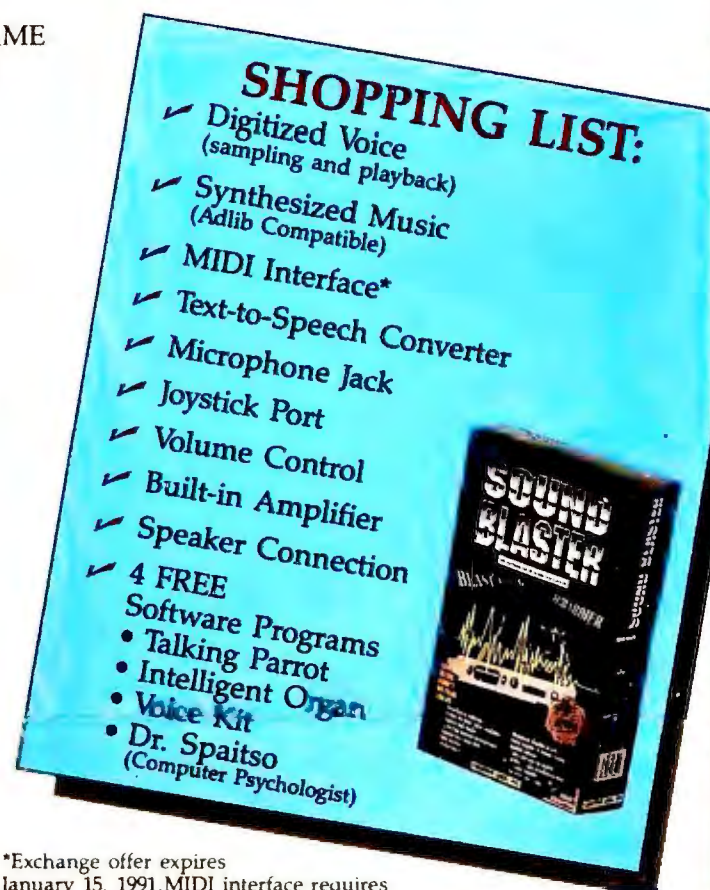
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Users Applaud NetWare, Request Better Support

Upgrade Prices Seen as Excessive

Novell didn't gain its dominance in local area network software through dissatisfied customers. Most NetWare users wouldn't think of switching. They praise their favorite LAN operating system for its performance, reliability, and flexibility. But after the paeans are finished, nearly all voice dissatisfaction with Novell's technical support and upgrade pricing.

Better Support, Please

"If you're just an end user, there is no free technical support," protests Bruce Berrens, LAN administrator for Holiday Companies, a Bloomington, Minnesota, wholesale-



"It would be nice if Novell got rid of its voice-mail system and got real people," suggests Jeff Walters.

retail conglomerate. "Novell's response is either 'Give us a credit card number' or to send you back to the reseller. We had a problem with that, since we no longer do business with the company we bought the product from."

Ted Hall, MIS manager for the Asbury Park Press in Asbury Park, New Jersey, has

"never been able to get a problem resolved through Novell's technical people." He subscribed to NetWare Assurance, a recently discontinued phone support and upgrade service, but "the only thing it did was provide upgrades. The technical support just wasn't adequate."

"It would be nice if Novell got rid of its voice-mail system and got real people," says Jeff Walters, vice president of Denver's Accelerated Bureau of Collections. "When I wanted to know if a particular board would work in my server I had to go through ten levels of menus, then answer a whole lot of questions. It took three days for a guy to call me back to tell me no."

Frustrated by such experiences, NetWare users have turned to each other for help through user groups, bulletin boards, and especially NetWare, CompuServe's Novell forum. "I really appreciate NetWare, especially since they dropped the surcharge," says Berrens. "Our problems have been solved either over NetWare or by talking with other users."

But NetWare isn't the answer to everyone's problems. When Charles Raley, a programmer analyst in the Department of Instructional Media at the University of California at Davis, has problems with his department's LAN, members of his user group tell him to turn to NetWare. "But you have to be comfortable enough with CompuServe to get into NetWare, then you have to wade through the forums to find what you want. It would be very helpful if Novell



Both Nancy and Charles Raley say that their organizations depend on NetWare but often struggle to find technical advice.

included a tutorial on navigating NetWare with their products." Walters also finds NetWare intimidating. "It's huge. How do you know what's new? I can't tell. Where do you begin to look? You have to talk with Novell's phone support—at \$200 an hour—to find out."

The LAN administrators who report to Nancy Raley, manager of office systems for CalFarm Insurance in Sacramento, California, are highly trained. They support CalFarm's large, fast-growing LAN themselves. But occasionally they're stumped by a tough problem. And "the people we have access to at Businessland, ComputerLand, and our other dealers don't have the expertise at the advanced level we need," says Raley.

Her options? "There's NetWare [or] I can hire a consultant," she says. "We go to user groups, but we find ourselves the most experienced of the lot." Raley suggests that Novell make its technical experts available to meet with user groups to help resolve tricky

problems. "I know they're worried about their most valuable engineers spending too much time on support, but I've seen this done successfully by other vendors."

Helping NetWare Dealers

How do NetWare dealers rate the support they get from Novell? Bruce Umamoto of America's Computer Center in La Mirada, California, is quite content. "I like Novell's service—it's improved a lot over the last six months, and now it's excellent. I don't get put on hold as often, and when they have to return calls they do it within 15 minutes. That means that when our customers call us with a question, we can get them an answer right away."

But not all dealers are as satisfied. "Whenever I call their dealer support number I get put on hold for half an hour, then they tell me they'll call me back," says Todd Gould, technical director for Loren Data in Santa Monica, California, a custom LAN data base (see *NetWare*, p. 86)

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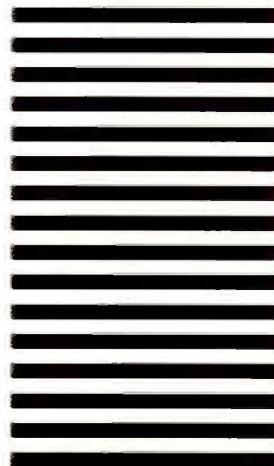
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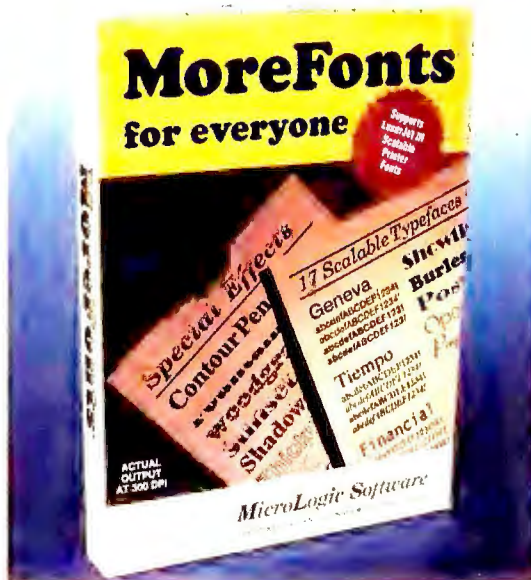
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The new release adds "on-the-fly" downloading of fonts directly to your printer when using WordPerfect or Microsoft Word, to save hours of time and megabytes of disk space. "MoreFonts loads requested fonts directly into the LaserJet, thereby avoiding the hassle of selecting and making separate bitmapped fonts in advance," explained Frank Hainze, president of MicroLogic Software. "Just select any size font from within your application, choose the shading or special

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LaserJet III or a PostScript printer — for all the HP compatible lasers."

Fonts for Windows 3.0

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LaserJetIII Support

MoreFonts generates the largest fonts your printer can print (from 2 to 999 point) in the highest resolution possible (300 dpi) on the popular Hewlett-Packard LaserJet III, IIP and IID printers. It also supports the LaserJet Series II, 2000, Plus, 500 Plus, DeskJet, DeskJet Plus, and Dot-Matrix printers (for First Publisher). MoreFonts runs on any IBM PC, XT, AT, PS/2 or compatible with at least 384K bytes of memory, DOS 2.0 or later, and a hard disk.

Thousands of Special Effects On Exhibit

LOS GATOS, CA—Thousands of special effect fonts, created with MicroLogic Software's MoreFonts font generator, went on exhibit today.

"Once you've selected a typeface, you can specify over 50,000 combinations of point size, pattern, outline, shadow, orientation

and symbol set," said Dick Brown, president of Brown-Wagh. "So when black type isn't enough, you can combine your choice of 6 outlines, 8 shadows, 27 fill patterns, and 28 background effects for eye-catching variety. You can use a touch of conservative gray or a splash of something really wild."



Critics Say "Thumbs Up" to MoreFonts



Dale Lewallen, PC Week

"MoreFonts could be a one-stop shop for most users. By providing automatic font installation for several different applications, a surfeit of special effects, 40 symbol sets and a good selection of typefaces, the package earns a high rating for value."

David Dean, PC Publishing

"MoreFonts wins on speed hands down. The typefaces included are comparable with typefaces costing more than eight times as much."

Mark Brownstein, InfoWorld

"Even if the fonts weren't so good, MoreFonts would be a great way to experiment with fonts. With the outstanding quality, it's an even better deal."

David Dean, PC Publishing

"Finally the ease of use of MoreFonts should make this a good choice for those just learning about their LaserJet or compatible printer; advanced users will find this package suits all of their font needs."

Benchmarks, LaserJet Journal

"MoreFonts is the overall winner of the seven font generators we tested..."

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2	Font Solution Pack	2	6	7	15
3	Type Director	6	4	4	14
4	Glyphix	3	7	3	13
5	Fontware	5	3	2	10
6	Digi-Quilt	1	1	5	7
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MIS head Ted Hall (center) says that the Asbury Park Press never gets problems resolved through Novell's technical people.

NetWare

(continued from p. 84)

development shop. "So instead I put it on NetWare, and we get a response within 24 hours."

Gould does praise the technical information data base Novell distributes to resellers and user groups. "It's by far the best documentation of any software product on the market," Gould says. "I can quickly find every occurrence of a particular item in all the manuals, browse the actual pages from the printed manuals, and even see the diagrams."

Wanted: Faster Bug Alerts

Users and dealers alike lament the lack of any system to quickly warn them of NetWare bugs and disseminate fixes as soon as possible. "I need to hear about those bugs right away, not over lunch months after they've been discovered," says Jeff Seals, Jr., in-house computer consultant for Sealcore, a Charlotte, North Carolina, ceramic-plant builder. CalFarm's Raley agrees. "Novell needs a mechanism to quickly provide patches, so people with problems affecting their productivity can fix them without waiting for the next upgrade to roll around."

Until Novell comes up with such a mechanism, Seals sug-

gests that the association of NetWare user groups, NetWare Users International (NUI), take on the responsibility for informing users of bugs and fixes. "If a user group discovers a bug or comes up with a great fix, they should give it to NUI to be passed along to all the other user groups."

Michael Wegerbauer, a pro-

grammer analyst supervisor in the University of California at Los Angeles psychology department, thinks NetWare could handle the job. "We'd like a NetWare forum dedicated specifically to listing known bugs, so that people don't knock themselves out trying to figure out what's happening. There should be another section for the latest fixes, too."

End Overpriced Upgrades

Most of Novell's customers think NetWare upgrades are too expensive. "I think upgrades should be in line with the price of the product," says Douglas Crum, a Clearwater, Florida, system integrator, NetWare dealer, and president of the Tampa Bay NetWare User Group. For example, upgrading from ELS NetWare Level II to Advanced NetWare 2.15 costs \$2065—63 percent of 2.15's \$3296 list price. "It's way out of line," Crum declares. "When you can get an

upgrade for *PC Tools* for \$15 to \$30 and it retails for \$150, that's reasonable. Ten to 20 percent of list price is a reasonable price for an upgrade."

Upgrading to NetWare 386 is even more expensive. Seals would like to do so but balks at the \$4745 price. "That's what we bought Advanced for, four years ago," Bill Spencer, president of Network Communications Technology of Park Ridge, New Jersey, which creates LAN diagnostic and management tools, feels that "if someone's going to have 250 nodes, they should probably pay \$8000 for it. But Novell should have a lower-priced version, for 25 or 50 computers, to allow people to migrate from [NetWare] 286."

Robert Dahlen, director of information systems and technology for the University of Denver, takes issue with Novell's plans to sell Macintosh support, global name service, and other features separately. "It's \$2000 for this, \$1500 for that, another \$2000 for that. They're nickel and diming us to death."

Conversely, many users with smaller LANs would like to see NetWare 386's improved memory management, easy installation, and other new features added to the cheaper NetWare 286 line. But Spencer points out a flaw in that approach. "Novell has got to be wasting resources by supporting two environments, so they must be looking ahead to where [NetWare] 286 will disappear. That would be the best thing for the users—and for Novell." When questioned by *PC World*, Novell declined to respond or to comment on other user suggestions. —Robert Lauriston

Alice LaPlante is a freelance writer in Palo Alto, California; Robert Lauriston is a contributing editor for *PC World*.

Novell: What Users Say

From *PC World* interviews



Overall satisfaction

Most users say that NetWare is the best network operating system around and that they're basically happy with it and Novell.



Cost of support

Many users think Novell should offer free telephone support to end users—particularly when their problems are caused by NetWare bugs.



Quality of support

Some who use phone support complain about being put on hold too long, or waiting days for Novell to call back. Others complain they can't get answers from their dealers or phone support. Many say CompuServe's NetWare forum is the best source of assistance, but others find it confusing and too hard to use.



Bug and fix notification

Users want to hear of bugs and fixes as soon as possible. One user suggests dedicating a specific topic in NetWare to this; another suggests that NetWare Users International coordinate the exchange of such information between user groups.



Upgrades

Most users think Novell charges too much for upgrades and should charge only 10 to 20 percent of list price.

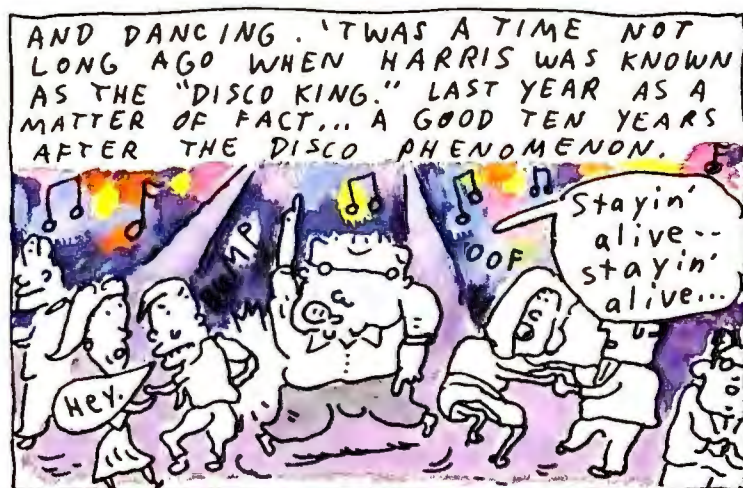


Accessories

Some users say NetWare accessory programs (such as backup and print utilities) often are flawed. Many users resent having to buy third-party utilities for almost everything beyond the basic network operating system.

Users are generally comfortable with NetWare and Novell but want improvements in customer relations and purchase policies.

TWO-FISTED MANAGEMENT



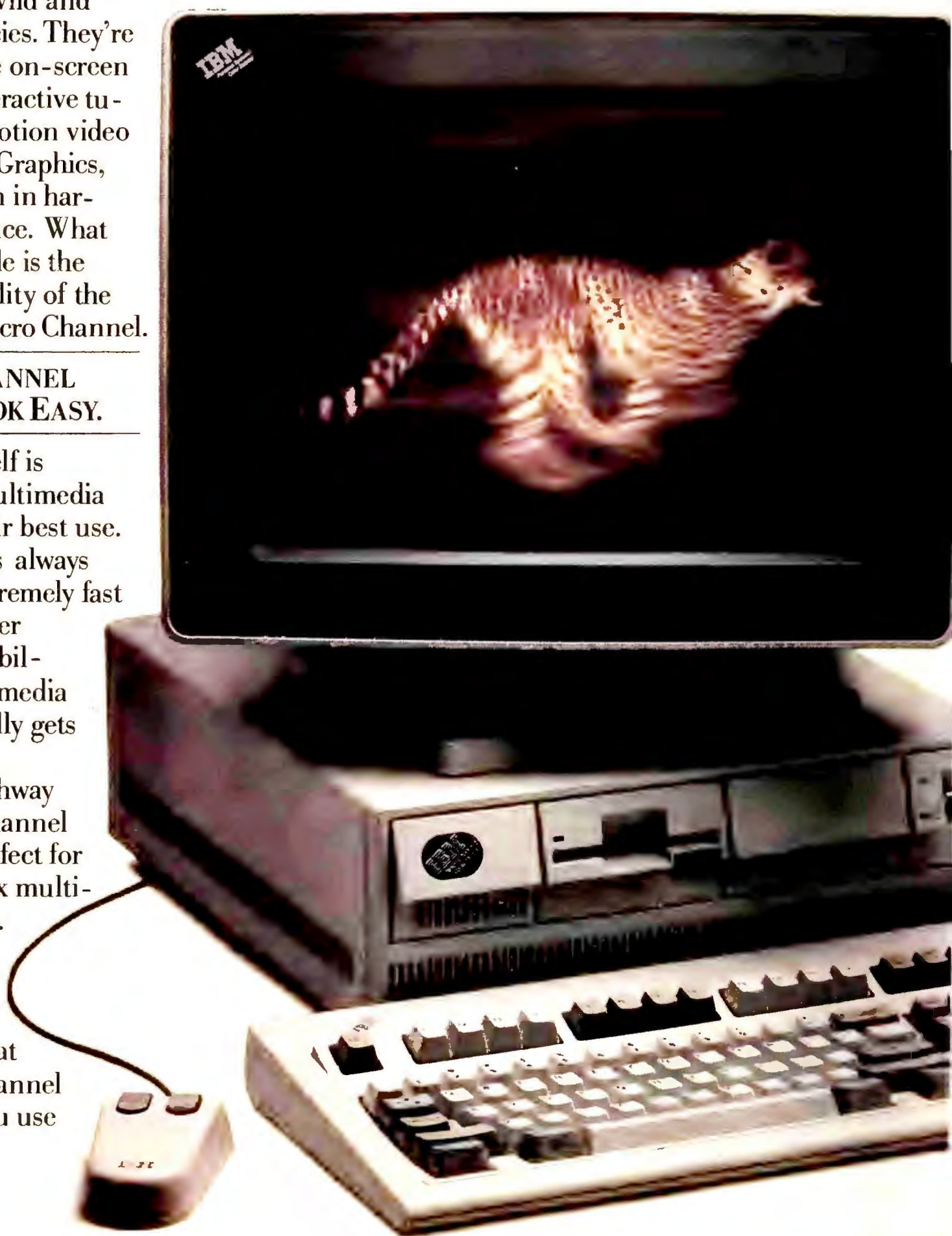
Don't look now, but moving on

Suddenly, IBM Personal System/2[®]s with Micro Channel[™] on desks everywhere are exhibiting some pretty wild and wonderful tendencies. They're creating incredible on-screen presentations. Interactive tutorials with full-motion video and stereo sound. Graphics, text and animation in harmonious coexistence. What makes it all possible is the multimedia capability of the IBM PS/2[®] with Micro Channel.

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The PS/2 itself is designed to put multimedia applications to their best use. Micro Channel has always given the PS/2 extremely fast data rates and better multitasking capabilities. But in multimedia applications, it really gets a chance to shine. The multilane highway design of Micro Channel Architecture is perfect for processing complex multimedia applications. Most conventional PCs just don't have the power or the data paths to do it at all. Plus, Micro Channel in the PS/2 lets you use

the new IBM CD-ROM that gives you the storage equivalent of over 400 diskettes on



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Another exciting multimedia product is the IBM M-Motion Video Adapter/A™. Coupled with the power of Micro Channel, it lets you incorporate full-motion video and high-quality sound from sources like video disks, VCRs and video cameras, digitize them, and display them in an endless array of formats.

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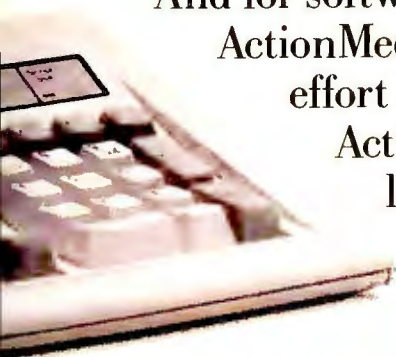
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DR DOS 5.0. WE COULDN'T HAVE SAID IT BETTER.

THE NATIONAL NEWSPAPER OF CORPORATE MICROCOMPUTING

PC WEEK

D-14 Sunday, May 20, 1990 ★ ★ SPECTRA

JOHN C. DVORAK ASK DVORAK

A major advance in DR-DOS

graphical user interface designed to be used equally well with a keyboard or a mouse. ViewMAX allows for easy execution of DOS commands and "point and shoot" running of any application software, eliminating the need for users to learn and correctly execute cryptic DOS commands. The user's disk layout can be viewed as icons, text or in a graphical tree format.

Users who need to transfer data from one machine to the other can do so easily with FileLINK, a file transfer utility included in DR-DOS 5.0. FileLINK provides easy, high-speed transfer of files and programs between systems over standard serial cables. The utility installs itself from one machine to the other via the serial link, so DR-DOS 5.0-based systems can communicate with machines running functional DOS operating systems.

HIS LAST Monday

San Francisco Examiner

BUSINESS

IBM Launches New Consulting Program

Specialists Will Analyze Clients' Businesses with Eye Toward Modernizing Host-Based Applications.

See Page 148.



DRI To Upstage Giants With Own DOS 5.0

By Gina Smith

Users hungry for the memory relief promised by DOS 5.0 will be able to buy the system software next month—but not from IBM or Microsoft Corp.

Digital Research Inc. (DRI) is poised to release DR-DOS 5.0, the latest version of its DOS compatible operating system. Early users and company officials say it offers many of the key features planned for Microsoft's unannounced DOS 5.0.

DR-DOS 5.0 is the first commercial version of the previously OEM product. Its most noteworthy feature is a memory-management capability that allows users to free as much as 620K bytes of memory for application use, said Dick Williams, president of DRI in Monterey, Calif.

Although Microsoft officials have said that a new DOS version

will be shipped by year's end, sources say that version is in the very early stages of development.

"Microsoft is only promising this, and DRI will be shipping soon. If [DR-DOS] can prove it's really compatible, and if it looks good, I'd have no problem recommending it," said Bob Hollingsworth, a computing consultant for an automobile maker in Detroit.

"I don't care whose name is on the package if it can help us with our memory problem," said Darrin McCarthy, end-user computing analyst with Porsche Cars North America Inc. in Reno, Nev.

Beta testers report that DR-DOS 5.0 includes a number of features not found in current MS-DOS and PC-DOS versions. Among them are a graphical,

See DRI Page 6

Key NewWave Office Elements Due This Month

from Steve Higgins

Microsoft Corp. (HP) will

FIRST LOOK

Turbo C++ Delivers Power To Programmers

By Peter Coffee

So what's all the hoopla about? MemoryMAX, for one thing. A breakthrough in memory management that can give you more than 620K so you can run today's memory-intensive applications, including, for example, dBASE IV, on Novell NetWare.

In fact, John Dvorak calls MemoryMAX nothing short of "amazing."

The Press goes on to mention that because DR DOS 5.0 is fully DOS compatible, you can run all your current DOS applications. And because it is easy to install and requires no hard disk reformat-

ting, upgrading to DR DOS is simple. Since DR DOS 5.0 also includes ViewMAX, a graphical interface, DOS is easier than ever to use.

Now if we could just get a word in edgewise, we would simply like to add that DR DOS 5.0 is available now. Call your reseller now.

DR DOS 5.0

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WE MAKE COMPUTERS WORK

For Laptop and Notebook manufacturers, DR DOS 5.0 is fully executable from either RAM or ROM. And, it's available with BatteryMAX, a battery-saving feature that can increase battery life 2-3 times (dependent upon OEM implementation).

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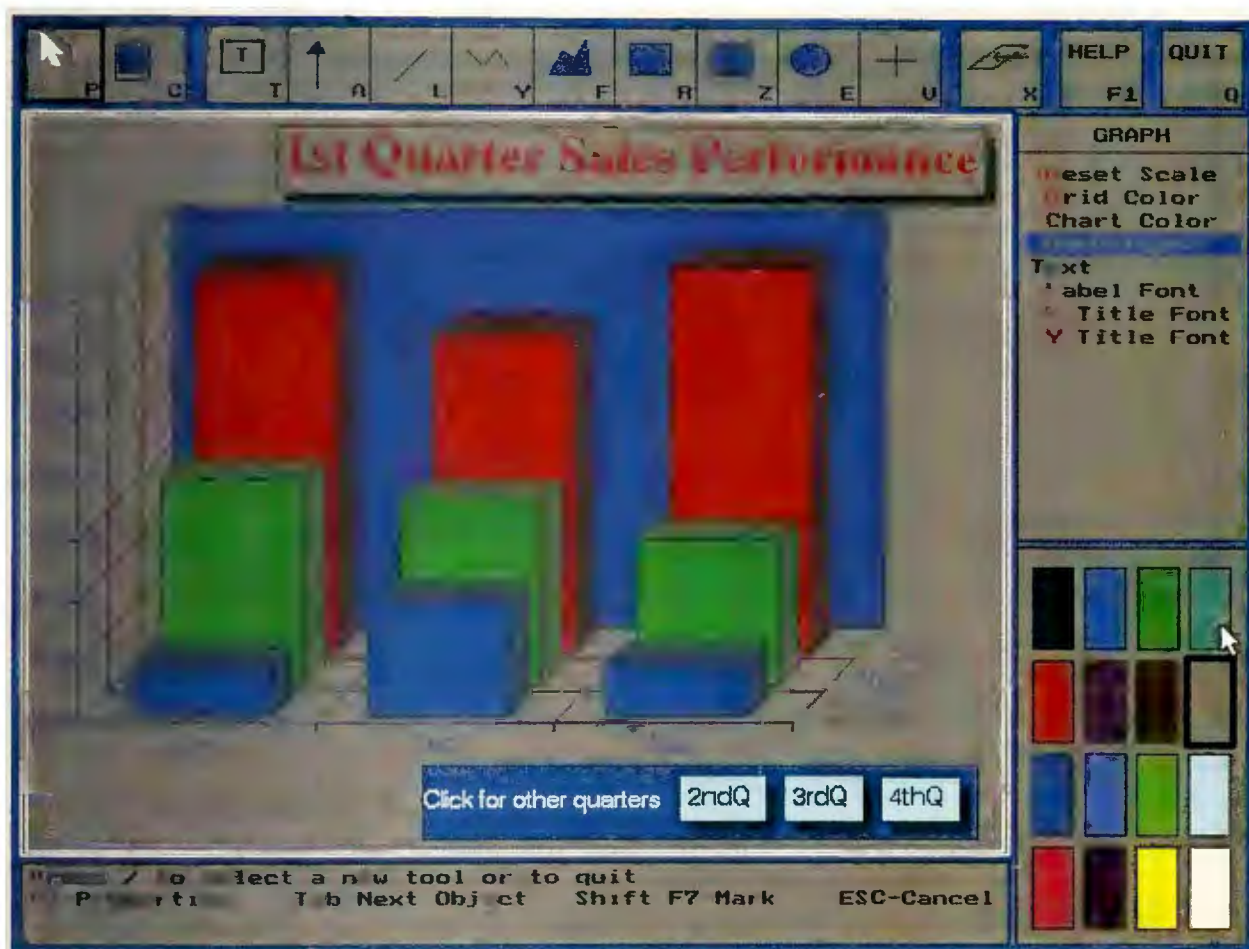
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PREVIEW

PC WORLD OFFERS FIRST IMPRESSIONS OF PRERELEASE HARDWARE AND SOFTWARE

Quattro Pro 2.0, the Presentation Spreadsheet

More than just a spreadsheet, Quattro Pro 2.0 adds great features that rival presentation packages.



Quattro Pro 2.0 offers graphics tools that rival those of some stand-alone presentation packages. New features include 3-D graphs and the ability to insert hypertext buttons in a graph that will run a macro or jump to another graph.

John Walkenbach

Ask your friends to recommend a spreadsheet, and chances are they'll suggest Borland's *Quattro Pro*. Faster and easier to use than 1-2-3, *Quattro Pro* has steadily chipped away at Lotus's share of the spreadsheet market. And with its superb macro facility, intelligent memory management, and advanced math functions, *Quattro* has

won near-universal praise, including a *PC World* Best Buy (see "Seven Sensible Spreadsheets," April 1990).

But *Quattro Pro*'s biggest selling point has always been its business graphics, even though it's the only major spreadsheet that has not yet embraced a graphical user interface. Version 2.0 adds more sparkle with three-dimensional graphs, hypertext slide shows, and 35mm slide output.

It also includes a goal-seeking command and a handy link to Borland's *Paradox 3.5* data manager.

Half Spreadsheet, Half Graphics

From the beginning, *Quattro Pro*'s business graphics have outshined the competition's. The key element is its graph annotate mode, which lets you augment a chart using drawing tools and clip art. Version

2.0 enhances the program's graphics prowess, making *Quattro Pro* a reasonable and inexpensive alternative to graphics packages such as *Harvard Graphics* and *Freelance Plus*.

The most important new feature is 35mm slide support. Output options were formerly limited to the PIC format; version 2.0 adds support for EPS and PCX formats, which can be used by service bureaus to create slides. *Quattro Pro* now imports CGM files in ad-

SNAPSHOT

Quattro Pro 2.0

The latest upgrade to this popular spreadsheet offers graphics features that compare well with those of leading presentation graphics packages.

KEY FEATURES

- Exports graphics in EPS and PCX formats for 35mm slides
- Four new 3-D chart types
- Hypertext slide-show buttons
- Hot link to Paradox 3.5
- Goal-seeking function

AVAILABILITY

Fourth quarter 1990

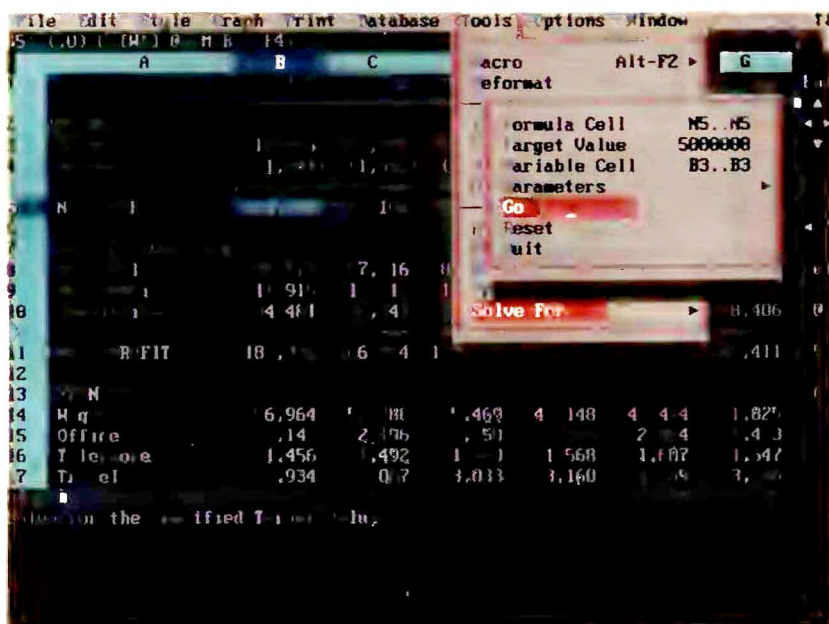
PRICING

\$495 (includes ProShow Power Pack); for registered 1.0 users upgrade \$79.95, ProShow Power Pack \$39.95; for 1-2-3 owners *Quattro Pro* 2.0 \$99.95, ProShow Power Pack \$39.95

Borland Int'l

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Scotts Valley, CA
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800/331-0877

Reader service no. 813



Quattro Pro 2.0 adds a helpful goal-seeking procedure. Called Solve For, the command lets you determine the value in a target cell needed to produce a desired result.

dition to the 30 clip-art files provided. You can copy images between presentations as well.

Version 2.0 offers four new layered 3-D graph types: bar, area, step, and ribbon charts. Unfortunately, you can't adjust their perspective or orientation; therefore, you may need to rearrange the data series so data plotted at the rear of a chart won't be obscured.

Also new is the ability to insert hypertext buttons in a graph, à la *Harvard Graphics 2.3*. You can place buttons anywhere on the screen and then attach a macro or graph name. When you click the button with a mouse, the macro executes or the graph displays. You can even hide the buttons behind graphic elements, so that clicking on a bar, for example, could display additional details. This feature is ideal for on-screen presentations, especially for customer-controlled sales demonstrations. With a bit of work, you could even use *Quattro Pro* for an attractive front end to a *Quattro* data base.

For extra graphics clout, Borland bundles a *ProShow Power Pack* option, which includes 100 additional clip-art files, two Bitstream headline fonts, a 60-page presentation

tip book, and a \$100 credit with a slide service. Current *Quattro Pro* users must add \$39.95 to the \$79.95 upgrade price to get *ProShow*.

Frequent business presenters will find *Quattro Pro* no substitute for the latest presentation packages (such as *Microsoft PowerPoint*) that offer presentation aids, aimed at speeding slide show creation. But Borland is close to the mark in claiming 80 percent of the functionality of most presentation packages.

Paradox Links and Goal Seeking

Like *1-2-3* release 3.x, *Quattro Pro* can query external data base files, including *dBASE* and *Paradox*. But for complex queries of large data bases, you'll want to exploit the new ability to run *Quattro Pro* from within *Paradox 3.5* and quickly toggle between them. You'll need at least 2MB of RAM to do so, however, since both products remain in memory and use a context-switching process.

While in *Paradox*, you can generate a query and dispatch the matching records directly to a *Quattro* worksheet for manipulation and charting. If you own *Paradox SQL Link*,

you can even bring in data from SQL data base servers, mainframes, and minis—but you must issue the query from within *Paradox*.

Version 2.0 also boasts a handy new Solve For command, but don't let the name mislead you. It's nothing like *1-2-3/G's* powerful Solver function. Rather, it's a goal-seeking procedure that determines the value of a single input cell that will yield a desired value in a dependent formula. For example, if you know January sales will be \$50,000 and you project volume to increase steadily, you can set up the formulas and ask *Quattro Pro* what monthly percent increase will yield an annual sales level of \$650,000. In previous versions you could get the same result, but you had to go through the tedious process of plugging in test values manually. Solve For gives you the answer in an instant.

Quattro is clearly a step ahead of its rivals with its Solve For function: *Excel* provides a macro that attempts to do the same thing, but it doesn't work as well. To get a similar goal-seeking feature in *1-2-3* release 3.1, you'll need an add-in. For more complex problems involving linear programming, *Quattro Pro* users can turn to the optimization feature, although it's less powerful than *1-2-3/G's* Solver and far more difficult to use.

As in the previous version, you can select a graphics mode to display graphs and spreadsheet data on the same screen. And you can squeeze even more text onto the screen in text mode—version 2.0 now supports extended screen modes, including 132 characters by 60 rows, for most popular VGA adapters.

Another welcome improvement is an enhanced LaserJet driver that speeds *Quattro's* rather slow printer output. It

downloads up to eight Bitstream fonts and takes advantage of the printer's internal processing. (Unfortunately, there's still no background printing.) Network users also can save disk space by sharing font files.

Does It Stack Up?

Although superb graphics is its most obvious attribute, *Quattro Pro* continues to be a powerful spreadsheet with features that stand up well to the competition.

If your hardware isn't quite up to the standards required for running *Excel* or *1-2-3* release 3.1, you'll find that *Quattro Pro's* VROOMM (virtual runtime object-oriented memory management) overlay technology can help you fit more data in the same amount of RAM. With VROOMM, you can load large files that would choke *1-2-3* release 2.2, even without *Always* loaded.

Like *Excel*, *Quattro Pro* lets you work with multiple spreadsheets in resizable windows, and its pulldown menus are accessible by mouse or keyboard. *Quattro Pro* lacks the 3-D worksheets of *1-2-3 3.x*, but with its flexible file-linking commands, you'll hardly miss them. Version 2.0 is fully compatible with *1-2-3* release 2.2's files, including those with linked cell references. The optional *1-2-3* menu system remains, along with a special introductory offer for *1-2-3* users.

While most developers jump headfirst into graphical environments, *Quattro Pro* shows that a high-end spreadsheet can still run on low-end equipment. You give up a display that matches printed output, but you don't lose much in other areas, and you can still create top-notch business graphics. ☺

John Walkenbach is a PC World contributing editor.

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PC Globe and **PC USA** provide instant information — dazzling maps, graphics, socio-economic and cultural information, time zones, currency exchange rates and much more — on over 177 countries and all 50 United States (and Puerto Rico). This critically-acclaimed package features fast, easy point-and-shoot operation to put a wealth of visual data at your command.

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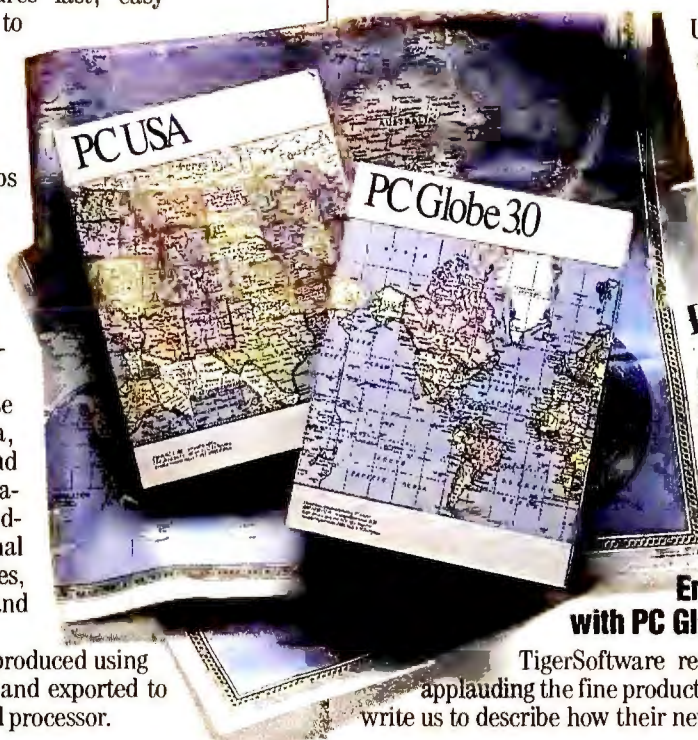
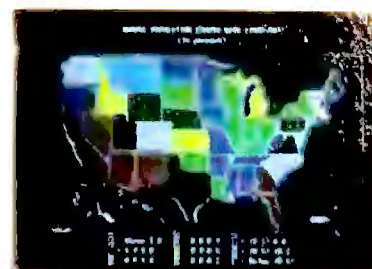
Both are the perfect gift for students, business people, teachers and travelers.

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TigerSoftware receives stacks of mail applauding the fine products we sell. Many people write us to describe how their new copy of WordPerfect

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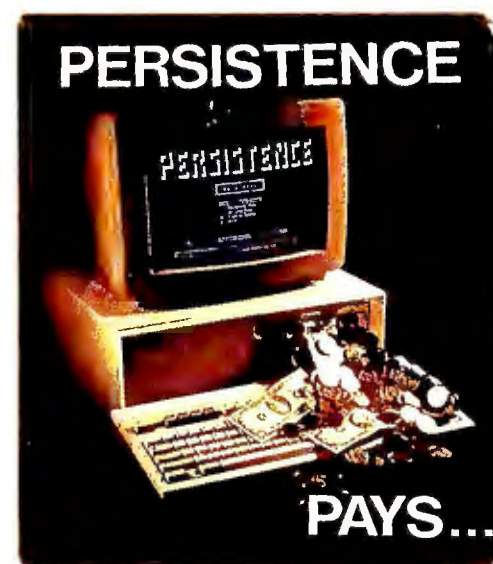
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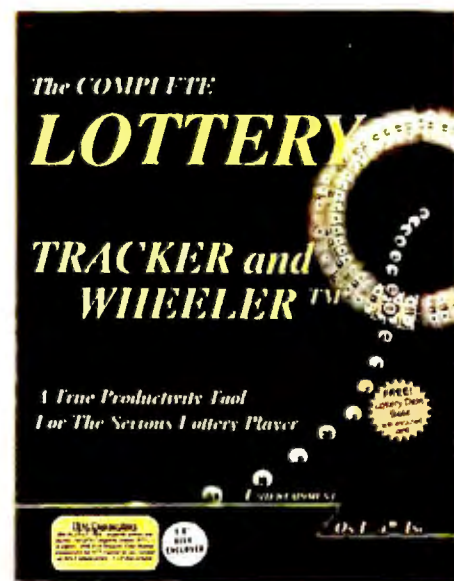
Fun and Profitable!

This remarkable system makes playing Pick-6 games fun — and profitable! It can systematically increase your chances of winning by HUNDREDS of times. It includes 20 of the most popular wheeling systems of the world.

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lows you to address copy to a word processor, so you never have to type a name and address again.

An integrated Solution.

Instant Recall goes one further by giving you integrated views that make connections for you, speeding your work. You can pull together your notes, tasks, schedules, names, and addresses on a single screen by topic, date, person assigned, priority or embedded text. This replaces your desktop organizer and text database software with a powerful integrated solution — making connections between pieces of information, giving you multiple perspectives, creating timelines from dates you've entered piecemeal. So Instant Recall actually shoulders much of the work for you.

Instant Recall is easy to use and easy to learn. Among its user-friendly features are pull down menus, mouse support, help screens, date and time stamps, a clipboard for exchange of information with other applications and import and export capabilities. It's compatible with all popular word processors and spreadsheets and has conversion utilities for Sidekick, Tornado, Memory-Mate, and delimited ASCII files. It's powerful, too, allowing up to 65,000 characters (over 30 pages) of text per entry and schedules for 64 individuals and 16 groups possible.

Instant Recall has received rave reviews in the industry press. In a recent *InfoWorld* comparative review, Instant Recall was rated tops in its category, garnering

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- A personal manager on a disk!
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CHRONOLOGIC

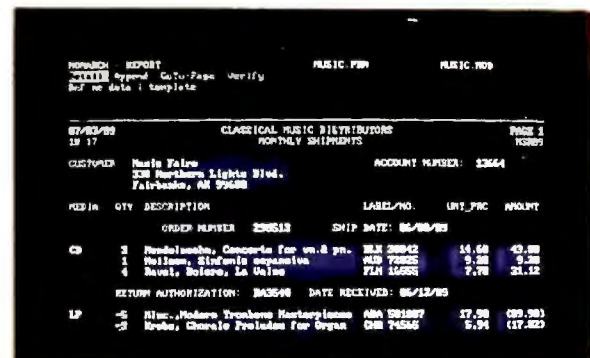
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Now You Can Download Reports From Any Mini or Mainframe and Bring the Data Alive on Your PC!

Turns a Report File into a Ready-Made Database.

Consider for a moment the vast ocean of information that governments, corporations and other organizations around the world accumulate, store and manage. Every day, billions of bytes of new information are added to the pool. If handled with thoughtful care, this information can be a priceless resource.

The sheer volume of information demands a mainframe or mini-computer for data storage. But here's the paradox: All the best tools for data analysis are on the PC. PC users who need to get their hands on the data cannot gain access to it. They must sift through stacks of printed reports to find what they want. Now, for the first time, there's a remarkably intuitive new tool to help PC users bridge the data gap.



Monarch reads report files and extracts the data. Here, the extraction template overlays the report.

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Monarch reads report files and extracts the data. Here, the extraction template overlays the report.

Existing Reports Become Valuable, Ready-Made Databases.

Monarch reads computer-generated reports and extracts the data! To understand the magic of Monarch, picture all the reports that come across your desk. All those cost summaries, transaction reports, customer lists, asset schedules, payroll reports and more. Think of flipping through all those pages trying to understand what's going on. Imaging trying to rekey all that data into your spreadsheet for analysis. With Monarch, the data comes alive.

Monarch can read any report downloaded from a mainframe or mini-computer. (Or generated on a PC.) It extracts data from the report file and serves it up any way you want. You can see it, sift it, select it, summarize it and send it out to your spreadsheet, word processor, graphics package or database manager. Monarch can read any report stored on disk, including ASCII files, TXT files, PRN files and SDF files.

CASE STUDY: The Agony of Printed Reports...

Suppose you've got a 500-page customer activity report that's been downloaded from your company's mainframe. You've been asked to analyze sales trends, but you don't want to spend hours digging through the printed report. Monarch allows you to automate the analysis by turning the report into a live database.

Here's how it's done. Simply load the customer report file into Monarch, quickly define a data extraction template, and then explore the report using powerful data analysis commands.



You can tell Monarch to show you all the sales transactions for a particular customer, product, salesman or region. Then produce crosstab summaries that show the field totals and record counts broken out in a variety of useful formats. Data and reports can be output on a printer, or exported to applications like Lotus 1-2-3.

personics

FY 1002 Monarch 5 1/4" & 3 1/2" \$495.00
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Expand Your Power and Control Over Lotus 1-2-3 Macros!

Go Inside and Diagnose Any 1-2-3 Macro Error!

Many PC users all over the world have come to realize the power of Lotus 1-2-3. Not only is it a great spreadsheet program, its macros make it a powerful computing language unto itself. Anyone who knows 1-2-3 quickly realizes you don't know 1-2-3 until you know how to do macros. 1-2-3 macros let you automate a whole range of tasks that save time and energy. They make Lotus 1-2-3 the revolutionary program it is.

But 1-2-3 macros, like any programming language, have their special characteristics that turn little syntax errors into monstrous problems. Everyone who uses 1-2-3 macros undoubtedly knows the frustrating ERROR message that inevitably crops up when you're trying to run a new macro. Even the best 1-2-3 macro developers run into snags when putting together a macro.

The Macro Solution.

Until now, the only answer for those frustrating situations has been invoking the 1-2-3 STEP mode. You start at the beginning and poke along until an error message pops up on the screen. After you've figured out what's wrong, you go back to the beginning and start all over again. To make matters worse, if your macro contains the [WINDOWSOFF] and [PANELOFF] commands, you're sailing in the dark. There's nothing more frustrating than trying to get a job done with a macro you can't get to work and having no help with it. On routine 1-2-3 questions, you can ask whoever is around for help or call technical support. With macros, you either find an expert or you can just give up.

Now, there's a better way — the Personics Macro

Editor/Debugger (MED), an enormously powerful, truly interactive, and genuinely easy-to-use tool for developing, debugging, and maintaining 1-2-3 macros. As soon as you find a problem with one of your macros, just pop up the MED debugger window and quickly find out what you need to change. The Personics Macro Editor/Debugger will become your private technical support line, immediately available whenever you need it.

No Need To Be Frustrated Any Longer.

You'll be amazed at how much more productive you'll be with MED in your tool kit. When an error condition is identified in MED's debugger window, you can jump to the editor window, quickly make a change, then resume execution where you left off. And MED's expanded error messages give you the information you need to understand why your macro errors have occurred. Each error message is also described in depth in MED's detailed handbook. From now on, if you have a problem with a macro, you know where to turn.

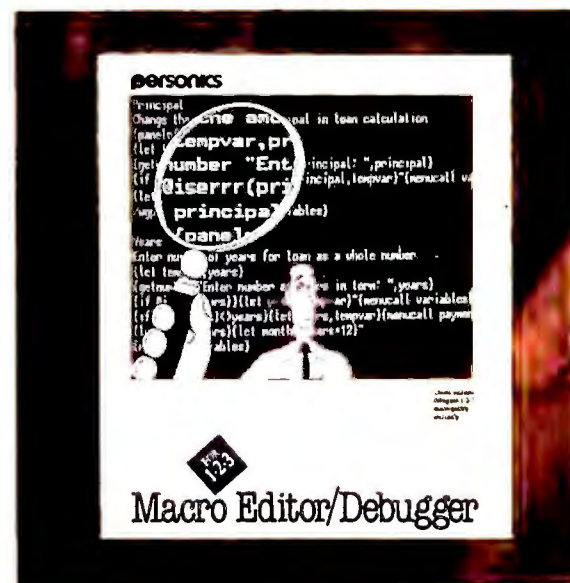
With the Personics Macro Editor/Debugger, you won't dread attempting long 1-2-3 macros because you're afraid they won't work. You can track down even the most elusive macro problems simply and easily and then know how to fix them. You can start macro execution anywhere and follow along at a choice of speeds or set watchpoints to monitor important variables. With MED, you can set breakpoints to halt execution when a user-defined condition is met. Each of the Personics Macro Editor/Debugger's features are designed to make developing and debugging your macro jobs as easy as possible.

Fast, Effective, and In-Depth.

Sometimes, you have to play doctor with a software package like Lotus 1-2-3 to get the most out of it. Should I

have done this in my macro? Or should I have done that? Sometimes, being the best doctor isn't enough to diagnose the problem with a complicated macro. That's when MED comes in.

The Personics Macro Editor/Debugger is receiving wide praise for its effective way to shortcut 1-2-3 macro errors. "No serious macro developer should be without this tool," says noted macro expert Scott Tucker. The Personics Macro Editor/Debugger — your complete diagnostic kit for 1-2-3 macros.



personics

FY 2830 Macro Editor/Debugger
5 1/4" & 3 1/2" \$199.95
IBM PC, XT, AT, PS/2 and compatibles; works with 1-2-3 Release 2.0, 2.01 and 2.2 and uses approximately 65K of RAM. If you are using 1-2-3 Release 2.0 or 2.01 and MED is your only add-in; you'll need approximately 20K of RAM for the 1-2-3 Add-In Manager.

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Isn't It About Time You Used the Finest Word Processing Software in the World?

Includes FREE Ko-Pilot and RightWriter 4.0

There's only one way we could think of to improve WordPerfect 5.1 — and that is to include RightWriter and Ko-Pilot — so we did! We call it "The WordPerfect Writer's Pack," everything you need to create magnificent documents, check them for errors in grammar, style, word usage and punctuation — even use existing documents created on other word processors. That's over \$200 of award-winning software FREE!



WordPerfect is considered the standard in word processing software for the business environment (with its advanced network support), and this brand new version has been streamlined even further, making it faster and simpler to use. Now users of any expertise level can fully enjoy the amazing functionality of WordPerfect.

What's New in Version 5.1?

For starters, WordPerfect 5.1 features the most elegant pull-down menu system we've seen in word processing. It is so well designed, it glides the user through any task, and makes every document you create clean and professional. You'll love the new features for quickly setting up columns and rows, and the ability to adjust your text in seconds when making revisions, wrap text in-column, around graphics, charts or call-outs. No other system allows so much flexibility — all without the usual plethora of cryptic commands.

Speller, Thesaurus & Dictionary Hyphenation.

A 115,000-word spell check dictio-

nary quickly detects errors in spelling, typographical errors, double words and aids in hyphenation. And Version 5.1's Speller and hyphenation dictionary have been combined into one file, requiring less disk space.

FREE Ko-Pilot! with the Purchase of WordPerfect

Throw Away Your WordPerfect Manual!

Don't sit at your PC frustrated with WordPerfect any longer. Now, Ko-Pilot gives you the power to use all of WordPerfect's functions, from the simplest to the most advanced, at the touch of a key. All you do is press F3 when you're not sure how to use a feature and Ko-Pilot takes over from there. With simple pull-down menus that tell you your options, you have instant access to the features you want without having to memorize the complicated key combinations. A \$69.95 value.

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The premier grammar, style and punctuation checker for the PC!

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IBM PC, XT, AT, PS/2 & compatibles; minimum 384K.

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CO/SESSION... Operate Any Computer Anywhere in the World — By Remote Control!

CO/SESSION allows you to quickly connect your computer to a distant PC (on a phone line) and run that remote computer as if you were right there — at the keyboard! From a laptop in a hotel room, you can control your PC back at the office — even if it's more powerful — provide training, or troubleshoot a customer's system from your office.

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Easy to Use.

The best package available for remote computing,



Operate this computer...



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...from anywhere!

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Co/Session protects your data with features like: dual-passwords, password-checking and data encryption. You can restrict the ability to send or receive files on the remote PC, blank the other computer's screen — even disable its keyboard to prevent unauthorized access.

Fastest Remote Software Available.

Co/Session transfers files up to 20% faster — updates screens up to 400% faster than competitors! In fact, Co/Session was proclaimed "Fastest Remote Software Package" by InfoWorld in March, 1989!

And Co/Session is fully compatible with all leading software like Lotus, WordStar, WordPerfect, dBASE IV, and SideKick.

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System Sleuth is an easy-to-use, advanced "passive diagnostic" system that probes deep into the heart of your PC, illuminating secrets (and pitfalls) — without damaging your precious data. Extensive helps screens aid in understanding how your computer works — and why it won't! System Sleuth also gives you the information necessary to make smart configuration decisions when adding new hardware and software — maximizing its performance — and avoiding conflicts.

In addition, System Sleuth helps you avoid needless

repair bills and provides details that can be helpful when obtaining technical support from hardware and software manufacturers — your system status is displayed right on the screen.

You'll have instant access to information on processor and card types, BIOS date, DOS version, ports used and memory installed, including a complete rundown of what's contained in each 64-KByte segment up to 1 MByte. Display TSRs loaded, their functions and memory allocation, interrupt vector tables, device drivers loaded (and attributes) and disk information (including bad tracks).



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The detailed, color-enhanced maps display current precipitation, temperature, cloud cover, storms, lightning, hurricane tracks, jet stream movement, freezing levels, soil temperatures and radar-gathered information. The fast, menu-driven operation provides information for family use, business travelers, travel agents, pilots and others. Switch between maps for a complete picture of the current weather conditions anywhere.

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*Use All Existing Files with
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Now those indispensable word processing files you created six months ago can be easily converted to the format you're running now. WORD FOR WORD is ideal for exchanging files of different formats with business associates, customers, friends — you can even convert files created on your home or laptop computer to the format used in your office — with all of the formatting commands (like bold, underline, centering, tabs, etc.) intact!

WORD FOR WORD is the fastest! It can convert a 25-page document in less than one minute — 600% faster than the competition!

Allows Lotus 1-2-3 Conversion INTO Your Word Processor!

WORD FOR WORD allows you to import spreadsheet data into your word processing format! And no other product allows you to perform conversion between "integrated" packages like Enable, Framework, Q&A and pfs: First Choice.

Supports Navy DIF, Peachtext and Enable, RapidFile and WANG PC.

Converts ALL Attributes!

...contained in the original: margins, tabs, indents, soft and hard carriage returns, boldface, italics, underlines, superscripts/subscripts, newspaper columns, headers, footers, centering, footnote formats, ruler lines, page ends — and more!

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WORD FOR WORD is a powerful, yet flexible file con-

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- Lotus 1-2-3 1A, 2.0
- Lotus Manuscript 2.0, 2.1
- Microsoft Word 3.0, 3.1, 4.0, 5.0
- Microsoft RTF
- MultiMate 3.3
- Multimate Advantage I & II
- Navy DIF
- OfficeWriter 4.0, 5.0, 6.0, 6.1
- PeachText 5000
- pfs: First Choice 1.0, 2.0
- pfs: Write (version C)
- Professional Write 1.0, 2.0, 2.1
- Q&A Write 3.0
- RapidFile (Memo Writer) 1.2
- Samna Word IV 1.0, 2.0
- Samna Word IV Plus 1.2, 2.0
- Volkswriter Deluxe 2.2
- Volkswriter 3, 1.0
- Volkswriter 4
- WANG PC 3.0
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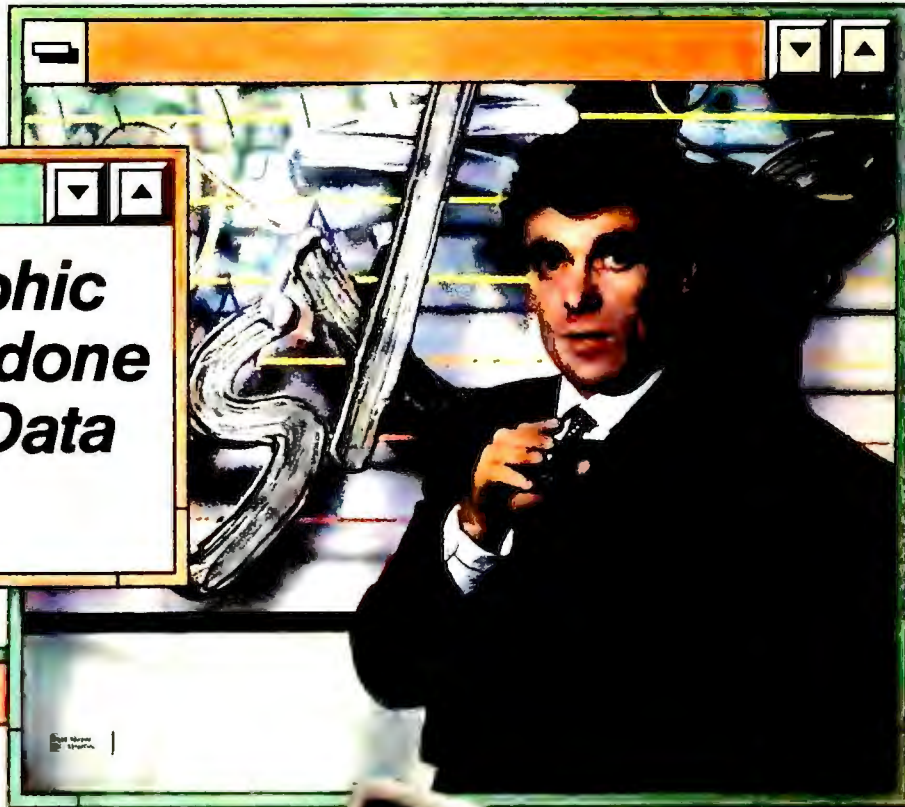
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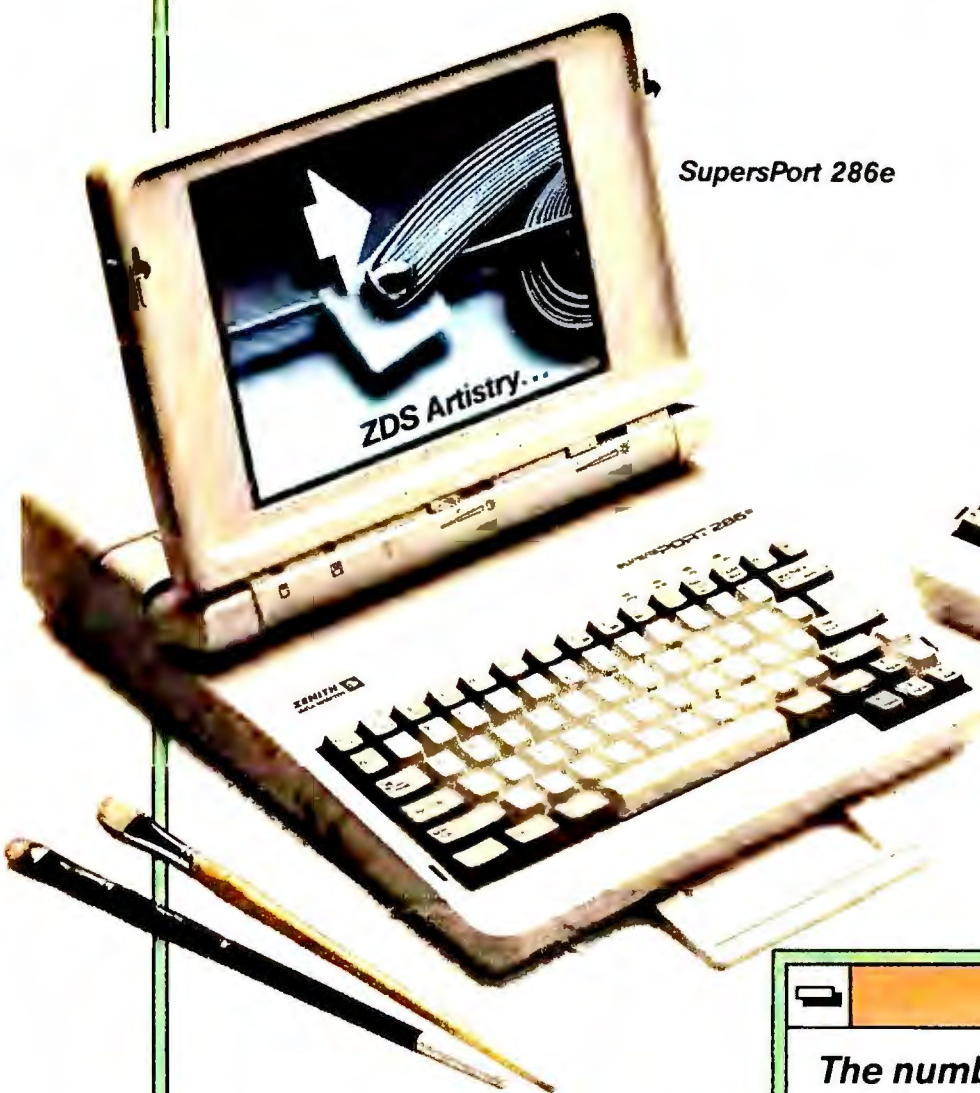
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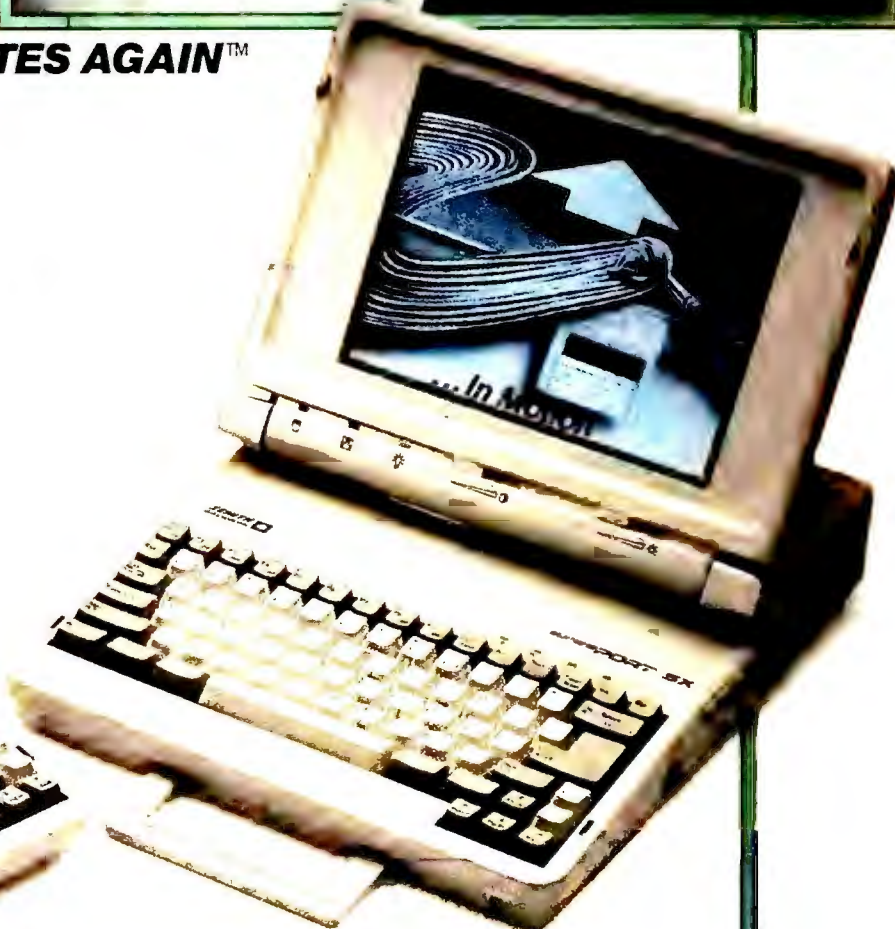
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SX Notebooks Hit 20 MHz

Compaq's LTE 386s/20 boasts a memory cache and a generous capacity for RAM, but TI's TravelMate 3000 is 2 pounds lighter and (probably) \$600 cheaper.



Compaq's 8.5-pound LTE 386s/20 runs at 20 MHz, boasts a VGA display, and comes with a built-in 4K memory cache.

Michael Goodwin

When the train's ready, everyone jumps on board: As soon as technology can support a new user benefit, manufacturers rush to deliver it. Thanks to a new generation of low-power disk drives, VGA displays, and CPUs, several lightweight 20-MHz 386SX notebooks are coming down the track. In fact, Compaq and Texas Instruments are running their 20-MHz trains on a collision course.

These lean little locomotives are both based on successful models: the LTE 386s/20 from Compaq looks very much like the company's best-selling LTE and LTE/286 except for its big, new VGA screen. TI's TravelMate 3000 is a slightly thicker version of its Best Buy TravelMate 2000—the lightest, most portable hard disk notebook on the market today.

Both 20-MHz notebooks

come with 2MB of standard RAM, a 60MB hard disk (smaller drives are available), a built-in floppy drive, and a PS/2 mouse port. (TI's 60MB model won't be available until January 1991.) Both machines offer an optional expansion unit. Both boast a big, bright, beautiful VGA display (although the TI has a super-VGA output port, while the Compaq doesn't). And both promise 3 hours of battery life. If past performance is any indication, however, Compaq's battery will probably deliver at least 5 hours.

The critical differences, then, are weight, memory, keyboard, and price—and your choices here are quite significant.

Weighty Matters

When it comes to traveling weight—including the notebook itself, battery, AC charger, and power cables—

TI's 6.8-pound TravelMate 3000 scores an easy victory over Compaq's LTE 386s/20, which weighs almost 2 pounds more. Despite the difference in weight, however, the two notebooks are almost identical in size and shape at 8.5 by 11 by 1.8 (or 1.9) inches.

In a world where powerful graphics applications are demanding heftier helpings of RAM, memory capacity will have a real impact on what kind of work you can do on the road—and how easily you can do it. With a 10MB ceiling for memory, the LTE 386s/20 will let you run *Windows* plus a bunch of memory-hog applications without a second thought. And while the TravelMate 3000's 6MB ceiling is anything but shabby, it might seem cramped sooner than you expect.

Unless your laptop is the *only* computer you ever use, you'll want a keyboard that's

as close to standard as possible. Your fingers will find the TravelMate 3000's dedicated cursor keys in the familiar inverted T; the LTE 386s/20's nonstandard arrangement takes more getting used to. Neither computer provides dedicated <Page Up> and <Page Down> keys. New firmware from Compaq should correct the problem of unreliable key contact that some LTE users report.

Cost comparisons fall out as you might expect given Compaq's reputation for premium pricing: As we go to press, TI's \$6399 baby (with the 60MB hard disk) is \$600 less expensive than Compaq's \$6999 60MB notebook. TI also offers 20MB and 40MB models, and you can choose a 30MB Compaq unit if you prefer.

Honed for the High End

Both Compaq and TI are aiming at users with money to spend: consultants, executives, and businesspeople whose

SNAPSHOT

Compaq LTE 386s/20

Compaq's 8.5-pound 20-MHz notebook gives you up to 10MB of CPU-speed RAM and will probably run for well over 3 hours.

KEY FEATURES

- 60MB hard disk and built-in floppy
- Square-pixel VGA display
- 4K memory cache

AVAILABILITY

Immediate

PRICING

\$6999 for 60MB model

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3000**

The amazingly lightweight TM 3000 gives you a floppy drive, a 60MB hard disk, and 3 hours of battery life.

KEY FEATURES

- 6.8-pound traveling weight, including built-in floppy
- Cursor keys in standard inverted T

AVAILABILITY

20MB and 40MB models immediate, 60MB model January 1991

PRICING

60MB model \$6399 (estimated)

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Austin, TX 78720-2230

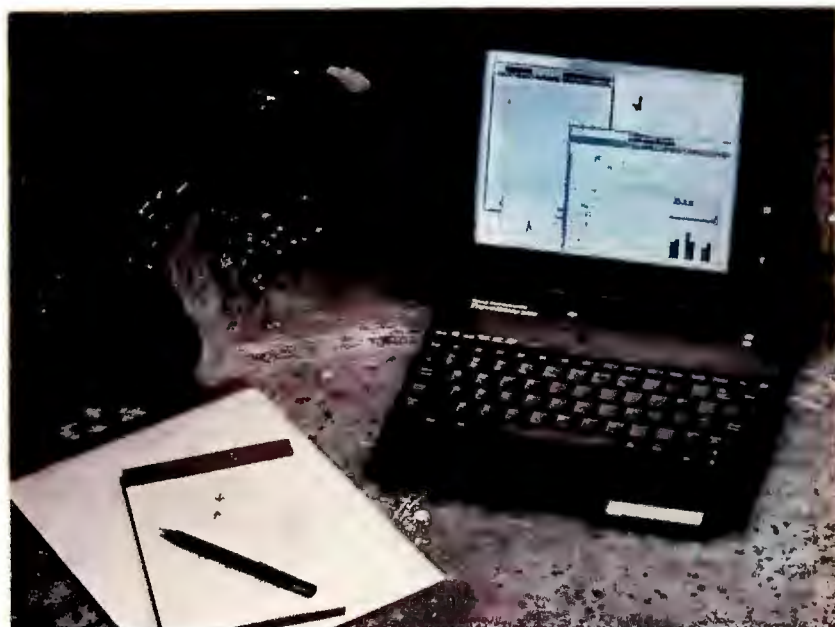
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companies have standardized on 386 desktops (and applications) and who need the same functionality on the road.

There's some crossover in the markets for these powerhouse notebooks and Compaq's SLT 386s/20. Since Compaq's LTE 386s/20 uses the same chip set as the SLT 386s/20, the two machines should race through the benchmarks at the same pace, but the similarity ends there. The SLT has a 120MB hard drive option, it lets you install up to 14MB of CPU-speed RAM, and its removable keyboard has a slightly better layout. On the other hand, its 18-pound traveling weight makes it more at home on a desk than in the hand of a frequent flier.

Even a quick comparison of the competing 20-MHz notebooks shows the TravelMate is 2 pounds lighter, \$600 cheaper, and has a slightly slicker key-



The featherweight (6.8-pound) TravelMate 3000 includes a floppy, a hard disk, and VGA graphics.

board. The LTE offers a higher 10MB RAM ceiling and will probably run a few hours longer on its battery. And if you want a 60MB hard disk right now, the LTE is your only choice. We'll need to wait for performance testing to reveal

how much difference Compaq's associative memory cache makes. But clearly, both of these trains will take you all the way home. ●

Michael Goodwin is an associate editor for PC World.

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Of course, ULTRA™ works just as well on leased lines, satellite links, and other networks. It even automatically negotiates the best connection with other modems. Hayes or otherwise.

Plus, it uses the world standards for error-control and data compression, V.42 and V.42bis, and it can downshift to MNP® levels 2 through 5.

What's more, ULTRA 96 is compatible with the most popular high-speed modem on the market. The Hayes V-series® Smartmodem 9600.™

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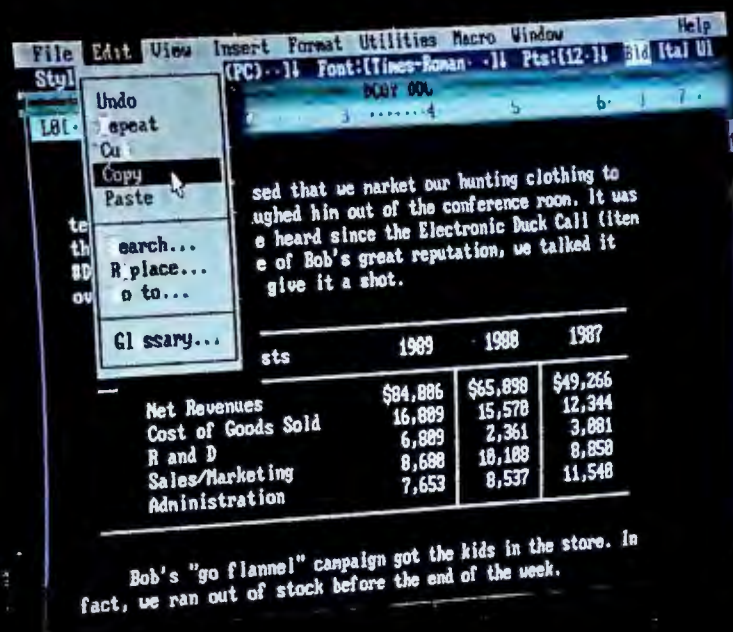


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Hunting se



ason is over.



We created new Microsoft® Word version 5.5 with a certain aim in mind: make powerful word processing features easier for you to find and use.

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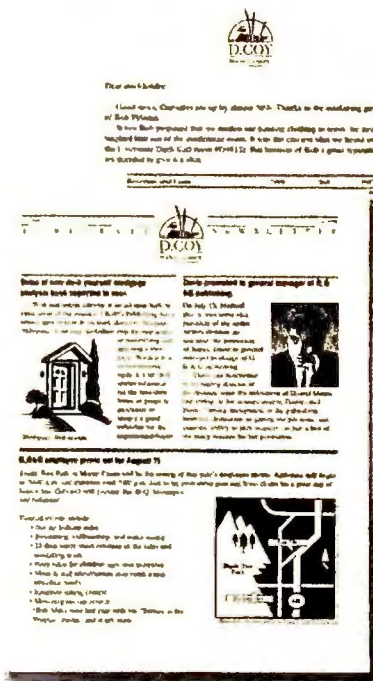
Of course, if you do happen to venture into unfamiliar territory, online help can lead you out of the woods. Automatically.

And you can do it all with a point and click.

New Word 5.5 runs swiftly on virtually any PC. And because it features the emerging industry standard interface (CUA), you'll have no trouble transferring your skill to other leading applications.

For more information on just how simple

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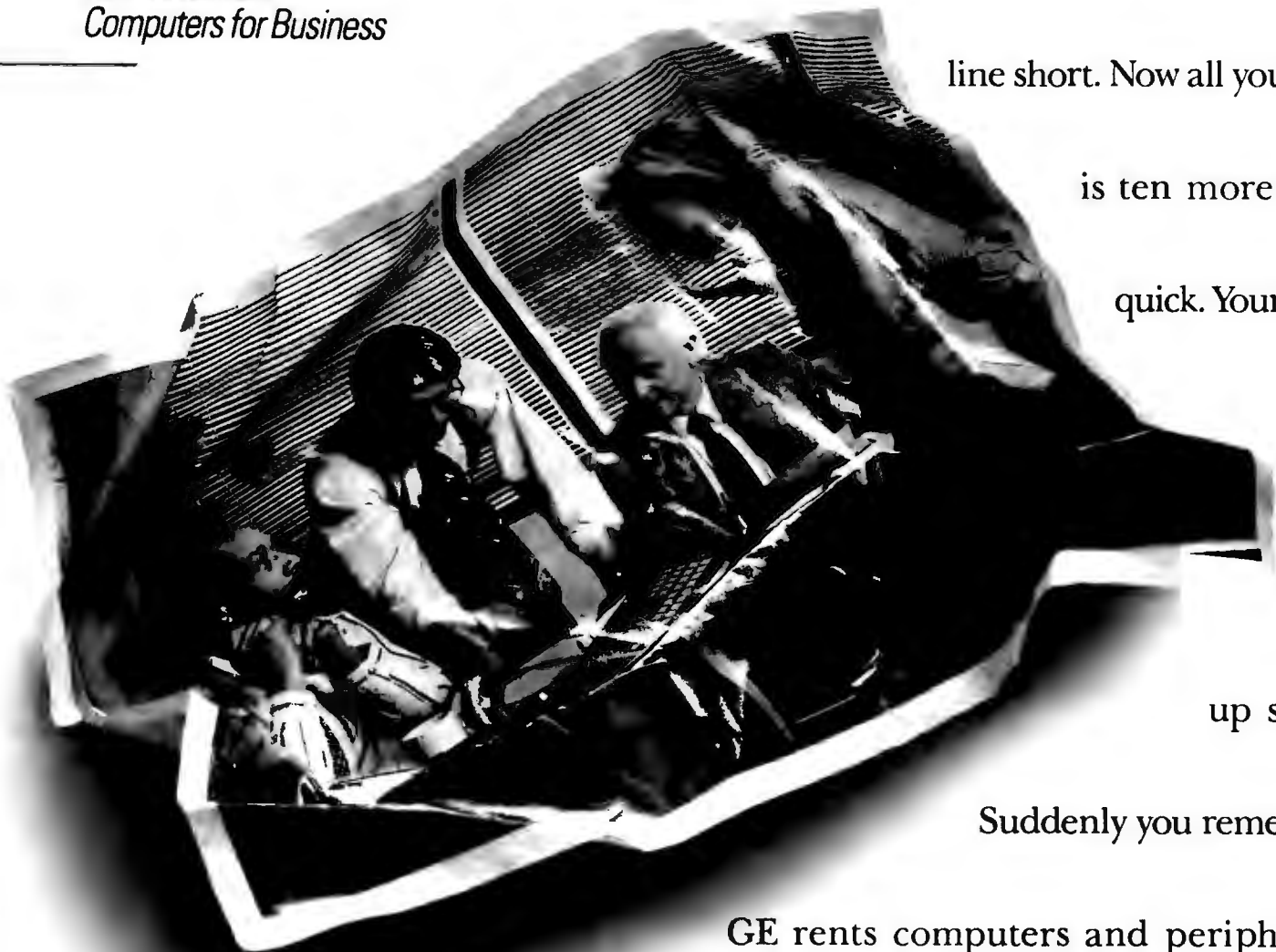
Our new ribbon lets you tie together anything from fonts to styles to formatting. And all it takes is just a point and click with the mouse.

You'll discover why, in the field of word processing, Microsoft Word 5.5 stands out from all the rest.

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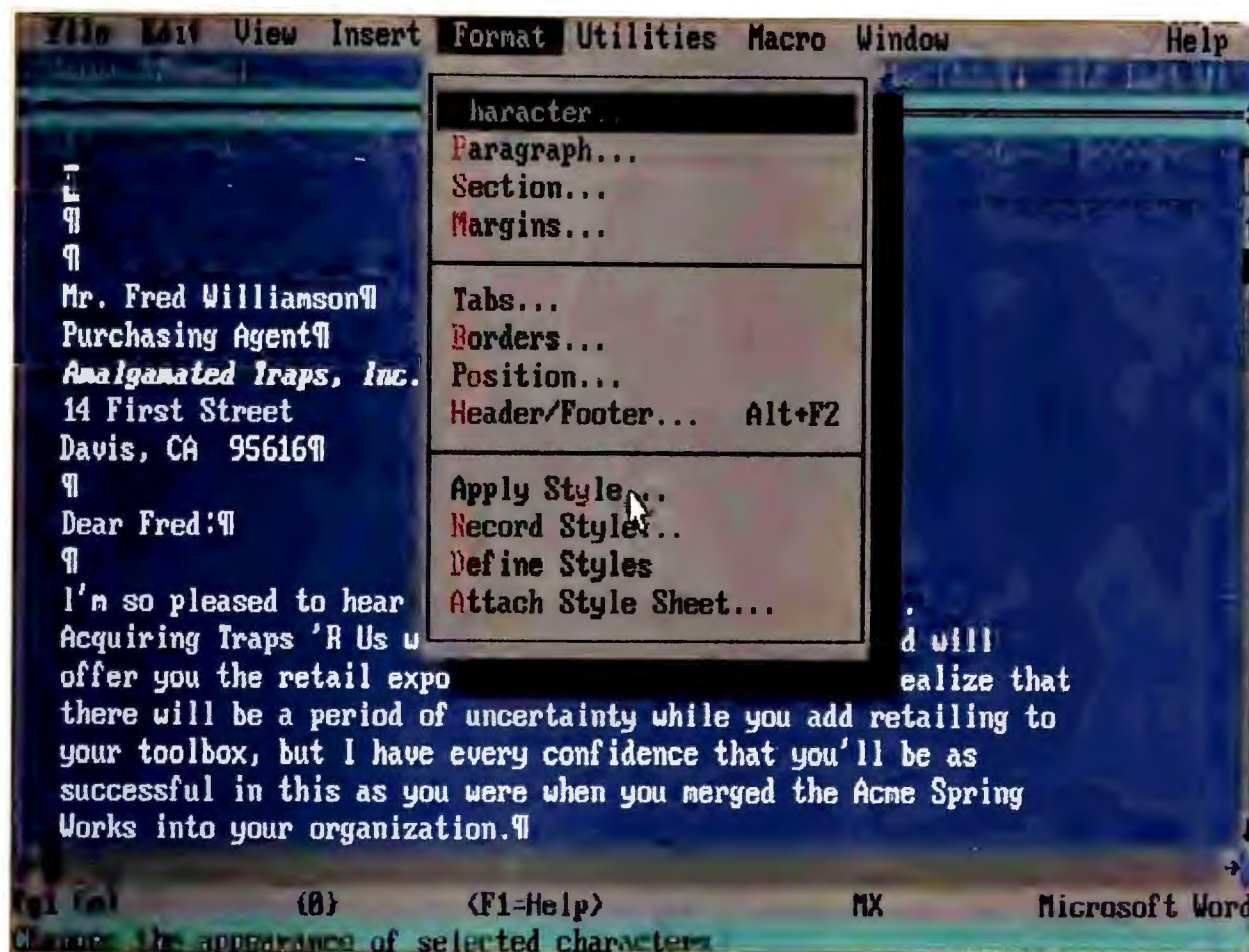
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Word 5.5's Big Risk: A Top-to-Bottom Make-Over

Microsoft one-ups WordPerfect's pulldown menus with a total redesign of the classic Word. Is Word 5.5 a breakthrough or another "new Coke"?



Revamped with pulldown menus, dialog boxes, and a top-line ribbon bar, Word 5.5 borrows several tricks from Word for Windows.

George Campbell

What's a loyal Microsoft Word user to think? First, Microsoft reinvents the Word wheel with Word for Windows. Now it takes an ax to the bottom-line menus of the character-based Word. Microsoft Word 5.5 offers a completely new look, with Windows-like pulldown menus and dialog boxes. It resembles a character-based Word for Windows.

The upgrade is only \$50, but will Word users be willing to learn a new interface? And what was wrong with the old menus anyway? Fortunately,

those who don't like the new look can opt to install 5.5 with the old menus.

Impassioned arguments with WordPerfect partisans aside, most Word users would admit amongst themselves that 5.0's interface is a rather awkward, Byzantine affair. The qualities that made Word users loyal were the powerful, elegantly implemented features and the sound underlying philosophy of "select, then format."

The good news is that Word 5.5's features and philosophy remain the same, while the new interface makes the program much easier to learn and

use. Although formal testing will await the final version, 5.5 appears to be just as fast as 5.0, giving it an edge over the current crop of graphical word processors, including Word for Windows. There are plenty of 8088 and 80286 machines that can't efficiently run a Windows application, so DOS applications such as Word 5.5 may still have a healthy future.

While archrival WordPerfect 5.1 merely tacked optional pulldown menus onto its original tough-guy interface, Word 5.5 risks a complete make-over. Because WordPerfect for Windows is still in the future, WordPerfect's approach was a

sound one: Mollify existing users by leaving well enough alone. But since Microsoft already positions Word for Windows to lure Word veterans, the company may mean to nudge users from the nest.

A Classy Face-Lift

The only notable addition in Word 5.5 is the capability to import Lotus WK3 files. But the interface modifications make this upgrade even more significant than the leap from 4.0 to 5.0.

The old menus at the bottom of the screen are replaced with a Windows-like top-line menu bar. Scroll bars line the screen, and dialog boxes, complete with buttons and list boxes, replace the irritating old menu fields. Even the spelling checker and thesaurus pop up as dialog boxes. Where you used to press <F1> to see a list of menu options, now you just click on an arrow to drop

SNAPSHOT

Microsoft Word 5.5

A mouse-oriented menu interface makes Word easier to learn and use—but old-timers are in for some relearning.

KEY FEATURES

- Pulldown menus and dialog boxes
- Formatting ribbon
- Imports WK3 files

AVAILABILITY

October 1990

PRICING

\$450, \$50 upgrade from Word 5.0, \$75 upgrade from earlier versions

Microsoft Corp.

One Microsoft Way
Redmond, WA
98052-6399
800/426-9400,
206/882-8080

Reader service no. 812

down a list box.

You can still use cursor keys and hot keys, but a mouse is almost essential. *Word 5.5's* new formatting ribbon, à la *Word for Windows*, lets you select styles, fonts, and character formatting with a mouse click. The ribbon even includes "hot spots." Click twice on *Font*, for example, and up pops the character formatting dialog box. Keyboard curmudgeons will be happy to know that the ribbon display is optional, but they may be surprised at how the ribbon can speed formatting.

Windowing—always a *Word* strong point—has also been improved. You can now cascade or tile windows and expand and contract them by selecting icons. Clicking on any part of a window makes it active.

If you're a *Windows* user, you'll feel at home with the top-line menu titles. Gone are *Word's* cryptic Library and Transfer menus—utilities are now more logically placed in Utilities, and file operations fall under File.

Style sheets, once buried in the arcane Gallery, are now found in the Format menu. Creating, editing, and attaching styles is much easier—to attach styles you merely click on a paragraph, click on the style sheet icon, and then select the style from a list.

Old Dogs Revisited

Word 5.5 bends over backward for new users, offering superb tutorials, on-line help, and manuals. Microsoft hasn't forgotten its regulars, either, providing a manual for current users and help screens that

display charts of old versus new commands. The package includes disks for version 5.0 in addition to 5.1, so corporate users can switch over smoothly. Still, *Word* veterans are in for some reeducation. Instead of pressing <Esc>TS to save a file, you'll press <Alt>-FS. For bold text, <Ctrl>-B replaces <Alt>-B. Function keys have also changed—instead of using <F6> to select text, you use the mouse or repeatedly press <F8>.

Fortunately, most of the new commands conform to the SAA/CUA standard, so if you've purchased a new application in the last few years, chances are you're familiar with them. Diehards can always revert to *Word 5.0* function keys by remapping the keyboard with the new Customize dialog box.

Word 5.0 printer drivers, dictionaries, and style sheets are still compatible, but you'll need to run macros through a conversion utility, and complex macros may need editing.

Many *Word* users will take this new version as a sign to move on to *Word for Windows*. Others will skip this upgrade and stick with *Word 5.0* until their hardware (or their thinking) is ready to embrace *Windows*.

Unless you're truly mouse-phobic, take a \$50 risk and check out *Word 5.5*. After the initial frustration, you'll find it easier to use than 5.0—and changing to 5.5 now will make it that much easier when and if you *do* move to *Windows*. ●

George Campbell is a contributing editor for PC World.

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As corporations seek a balance between paper and electronic forms, they're placing a high priority on making paper forms more efficient, reducing fill-in time, and establishing connections with their database.

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with one menu selection, retrieves them and automatically fills them into proper position in the form.

How FormFiller Works: Step 1 — Insert The Form Into Your Printer.

The secret to FormFiller's power is its ability to tightly synchronize the computer and printer for precise positioning. You begin by creating a template for each form, matching the exact spacing, position and size for each field or blank on the form and inserting captions, help and fill-in instructions if you like.

Simply insert a sample form into the printer, with the system prompting you for alignment with your printer head. You then invoke FormFiller's "print grid" command. This actually prints vertical and horizontal lines directly on the pre-printed form, with numbers along the top and the left margin. This grid, and the corresponding numbers, are your guide in establishing the coordinates for each print position on the form.

Step 2 — Locate Precise Print Positions for Each Blank.

Using FormFiller's new menu-driven interface, the next step is to create exact print positions for each blank on the form. It's fast and simple — just two keystrokes are required to establish a print position, defining it from starting point to ending point. And FormFiller allows you to adjust your print positions in any direction in incre-

stant call up and fill-in anytime. FormFiller allows data to be entered into templates using any format: columns, prompts, or into the actual form image. The data is then automatically transferred to exact blank positions on the pre-printed form.

FormFiller's Extensive Math Capabilities.

FormFiller contains dozens of math and financial functions that can be used within the form. These functions can be embedded in the form templates and automatically activated when values are entered into certain fields. This allows interactions and relationships between all fields in the form. If you're filling in a mortgage form, for example, changing one number will change all subsequent values related to that number.

Use Existing Data To Fill In Forms.

FormFiller's advanced "merge" features allow users to instantly merge database information into their pre-printed forms from spreadsheets and relational databases simultaneously.

Your existing data can be quickly imported (without conversion) using FormFiller's improved new import capabilities that support dBASE II, dBASE III, Lotus 1-2-3 (WKS and WK1), DIF and ASCII.

Pinpoint-Precise Accuracy.

Only FormFiller can position data in precise locations on the pre-printed form, using its unique print position "Locator Grid" which actually synchronizes the computer and printer. And FormFiller allows complete control of the printer, including print quality, fonts, attributes, variable page sizes and orientation using dot-matrix, ink jet, daisy wheel or laser printers.

Automatic Look-up And Fill-In.

FormFiller streamlines data entry with its unique "look-up" feature. This powerful function eliminates data entry by providing instant access to details frequently required during fill-in. In preparing an invoice, for example, you can simply enter a part description and FormFiller automatically finds the part number, description, price — even the customer's shipping and billing address.

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Fast Data Entry: This form requires specific part numbers and other cost codes. FormFiller can store this data, retrieve it and insert it — in position — on the form, instantly.

Multi-Part Forms: Each form has unique requirements. This form contains carbon "patches" and several parts. FormFiller's template allows fast fill-in of any form — regardless of its complexity.

Extensive Math: No other system could perform the calculations required for this form: FormFiller contains over 40 math and financial functions. It's fast — and error-free!

FormFiller is the ideal fill-in solution for government, insurance, legal and tax forms, building permits, medical forms, shipping airbills and countless others.

FormFiller is the only system specifically designed to accurately fill-in pre-printed forms with pinpoint-precise accuracy — for up to 640 fields! It eliminates the tedious nature of form fill-in, and allows forms, regardless of their type or complexity, to be filled in with unparalleled speed, and without the margin for human error.

FormFiller's advanced mathematical and financial calculation capabilities allow you to enter values and have the system make the calculations (using dozens of built-in formula functions) automatically. These extensive math functions include percentages, exponents, depreciation, amortization, interest, present and future values — even advanced trigonometry functions.

FormFiller also includes a time-saving "Lookup" feature that stores details such as part numbers, phone numbers, shipping and billing addresses, wholesale/retail prices, claim and case numbers and more — than

ments of up to 1/720th of an inch for pinpoint-precise alignment. You can quickly create custom grids for complex or inconsistently spaced forms.

When the data positions have been located, FormFiller will automatically insert X's to represent characters so you can visually test alignment and inspect the spacing of the fill-in areas.

Step 3 — Preparation of the 'Master Template.'

Once the coordinates for each print position on the form have been entered, you then enhance the "master template" for the form. FormFiller allows you tremendous flexibility to custom design master templates to fit the exact needs of your information flow and accommodate your data entry requirements. This master template controls the entire data entry process.

Step 4 — Swift, Simple Data Entry.

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You don't have to know anything about accounting to become instantly productive with Money Matters. There are no time-consuming set-up procedures or accounting techniques to learn. Choose from 14 pre-defined business categories. When you select one, the account tables are automatically established. Quickly enter starting data into Money Matters' handsome interface and from then on, each function is as easy as writing a check.

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- Automatic Payments
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- And Many More

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- Provides for departmental accounting or subcategories

► Checkbook Management

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► Bank Accounts

- Handles up to 15 bank accounts & credit cards
- Includes checking, savings, money market and more

► Forms

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- Receipts
- Mailing labels
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Just turn on your computer, and up pops a clean, simple menu of everything loaded on your hard disk — all of your programs and files. Simply select the program you want — and it's up and ready to run. Looking for a particular file? No problem. Just open a list of files with one keystroke — and select the one you need. DiskVision gives you complete control of all files and programs on your floppies or hard disk.

And when the hard disk is filled to the brim, just tag older or dead files — from the menu — and one keystroke moves them instantly to a floppy, prints a label, then asks you if you want them erased from the hard disk. It's remarkably simple, and you'll always know where the files are. If you need one of the older files at any time, one keystroke instantly loads it back onto the hard disk.

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The Individual Modules: An In-Depth Look.

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- Supports hard disk & floppy menuing.
- Provides easy access to files, then fast access back to the menu.
- Complete password and security protection.
- Also supports mouse menu operation.

► File Archive Manager

- Remarkably simple moving, copying and erasing of files.
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- Quickly move files from anywhere to anywhere — hard disk or floppy.
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- DiskVision maintains a complete log of all file operations for accurate file tracking.

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Here's one you'll love. TurboTax contains an AUDIT FLAG feature that actually flags you on possible audit situations — before the IRS does. The new TAX SAVINGS feature provides instant suggestions on how to save serious money on your taxes — legally. There are features that help pinpoint omissions in your return, a TAX WINDOW that gives you a synopsis of your return at any point during data entry and a final checklist to get your return ready to mail.



TurboTax Is Easier than Ever...

This new version of TurboTax also includes a host of time saving features that make working with it a breeze. A completely new tutorial gets you up and running in less than 10 minutes. Its smooth pull-down menus and windows move you quickly through any operation, with plenty of context-sensitive help available. Over 30 new "Speed Keys" cut the number of keystrokes needed to perform any function, and the handy REMINDER NOTES feature lets you attach notes to each line of the form.

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Form 1040-ES Estimated Tax Worksheet
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Schedule B Interest and Dividend Income
Schedule C (4) Profit or Loss from Business
Schedule D Capital Gains and Losses
Schedule D-1 Continuation Sheet for Schedule D
Sch D — Extra Additional Capital Gains and Losses
Schedule E Supplemental Income and Loss
Sch E1 — Extra Additional Rent and Royalty Income
Sch E2 — Extra Additional Partnerships, S Corp. Income
Schedule F (2) Farm Income and Expenses
Schedule R Credit for the Elderly or the Disabled
Schedule SE (2) Social Security Self-Employ. Tax
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Form 2441 Credit for Child and

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Form 3800 General Business Credit
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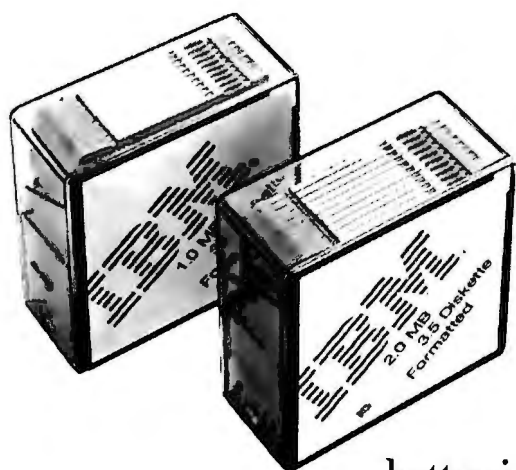
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DECEMBER 1990 PC WORLD 111

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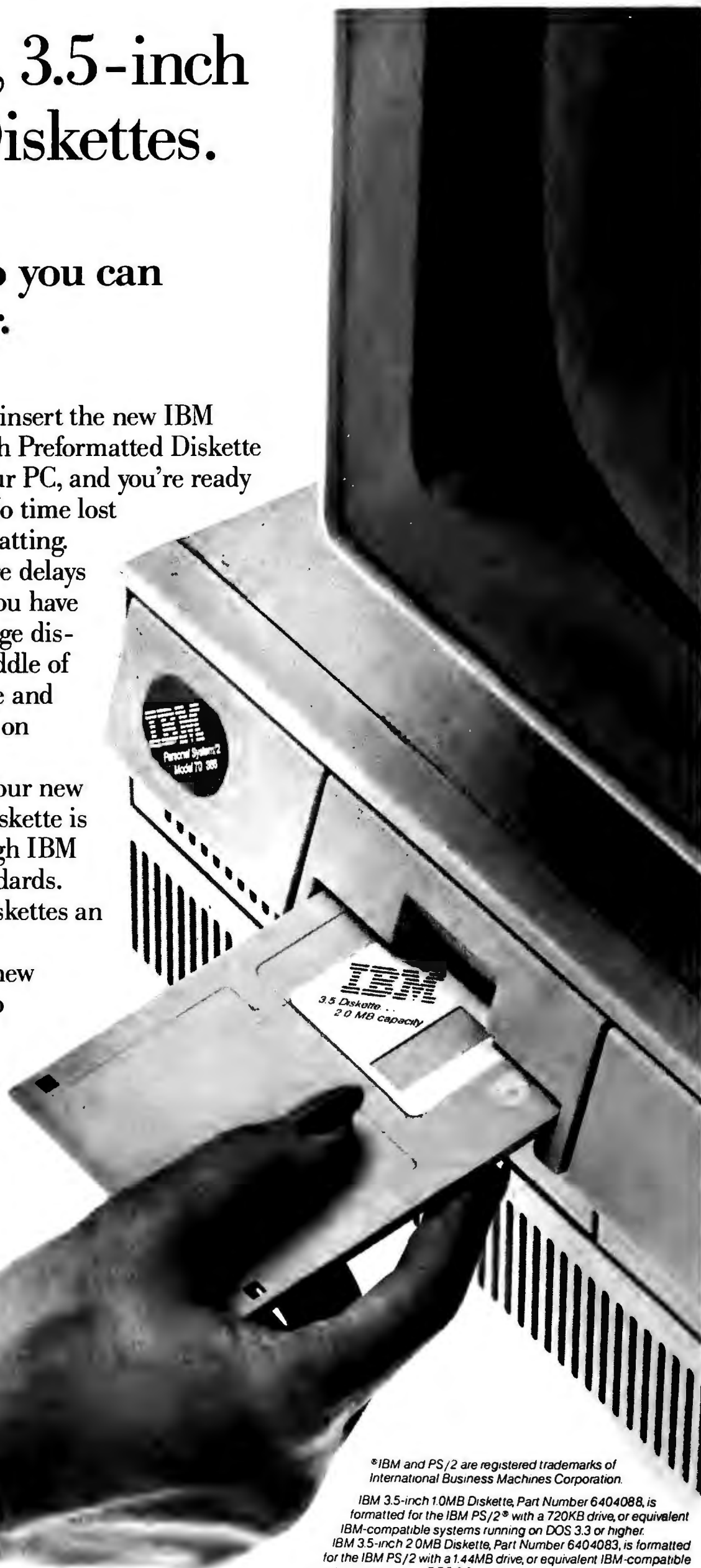
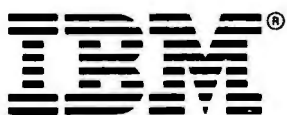
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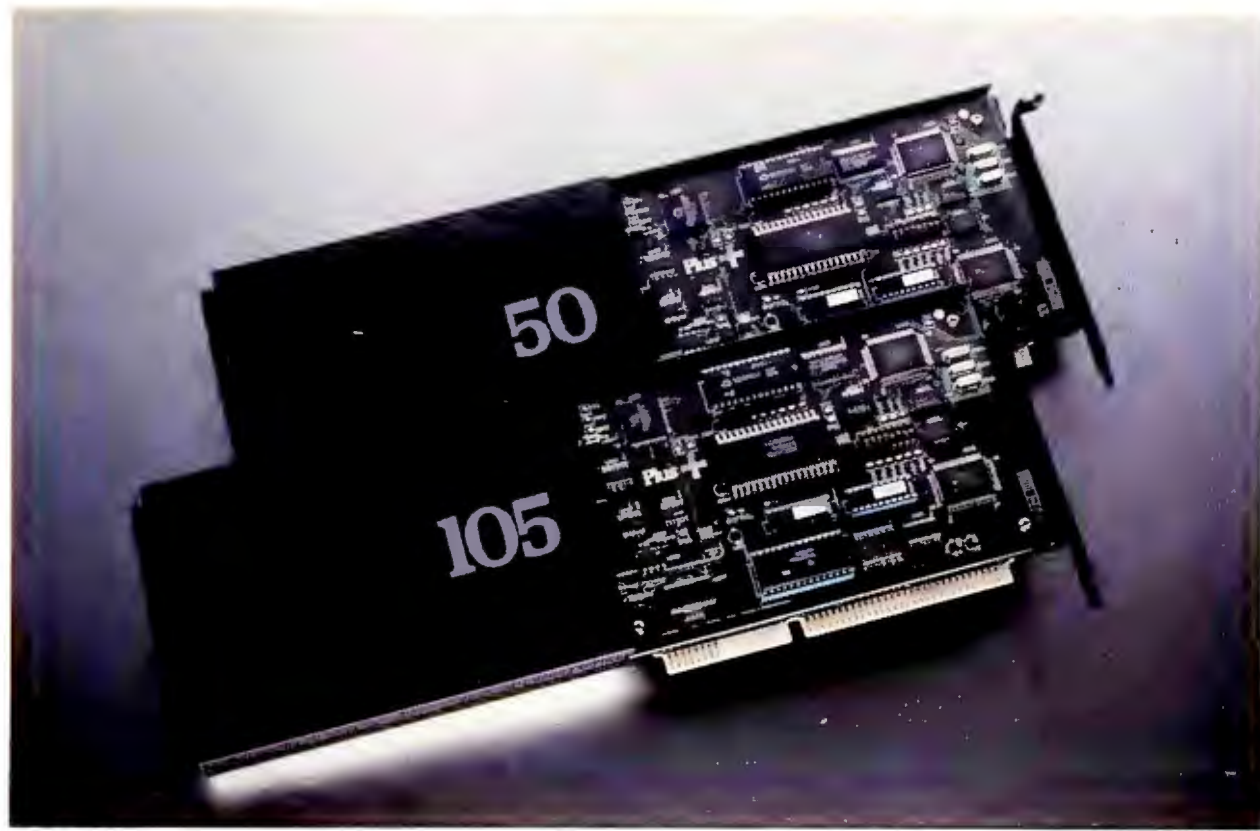
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The Hardcard Races Ahead

Greater speed and capacity give the Hardcard II XL the performance that 286 and 386 users demand.



Exploiting cache memory, the Hardcard II XL boasts an effective access time of 9ms—which Plus Development claims is the world's fastest for a 3½-inch drive. Like Plus's other drives, the Hardcard II XL installs quickly in an expansion slot and should prove highly reliable.

TJ Byers

The latest incarnation of Plus Development's popular hard disk on a board may be just what the doctor ordered for vintage or small-footprint 286 and 386 PCs whose hard disks are bursting at the seams.

The Hardcard II XL 50MB and 105MB models are roomier, faster, and cheaper than their predecessors. Prices are a slim \$579 (50MB) and \$999 (105MB), with Plus Development touting street prices of \$399 and \$699, respectively.

Pump Up Performance

The big selling point of the Hardcard II XL is its "effective" access time of 9ms, a rating derived from the throughput of the 17ms drive in combination with a hardware disk cache. This is twice as fast as

the Hardcard II's effective access time (see "A New Deal for the Hardcard," March 1990).

The Hardcard II and II XL both have 1:1 interleave, 64K of static RAM cache, and a 16-bit interface. (The original Hardcard has an 8-bit interface.)

However, the effective access time is a function of the RAM cache, and applications that deal with large files, such as *Windows* programs, won't benefit significantly from this scheme. The average access time of the XL disk itself is 17ms, which is still faster than most AT-compatible hard disks in use today.

Capacity is also increased, with disk sizes of 50MB and 105MB for the Hardcard II XL, as opposed to the 40MB and 80MB capacities of the Hardcard II.

Like all Hardcards, the Hardcard II XL is ruggedly

constructed. It boasts a mean-time-between-failure rate of 60,000 hours—about seven years of continuous use.

Quick Installation

Hardcard installation is fast and straightforward. Just pop the hood on your PC, and plop the Hardcard into an empty 8/16-bit slot. The Hardcard works with all existing hard disk drives, and you can install up to four Hardcards in a system, provided you have that many free 8/16-bit slots.

A simple menu-driven installation program lets you set up the drive for DOS, OS/2, or Advanced/NetWare 286 SFT. IBM PC LAN and 3Com 3+ networks are also supported.

The installation program automatically partitions the disk into logical drives and places them after the last logical drive. That's a big improve-

ment over the Hardcard II's method of elbowing its way into the D: position and pushing the other logical drives up a notch, which played havoc with your batch files and path settings.

As a fast, easy storage upgrade for improving the performance of an aging or limited-capacity machine, the Hardcard II XL is hard to beat. It's reliable, and it comes with a two-year warranty. It slips into your PC without fuss (except if you have an XT clone, in which case you still must turn to the original 8-bit Hardcard).

And Plus has gotten the message on price—particularly for the 105MB board, which is cheaper than many half-height drives of equal capacity. ☺

TJ Byers is a contributing editor for PC World.

SNAPSHOT

Hardcard II XL 50MB and 105MB

Low cost and high speed make the Hardcard an excellent hard disk upgrade for vintage and small-footprint 286 and 386 PCs.

KEY FEATURES

- 9ms effective access time
- Two-year warranty
- Works with existing hard disk
- 16-bit interface

AVAILABILITY

Immediate

PRICING

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Plus Development Corp.

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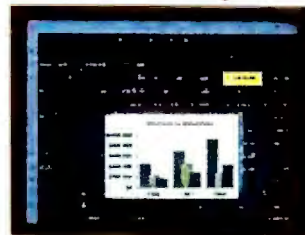
competitive than ever.

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run. With so many integrated features, you can take care of your expansion needs using only two slots.

And it comes with a host of unique network features like multilevel security, making it the best full-function PC for connected environments. All of this fits neatly into a space-saving design.



The COMPAQ DESKPRO 386S Personal Computer is also designed to handle general business applications. Its 16-MHz 386SX microprocessor gives you exceptional 386 performance. And its 32-bit architecture lets you run today's popular business software. It also offers the flexibility to run tomorrow's advanced business software.

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a broad range of integrated features.

The COMPAQ DESKPRO 386/20e Personal Computer is for experienced users. It's perfect for demanding applications like presentation graphics. And it's loaded with high-performance features like an advanced cache architecture. So it runs up to 50% faster than other 20-MHz, non-cached 386-based PCs.

For users doing similar jobs, but with more stringent performance needs, we offer the COMPAQ DESKPRO 386/25e Personal Computer. Its 25-MHz 32-bit performance lets you fly through financial analysis as well as other demanding applications.

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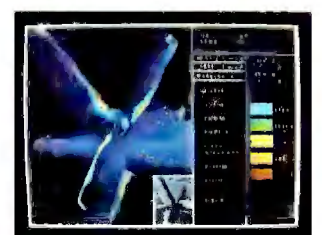
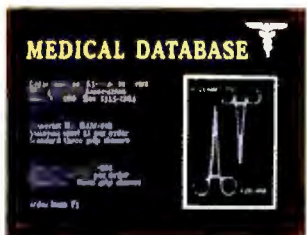
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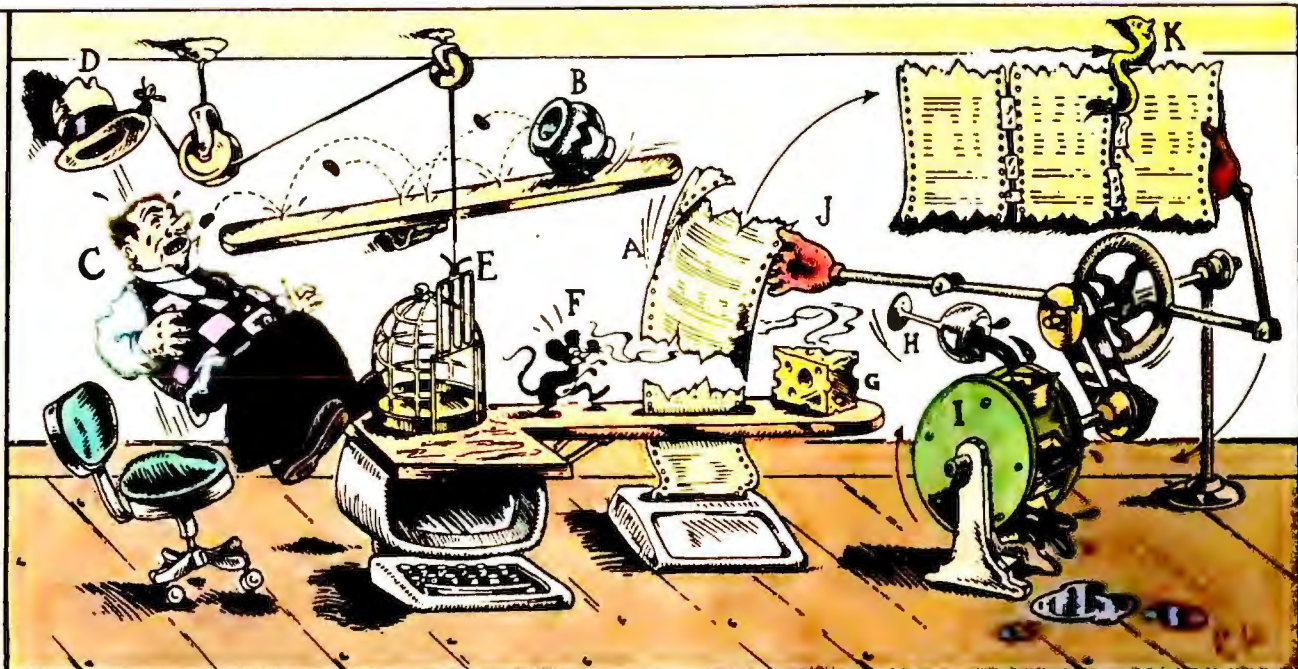


RISING SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBOLATED THAT HIS HAIR STANDS ON END, DISLODGING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (K).



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Circle 148 on reader service card

PRODUCT OUTLOOK

Edited by MIKE HOGAN

UltraLite 286V, 1500 HD

Widely Varying Notebook Entries From NEC and Tandy



Tandy's 1500 HD fits both a floppy and a fast 20MB hard drive in a tidy 6-pound package.

With the footprint clearly defined, the notebook field has become crowded. Now two of the oldest purveyors of portables have new entries that reflect their different strategies.

You pay twice as much for an NEC UltraLite 286V as you do for the Tandy 1500 HD—\$3999 versus \$1999 list price—but NEC provides more processor speed, a bigger and sharper display, greater expandability, and a more sophisticated package. You also get twice the parts; the 3½-inch floppy drive is an external device. Like the Tandy, it packs a fast 20MB hard drive, measures about 12 by 10 inches, and is under 2 inches high.

With a 12-MHz 286 CPU and the ability to boost memory to 5MB, you can run some of the most demanding applications when you're on the

road. Even *Windows 3.0* looks good on its 10-inch backlit VGA-compatible LCD display. NEC says users would rather have the full-sized VGA screen in a 6½-pound package than an internal floppy.

Not so, says Tandy; the 1500 HD contains a 3½-inch floppy along with a fast 20MB drive and is still able to keep its weight under 6 pounds. The machine's NEC V-20 CPU running at 10 MHz is nonstandard, but it's adequate for most word processing and spreadsheet tasks. The 640K standard memory can be augmented by 1MB—again, adequate for most tasks. Of more concern is the 640 by 200 CGA display. That's a little behind the technology curve, but the *DeskMate* environment that automatically boots up on the machine looks good.

Battery packs are \$100 and

last 3½ hours each. NEC's 1MB memory card costs \$499, and a 4MB card is \$1999. A 2400-bps combined modem and send-receive fax is \$799.

—Mike Hogan

IN BRIEF

While NEC's new UltraLite shoots for the cutting edge of notebook technology, Tandy has fashioned a midrange machine priced for the masses.

NEC Technologies Inc.

1255 Michael Dr.
Wood Dale, IL 60191
708/860-9500

Reader service no. 742

Tandy Corp.

1800 One Tandy Center
Fort Worth, TX 76102
817/390-3011

Reader service no. 743

INSIDE PRODUCT OUTLOOK

118 GridCase 1550SX
The first laptop designed to run *Windows*.

118 Canon BJ-10e
Makes ink jet printing portable and affordable.

120 Presentation Team
Gains ground on rivals with better-integrated modules.

124 Dauphin 3000SX
Color VGA graphics in a versatile laptop.

124 Infinity Desktop
Small-footprint SX comes in four different models.

128 Dell 425TE, 433TE
Nifty design in a pair of fast-performance EISA towers.

128 Dycam Model 1
Digital camera takes pictures and uploads images.

132 GrandView 2.0
Adds new tools to help you get organized.

132 Packard Bell Force 386/33, Force 386X Two low-cost machines give you the power of a 386.

136 Howtek Personal Color Scanner, UMAX UC300 Capture up to 16 million colors per image.

136 Little Big LAN, The \$25 Network Create a network on a shoestring.

140 PM9600 SA V.32/V.42bis, 9600EX Quicker transmissions for less.

GridCase 1550SX

Grid's Laptop: Windows on the Road

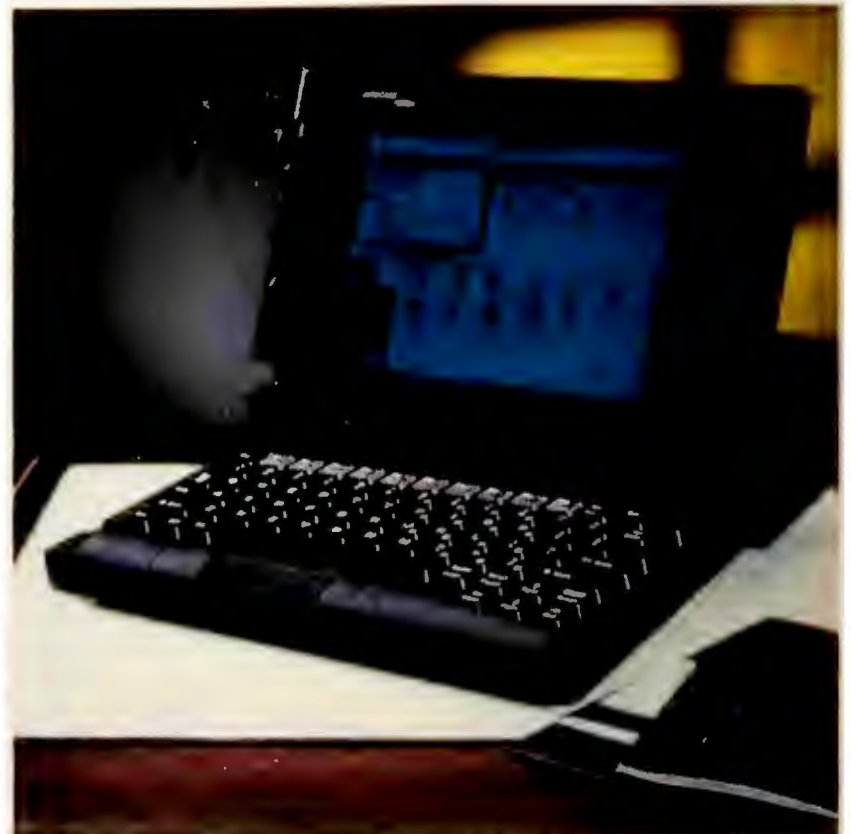
Grid's 20-MHz GridCase 1550SX is the first laptop specifically designed for *Windows*. A muscular 386SX platform, it comes with a keyboard pointing device called Iso-point, which solves the mouse-support problem that has kept *Windows* off most laptops.

Iso-point is a thin tube about the diameter of a drinking straw, located just beneath (and parallel to) the <Space>

bar. You roll the tube with your thumb to move the cursor up and down; slide it from side to side to move the cursor laterally. Buttons on each side provide clicking capability. The Isopoint is 100 percent compatible with the Microsoft Mouse and much easier to use than a trackball or touchpad.

Additional *Windows*-enabling features include a 20-MHz 386SX, 2MB of RAM expandable to 8MB, a VGA-compatible screen, and a fast 60MB hard disk with a 64K disk cache. The \$6295 list price includes *Windows 3.0*. Substitute a 120MB hard disk and pay another \$700.

At 14.6 pounds (including built-in floppy drive, battery, charger, and cables), the 1550SX is fairly light, but its 2-hour battery life is relatively short. The keyboard features



This full-featured *Windows* platform, the Grid 1550SX, includes a keyboard pointing device that solves laptop mouse-support problems.

dedicated cursor keys laid out in the standard inverted T, but the <Page Up> and <Page Down> keys are aliased, as is the numeric pad. These are

small prices to pay, though, for the convenience of running *Windows* on your desktop and on the road. —Michael Goodwin

IN BRIEF

A pointing device makes this full-powered laptop a true *Windows* platform.

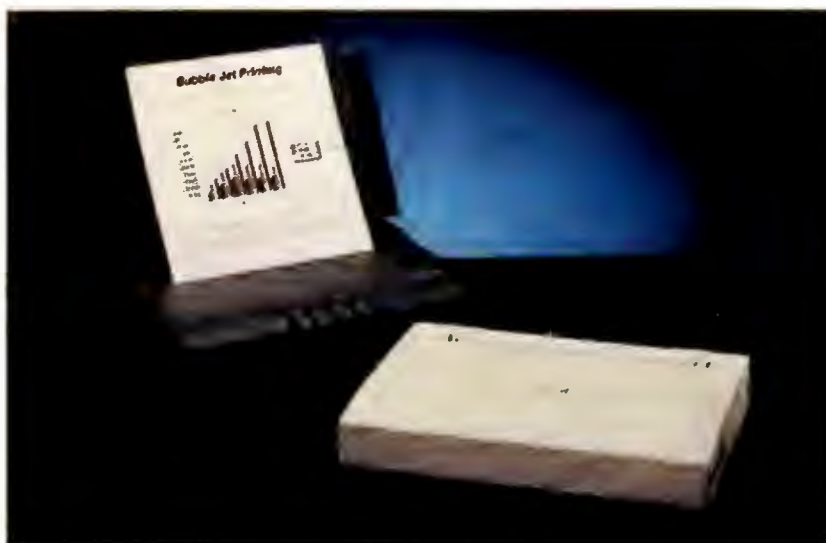
Grid Systems Corp.

47211 Lakeview Blvd.
Fremont, CA 94538
800/222-4743

Reader service no. 740

Canon BJ-10e

Light and Compact Printing On the Go



Perfect for your briefcase, the 4.6-pound Canon BJ-10e lets you print wherever your laptop can compute.

Some people never leave the office; others bring it with them wherever they go. Today's powerful laptops make that possible, but you usually can't print until you return to

the office. Now Canon offers a mobile printing solution.

At 4.6 pounds (including batteries) and \$499, Canon's BJ-10e won't strain your back or your budget. The printer of-

fers high-quality text printing and 360-dpi graphics in a box small enough to slip into your briefcase. The 12-by-8½-by-2-inch printer uses the same bubble-ink jet technology as its larger sibling, the BJ-130e, allowing for quiet 45db operation. And it emulates both the BJ-130e and IBM's Proprinter X24E, simplifying software support.

Typefaces include Courier and Prestige Elite in 10, 12, or 17 characters per inch (cpi) as well as proportional spacing. A 37K buffer will eventually allow for the downloading of soft fonts when Canon makes them available. The BJ-10e prints text at a speed of 83 to 142 characters per second, depending on the number of characters per inch. Print speeds are the same in either draft or letter-quality mode.

The BJ accepts letter- or

IN BRIEF

Canon offers a lightweight portable printer that's as mobile as you are.

Canon U.S.A.

One Canon Plaza
Lake Success, NY 11042
800/848-4123,
516/488-6700

Reader service no. 741

legal-sized paper, envelopes, and 3M and some other brands of transparencies. A 30-sheet paper feeder adds \$90 and 1.8 pounds to the package. The \$50 nickel-cadmium battery is good for printing about 30 pages between recharges; a 1.3-pound AC adapter is standard. Replacement printhead cartridges cost \$25 and last for about 700,000 characters each. —Daniel Tynan

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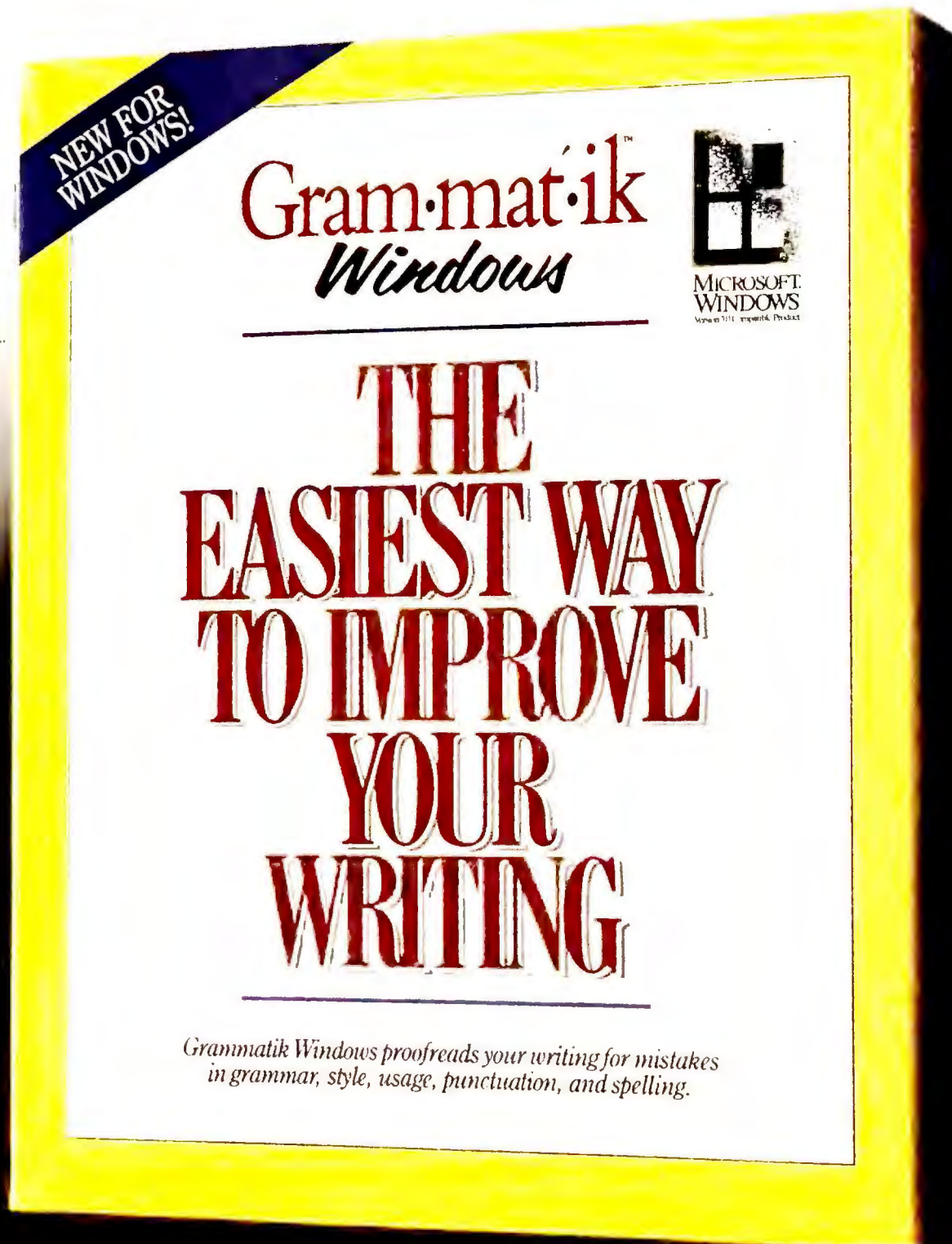
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Circle 282 on reader service card

Presentation Team 2.0

Better Integration for Presentation Graphics and Text



In addition to a WYSIWYG work area, Presentation Team 2.0 gains smooth integration between its text, graph, and drawing modules.

Presentation Team has always played in the shadows of *Harvard Graphics* and *Freelance Plus*, but Digital Research hopes that smoother integration among *Presentation Team 2.0*'s modules will make it a more successful contender.

Digital Research's previous version enjoyed certain advantages over its more powerful rivals, a graphical user interface being the most notable. Where *Harvard* and *Freelance* make you fill in blanks in a separate screen, *Presentation Team* had a WYSIWYG work area that displayed the changes to your presentation as you made them. What's more, it excelled at word charts—the most-used portion of any business presentation package.

But *Presentation Team* was hobbled by a lack of integration among its text, graph, and drawing modules, which forced you to bounce between them. The program also lacked certain essentials, such as the ability to import 1-2-3 WK1 files.

Version 2.0 corrects both these problems and adds many other enhancements. Word chart, graph, and drawing

modules are now fully and smoothly integrated around the WYSIWYG work area, making it a snap to build and edit visual images. In addition to accepting WK1 files, the program includes an inte-

grated version of Inset Systems' *HiJaak* file conversion utility. And Digital Research has developed a presentation manager that makes it easy to organize and output visuals.

Additionally, you get the ability to rotate text (by 1-degree increments on PostScript printers and 90-degree increments on other printers), automatic conversion of colors to black and white for output on standard printers, and up to 16 colors per chart (previously 8). Users will also find on-line, context-sensitive help, and network support.

The \$495 package still lacks many of the more powerful charting capabilities offered by *Freelance Plus* and *Harvard Graphics*, such as high/low/close charts and dual Y-axes. *Presentation Team*'s drawing tools don't include

any way to smooth curves, and its clip-art library (at 300 pieces) is notably smaller than *Freelance Plus*'s (900) or *Harvard Graphics*' (500). But where else can you find all the basics in an easy-to-use, WYSIWYG shell? For many users, that simplicity outweighs the absence of exotica.

Presentation Team 2.0 requires DOS 3.0 or a later version, 640K of memory, a hard disk, a graphics display, and a pointing device. —Patrick Marshall

IN BRIEF

Version 2.0 brings *Presentation Team* the integrated features of the leaders, along with WYSIWYG editing.

Digital Research

P.O. Box DRI
Monterey, CA 93942
408/649-3896,
408/646-6248 (fax)

Reader service no. 753

Back-It 4

Taking the Boredom Out of Backup

Backing up your data gets exciting only when you forget to do it and your hard disk crashes. Gazelle Systems does away with the modern equivalent of Chinese water torture with *Back-It 4*, a reworked version of *Back-It 3.1* that the company claims is fast, simple, and versatile.

Rather than offering different interfaces for different skill levels, *Back-It 4* bridges the gap between novice and expert with footnotes at the bottom of the screen and context-sensitive help.

Back-It 4's cleaner menu system leaves out the details until you need them. The first screen shows the four basic functions: Backup, Restore, Configure, and Quit. If you

simply want to back up or restore your hard disk, a "direct" option appears from a pulldown menu, and you're prompted to answer the obvious questions about source and destination drives.

IN BRIEF

Back-It 4 is faster and easier to use, with a simplified interface, multilayered help screens, and the ability to automate 50 backup routines.

Gazelle Systems

42 N. University Ave. #10
Provo, UT 84601
800/233-0383,
801/373-6933 (fax)

Reader service no. 759

You can move faster still if you take advantage of *Back-It 4*'s preset function, which lets you create up to 50 custom backup routines—for instance, all WK1 files or only changed files—and is accessible from the Back-Up Manager. A new data compression technology actually increases the speed of the backup while compressing. *Back-It 4* can back up to anything recognized as a DOS device, including Bernoulli Boxes, DAT devices, and network drives.

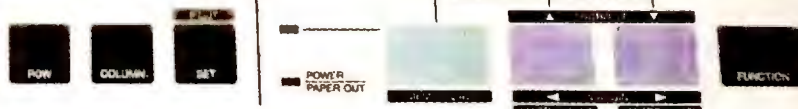
Back-It 4 1.0 retails for \$195, but through January 1991 it has an introductory price of \$169, with the *GZFORMAT* disk formatting program as a bonus. Upgrades from any version are \$40.

Back-It 4 requires DOS 2.0 or a later version, 384K of RAM, and a mass storage device. —Melissa R. Riofrio

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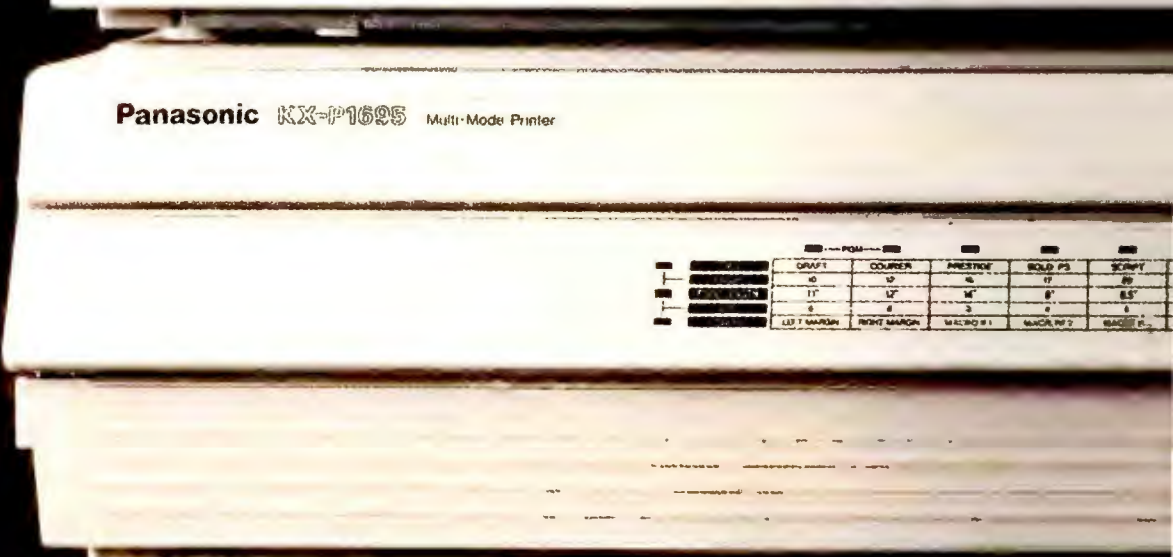
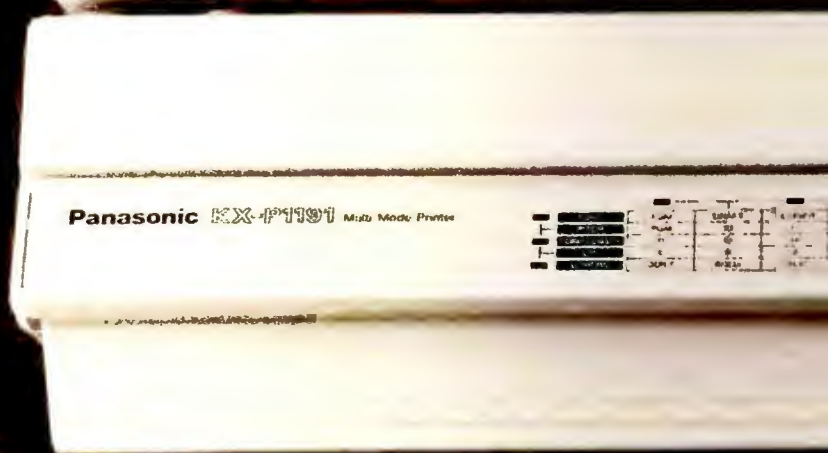
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Dauphin 3000SX

Colorful Computing on the Road

At \$9995, it isn't cheap, but Dauphin Technology's 3000SX makes a movable feast of color VGA graphics, thanks to some tasty active-matrix display technology.

The thin-film panel on this pricey laptop is, in effect, a single 10-inch-diagonal semicon-

ductor. Its surface is etched with about a million transistors—three per pixel to mix just the right amounts of red, green, and blue for crisp, 640 by 480 color resolution. It's currently limited to the eight primary colors, but Dauphin says that new graphics drivers under development should soon enable each transistor to produce several different shades of the three primaries to yield 256 colors.

The power draw of this 20-MHz 386SX-based laptop makes it strictly a plug-in-and-play proposition. But at 16 pounds, it's light enough to move around if you want to give on-screen slide shows or show your engineering drawings to co-workers down the hall or across the country.

You won't lack storage space for those graphics-in-



The Dauphin 3000SX gives you portable VGA color, thanks to its active-matrix display technology, but you have to pay a hefty price.

IN BRIEF

One of the first implementations of active-matrix color displays, this laptop also packs the power and storage you need for portable graphics applications.

Dauphin Technology Inc.

1125 E. St. Charles Rd.
Lombard, IL 61048
800/782-7922,
708/627-7618 (fax)

Reader service no. 748

tensive applications, either. The Dauphin 3000SX packs a 19ms, 200MB hard drive and 2MB of memory, upgradable to 8MB on the system board. There's also a socket for a 387SX coprocessor, a half-length 8/16-bit slot for an add-on, such as a networking card,

and a fax/modem slot for Dauphin's upcoming 2400-bps fax/modem. You'll also find two serial ports and parallel, external floppy, and external display ports, as well as a 100-pin port for Dauphin's \$220 expansion bus, which holds one 8/16-bit card. —Mark Henricks

Infinity Desktop Computer

The Ultra-Small SX

Downsizing is the name of the game in 386SXs, and Falco's Infinity Desktop goes most SXs a few inches better—without giving up any of the necessities.

At 13.6 by 10 inches, the 16-MHz PC saves you more than 2 inches in width and almost 6 inches in depth over the 16-by-15.6-inch footprint of IBM's 55 SX. Its 2.75-inch profile is also more than an inch lower.

Each Infinity model comes with 1MB of RAM, expandable to 8MB on the motherboard, which also stocks a super-VGA (1024 by 768) controller, a 387SX math coprocessor socket, and one serial and two parallel ports. A floppy drive controller and an Integrated Drive Electronics (IDE) hard

drive connector are also on the motherboard, enabling you to add Falco hard drives of up to 200MB without using a slot.

The two 8/16-bit expansion slots for add-ons such as a fax board or modem seem a little

stingy; even IBM offers three, and most SX makers give you more. On the other hand, the Falco machine doesn't need an internal fan for cooling, so there's no annoying hum.

The Infinity Desktop



A high degree of integration on the motherboard makes the Infinity Desktop as much as 12 square inches smaller than other 386SX systems.

IN BRIEF

Nearly the smallest SX computer you'll find, the Infinity Desktop asks you to trade a little expandability for a lot more desk space.

Falco Data Products, Inc.

440 Potrero Ave.
Sunnyvale, CA
94086-4117
800/325-2648,
408/745-7860 (fax)

Reader service no. 754

comes in four models, ranging from a mere \$1170 for a diskless station to a still-reasonable \$2765 for a single-floppy system with a 100MB hard disk. Add another \$300 to \$700 depending on your choice of monitor, including a super-VGA at \$600 and a multiscan at \$685. —Susan Lusty

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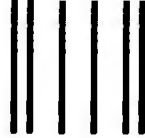
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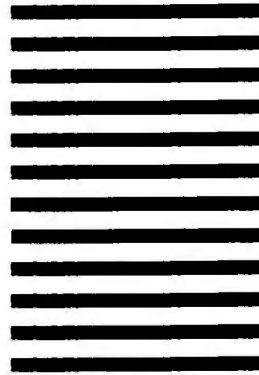
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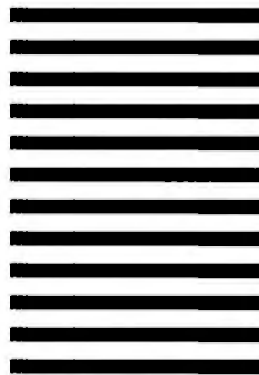
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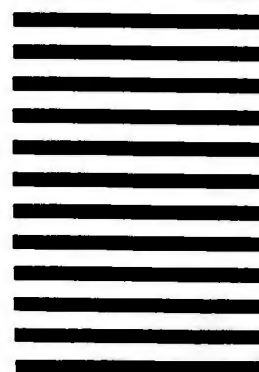
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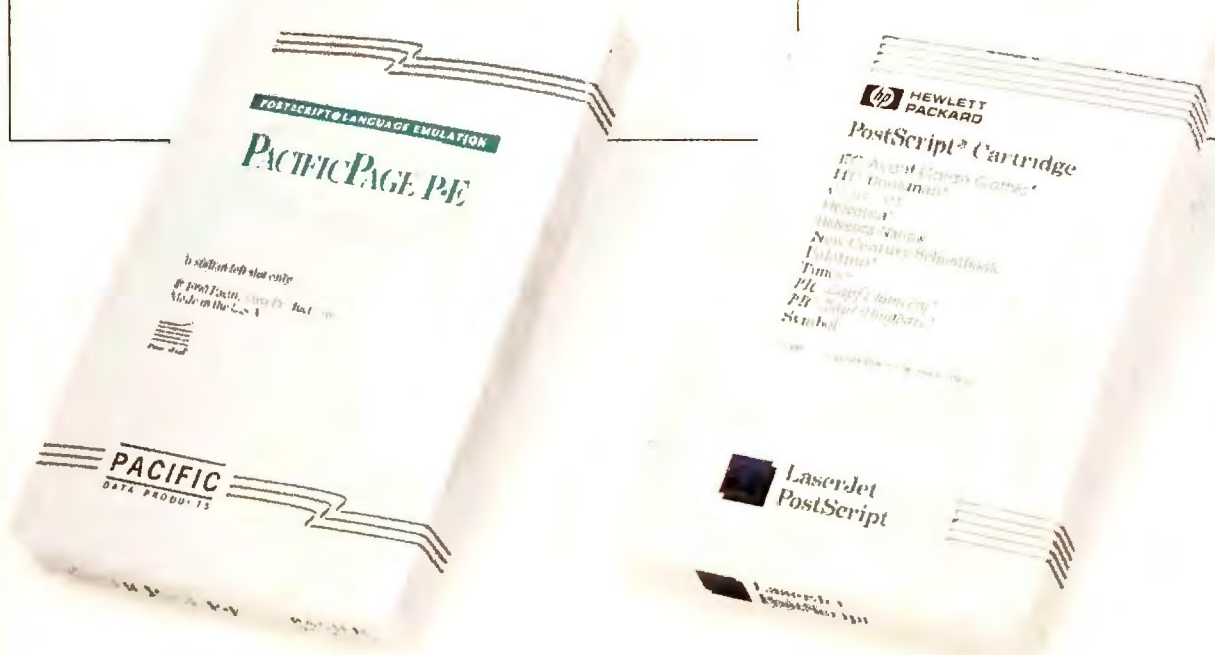
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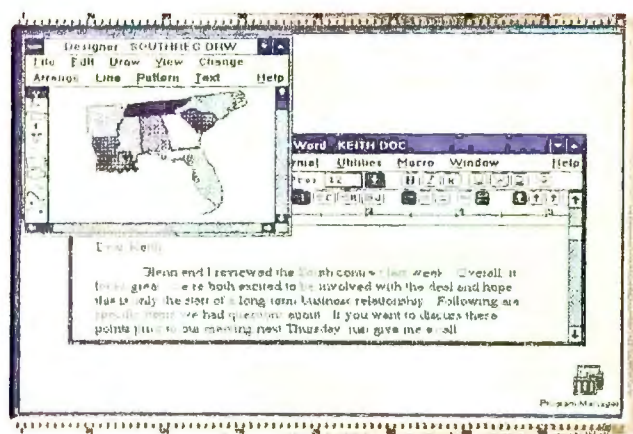
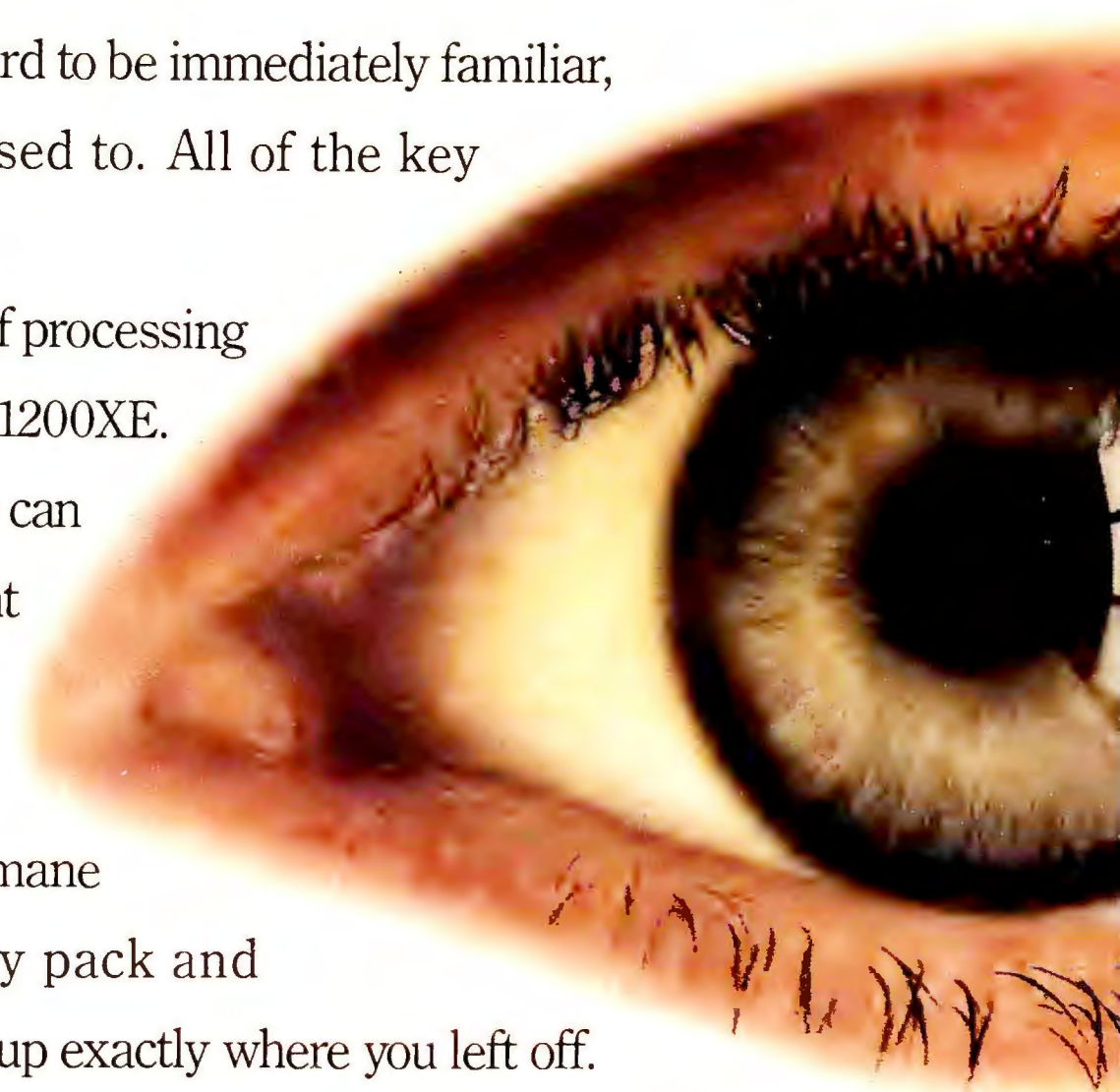
Next, you'll find the keyboard to be immediately familiar, since it's what you're already used to. All of the key spacing and sizes are standard.

You'll also discover plenty of processing power packed into the 286-based T1200XE. And the 20MB hard drive means you can keep all your programs and files right where you need them. With you.

Plus, you'll undoubtedly appreciate the T1200XE's other humane features like a slim line battery pack and AutoResume™, which lets you pick up exactly where you left off. No grand reopening of the system, program and file every time you want to start work again.

The only thing you'll notice we've skimped on is size and weight. After all, what good is a portable if you can't take it with you?

With notebooks like the T1200XE it should come as no surprise that Toshiba sells more portable PCs than any other company in the world. After all, you're not the only one who recognizes a good thing when they see it.



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In Touch with Tomorrow
TOSHIBA

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425TE, 433TE

Twin 486 EISA Towers Include Dell's First 33-MHz Server

Two 486 EISA towers are Dell's way of helping you gather your collection of office workers into a real work group. Both high-end servers come with clever design features: Expansion slots hold boards vertically, so heat rising from one board won't warm its busmates. The ports at the rear of the cards are conveniently located on the upper face of the tower along with system I/O ports—so you'll seldom need to get on your knees to hook or unhook cables to the server. And the

top-face bay for ports and connectors is covered by a sliding, coffeeproof cover.

A four-character LCD on the front panel displays status and error messages during boot-up and makes troubleshooting a lot easier. The power switch and reset button are also located on the front panel. Moreover, you won't need a screwdriver to get inside: All the parts snap on and off.

Both machines feature the high-capacity EISA bus, which should help reduce or eliminate network bottlenecks. Dell maintains that the machines have been tested and found 100 percent compatible with every EISA network board it could find.

The 425TE runs at 25 MHz and omits a memory cache, since tests showed no performance improvement. The 433TE runs at 33 MHz and includes a 128K cache that Dell says bumps up performance 7 percent. In most other respects the machines are twins: Both ship with 4MB of

RAM and provide 8 EISA slots and 11 drive bays (5 externally accessible) so you can pack in up to 64MB of RAM and 2GB of storage. Both also have a new ROM-based setup that includes several handy features, such as the ability to

disable floppy boot. Both include a "smart," heat-sensitive fan: The hotter the machine gets, the faster the fan runs.

The basic system configuration includes a 3½-inch floppy drive and an 80MB hard drive, as well as a monochrome VGA monitor. Prices are \$6749 for the 425TE and \$8949 for the 433TE.

—Michael Goodwin

IN BRIEF

Choose a fast or faster 486 network server from Dell and get a bundle of conveniences that make these towers easy to install and reconfigure.

Dell Computer Corp.
9505 Arboretum Blvd.
Austin, TX 78759-7299
800/426-5150
Reader service no. 746



Dell's 425TE (above) and 433TE EISA towers sport several clever design features that make them easier to install and configure, including a front-panel LCD that displays status and error messages during boot-up.

Dycam Model 1

A Digital Photo Finish for Your PC

Gray-scale scanners are fine for importing photographic images into your PC, but they won't take the picture for you. Now Dycam is offering a digital still camera that cuts out the middle scan. Half the cost of most 8-bit scanners, the Dycam Model 1 lets you take a picture of virtually anything and upload the image through your PC's serial port.

The \$995 Model 1 is about the size of an instant camera and just as handy. Point and shoot; moments later a 376-by-240-pixel image appears on

your screen in 256 levels of gray. You can slip the 7-by-3-by-1-inch shutter box into your pocket and take it on the road.

The Model 1 stores up to 32 images in memory for 24 to 48 hours on two AA nickel-cadmium batteries. To download images and/or recharge the batteries, simply snap the Model 1 back into its cradle and plug the cradle into your PC's serial port and any AC outlet.

Don't expect photographic controls; you can't manually adjust focus, shutter speed, or

the intensity of the built-in flash, and there's no numeric picture counter. Audible beeps warn you when you've taken a bad picture and count down the number of remaining exposures after 26—five beeps if five exposures remain.

Dycam's software is also bare-bones. You can view each picture under *Windows 3.0* or save it as a TIFF file, previewing all the images at once via a proof sheet-like display on your computer. But if you want to crop, resize, or retouch images, you'll need to buy a dark-room-style package such as Astral Development's *Picture Publisher*. Each photo takes 90K but can be compressed

IN BRIEF

This pocket-sized digital camera lets you store black-and-white photos in your PC at half the price of a scanner.

Dycam Inc.
9546 Topanga Canyon Blvd.
Chatsworth, CA 91311
818/998-8008,
818/998-7951 (fax)
Reader service no. 755

using off-the-shelf archival software.

Viewing requires DOS version 3.0 or a later version, *Windows 3.0*, 1MB of RAM, and a hard disk. —Daniel Tynan

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pads, and slips of paper that littered my desk are gone...I just put them into Agenda.'

—Grant Tipler, Manager, Corporate Banking, Head Office, The Royal Bank of Canada

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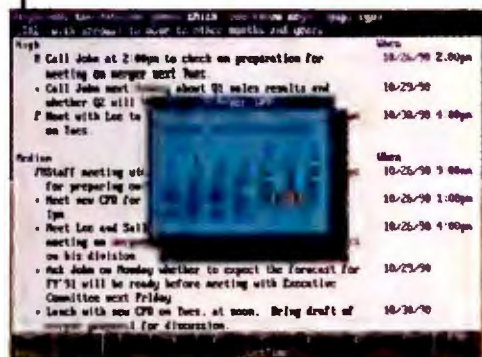
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GrandView 2.0

Information Manager Turns Outliner

You can view the once-trendy personal information manager (PIM) category in different ways: as the best hope for managing your work load, or as a catchall for the oddballs of the software world. Symantec would prefer that you take a *GrandView* and forget the package's earlier PIM label.

In version 2.0, Symantec reaffirms *GrandView*'s identity as a "text outliner," which is a better description of its structure. But the improvements amount to a passel of PIM-like tools—including column and calendar functions and a memory-resident option—to help you organize yourself and those around you.

As with version 1.0, you can use *GrandView* to simultaneously build documents and outlines by entering free-form text beneath headings and subheads, seeing only the detail you need. You can tackle simple project management, to-do lists, and schedules and track group projects.

GrandView 2.0 provides new, easier ways to sort and view your schedules or projects. For example, you can create up to 22 categories for each document and arrange them in spreadsheetlike columns (although you can display or

print only 3 at a time). 2.0's new calendar function makes it easy to juggle schedules and view or print lists of the people, tasks, or resources in a project by day, week, or month. But the package still lacks clock or alarm functions and an automatic way to schedule recurring events, such as weekly staff meetings.

Rudimentary file-locking and a handful of group-management features make *GrandView 2.0* good for networks. Link multiple outlines to one document on the network if, say, you want to hang individual to-do lists off a master work-group schedule.

GrandView 2.0 gains power as a desktop presentation tool with hooks to *Harvard Graphics* and *Freelance Plus*, letting you instantly turn out-

Outline	Person	Date
1. NEW PRODUCT SCHEDULE		
A. PRODUCT DEVELOPMENT		
1. Prototype complete	John, David	9/6/98
2. Final engineering release	John	9/28/98
3. Final QA	David	9/28/98
4. Release to Manufacturing	John	9/4/98
B. PACKAGING		
1. Package Design Complete	Cathy, Jack	8/21/98
2. Photo shoot	Cathy, Jack	9/3/98
3. Mock-up created	Jack	8/28/98
4. Mechanical Produced	Jack	9/28/98
5. Deliver to printer	Cathy	9/28/98
6. Initial order delivered to manufacturing.	Cathy	10/5/98
C. MARKETING		
1. Start work on ad campaign	Ed, David, Cathy	6/15/98
2. Ad design final	Ed	9/13/98
3. First ad appears	Ed	9/28/98
4. Develop Pricing Structure	David	6/15/98

Version 2.0 of *GrandView*, Symantec's text outliner, includes a bundle of PIM-like tools to help organize individuals and work groups.

lines into a series of bulleted text charts. *GrandView* exchanges files directly with *WordPerfect*, but the new page previews, style sheets, and support for PostScript printers let you produce good-looking output without ever having to open your word processor.

GrandView 2.0 retails for \$295; upgrades from earlier versions are \$50.

GrandView 2.0 requires 320K and DOS 2.0 or a later version; a hard disk or expanded memory is required for the TSR option. —Daniel Tynan

Force 386/33, Force 386X

Jumped-Up 386s

As top-of-the-line 386 machines get cheaper, 20-MHz and 25-MHz 386 models are getting squeezed out. Budget PC maven Packard Bell is dropping its 25-MHz offering from the lineup in favor of the Force 386X and Force 386/33.

Either way you jump, you get the usual Packard Bell bare-bones price with plenty of features on those bones. Configured as a decent *Windows* machine, the entry-level Force 386X comes with 2MB of memory (expandable to 8MB on the motherboard and 16MB overall) and a fast 124MB hard drive. You'll also find both 3½-inch and 5¼-inch floppies in this 16-inch-square, 16-MHz SX (which replaces a slightly larger SX model).

The drive controllers are on

the motherboard, but you'll need to use one of its three 8/16-bit slots for an extended VGA card. The Force 386X lists for \$4298 with a color monitor, but expect to find it at your local computer retailer for around \$2200.

If you worry that service will go the way of those extra margin dollars, Packard Bell has bumped up its previous four-month, on-site service promise to a full year. DOS 4.01, *GW BASIC*, the *Lotus-Works* integrated productivity package, and a \$49 Prodigy software start-up kit are bundled in for free.

Step up to the Force 386/33, and you get the same software, repair policy, two floppies, and hard drive, plus 4MB of one-wait-state memory backed by a 35ns, 64K memory cache and eight expansion slots. You can add 4MB more to the motherboard, and each of the two 32-

IN BRIEF

These cut-rate 386 and 386SX PCs give you the same big bundle of features at any speed.

Packard Bell Electronics

9425 Canoga Ave.
Chatsworth, CA 91311
818/773-4400

Reader service no. 692

IN BRIEF

This outliner/personal information manager adds a calendar, hooks to graphic programs, and other tools that aid both individuals and the work group.

Symantec Corp.

10201 Torre Ave.
Cupertino, CA
95014-2132
800/441-7234, 800/
626-8847 California

Reader service no. 752

bit slots can hold a memory card with up to 16MB. Two of its five 8/16-bit slots are filled by an extended VGA card and a drive controller that will support two floppy and two hard drives.

With a color monitor, the list price on this configuration is \$7387, but you can probably find the 386/33 at your local retailer for around \$4000. —Mark Henricks

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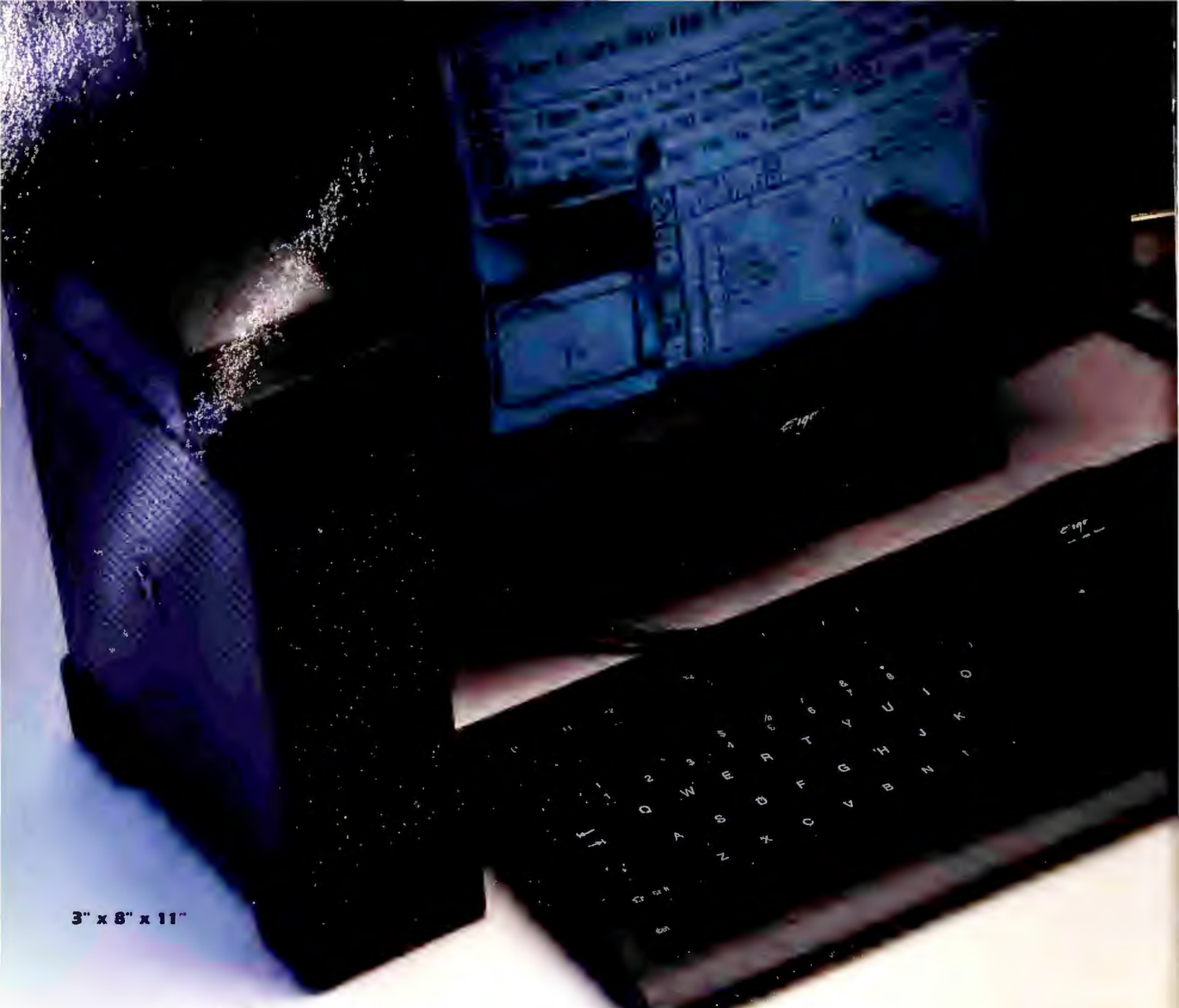
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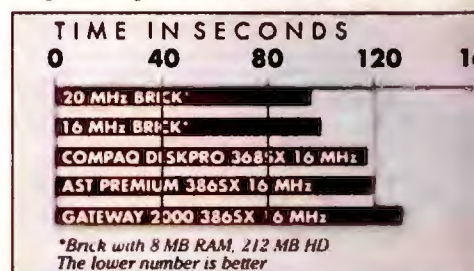
The Brick is powerful enough for the most demanding applications, while its elegance, quietness and size make traditional PC's seem downright obtrusive by comparison.

More Practical Than a Portable

For multisite computing, the Brick offers an alternative to the usual trade-offs of laptops or multiple PC's. Just keep your preferred keyboard and full size monitor, plus power supply at your regular destinations and carry only the 8 lb. Brick in between. You'll save half the cost, half the weight and all the hassle of coordinating files between multiple machines.

Blazingly Fast

Compared to published reports of all 386SX machines tested to date by *PC Magazine* and *Byte*, the Brick offers superior performance on the



Time to complete *PC Magazine* full benchmark test set.

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Consistently outperforms both Compaq's and IBM's 386SX on the PC Labs computer benchmark tests...Ergo's Brick maintains the functionality of a Desktop PC within a small form factor"

— PC MAGAZINE, Sept. 1990



Fits in half a briefcase, leaving room for full-sized folders, notebooks, etc.

aggregate of system, video and hard disk benchmarks.

Massive Hard Disk

Bricks are available with 16 or 20 MHz 386SX, 1-8 MB of RAM, a fast 44, 104 or 212 MB Conner or Teac IDE hard disk, and a 387 coprocessor socket. A 2,400 bps Hayes compatible modem is standard.

The fast VGA graphics feature up to 1024 x 768 non interlaced resolution with a full 1 MB of video memory. In fact, the Brick's video performance is twice as fast as the average of 42 386SX systems tested by *PC Magazine!* This makes an enormous difference in the perceived "response" of the system, especially if you're running graphically intensive applications like Windows or Desktop Publishing.

Surprisingly Expandable

The Brick is only about the size of a ream of copier paper, yet you can still add up to two ISA half cards internally, (one card with a floppy drive). A docking port allows easy, drop-in connection to our Docking Terminal, (\$249, available Q1 1991) which instantly hooks up all cables and provides another 16-bit 3/4 length slot. The "stretch" version of the Brick accommodates full length cards.



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Circle 64 on reader service card

Personal Color Scanner, UC300

Low-Cost Scanners Take You Beyond Black and White



Howtek's Personal Color Scanner and UMAX's UC300 can capture up to 256 gray shades or 16 million colors per image, and both offer incrementally adjustable resolutions of up to 300 dots per inch.

Desktop publishing on the PC has traditionally been a black-and-white affair. That's no surprise: Scanning, storing, and printing high-quality color images is expensive. Now affordable color scanners from Howtek and UMAX Technologies help solve the input part of the color conundrum.

Howtek's Personal Color Scanner and UMAX's UC300 can capture up to 256 gray shades or 16 million colors per image, letting you grab color as well as black-and-white images. You must still shell out for storage space—30MB for a single full-page color image. As for output, you may want to wait for 300-dpi color printers

to become more affordable.

At \$1995, the Personal Color Scanner is the cheapest color/gray-scale unit yet. It comes with Howtek's *Scan-It* software, which provides basic image-manipulation func-

tions: cropping, resizing, and adjusting color range and intensity.

Like Epson's ES300C color/gray-scale scanner, the UMAX UC300 costs \$2495 and comes with *Picture Pub-*

lisher Plus, the color version of Astral Development's sophisticated darkroom package.

Both flatbed scanners offer incrementally adjustable resolutions up to 300 dpi and feature line-art and halftone scan modes as well as gray scale and color. Maximum image size is 8½ by 14 inches. Both feature proprietary three-pass scanning engines, but neither emulates other popular gray-scale scanners, not even the HP ScanJet Plus.

Howtek's *Scan-It* requires DOS 3.0 or a later version and 512K of RAM for a 640 by 480 video adapter, 2.5MB of RAM for a 1024 by 768 adapter. UMAX's *Picture Publisher Plus* requires Windows 2.1 or 3.0 and 640K. —Daniel Tynan

Little Big LAN, The \$25 Network

Bargain-Basement LANs Big and Small

Want to connect PCs for peanuts? Information Modes proffers two products, both at breakthrough prices: *Little Big LAN*, a peer-to-peer network operating system like *LANTastic* or *LANsmart*; and *The \$25 Network*, which lets a few PCs share files and printers over serial cables.

Little Big LAN covers the whole range of standard peer-to-peer networking features. Users can share drives, printers, applications, and data files and run multiuser LAN applications. A simple pop-up messaging program is included, or you can run electronic mail programs like *cc:Mail* or *DaVinci* instead. *Little Big LAN* will link as many as 254 workstations over common Ethernet or Arcnet systems, or about 10 PCs using serial or parallel cables, or even modems. In marked contrast to major peer-to-peer LANs like *LANTastic* and *TOPS*, which

require you to buy a separate copy of the operating system for each PC, one copy of *Little Big LAN* per network is all you need.

The \$25 Network is a simpler product that links PCs via serial cables only. Its features are similar to *Little Big LAN*'s, but *The \$25 Network* doesn't support DOS file locking—which means trouble if two users try to edit the same file. While you can easily run a program stored on another user's PC, you may be better off storing it on your own disk, because applications that swap code in and out of memory via overlay files (like *WordPerfect* or *Quattro*) will run unacceptably slow. (Network boards are up to nine times faster than the fastest serial-port transfer.)

The \$25 Network has several advantages over its competitors. Unlike *LANTastic Z*, which connects only two PCs,

IN BRIEF

Little Big LAN is a full-featured peer-to-peer LAN, while *The \$25 Network* is a simple serial network. Either can be had for peanuts.

Information Modes

P.O. Drawer F
Denton, TX 76202
800/628-7992

Reader service no. 747

IN BRIEF

Howtek and UMAX scanners bring affordable color images into your PC, even if the cost of storing and printing them remains high.

Howtek Inc.

21 Park Ave.
Hudson, NH 03051
603/882-5200,
603/880-3843 (fax)

Reader service no. 749

UMAX Technologies

2352 Walsh Ave.
Santa Clara, CA 95051
800/562-0311,
408/982-0771,
408/982-0776 (fax)

Reader service no. 750

the program is limited only by the number of serial ports you can fit in a hub PC. And unlike Traveling Software's *Desk-Link*, it doesn't tie up your PC while someone else uses its files or printer.

Little Big LAN costs \$75 per LAN; *The \$25 Network* costs \$25 for the first LAN, \$12.50 for each additional LAN at the same location. All prices include unlimited telephone support. A null-modem serial cable for either program costs \$15 for the first 10 feet, 25 cents for each additional foot. —Robert Lauriston

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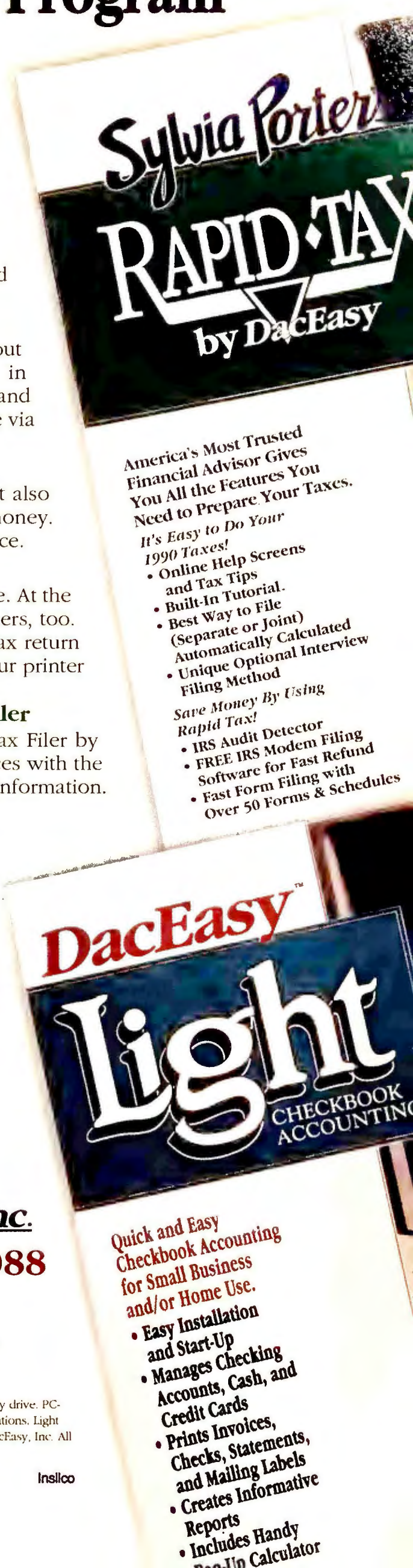
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Dallas, TX 75252

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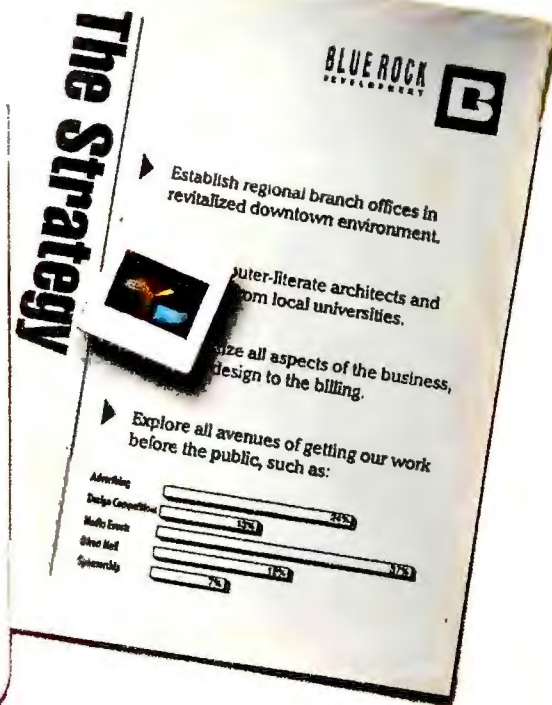
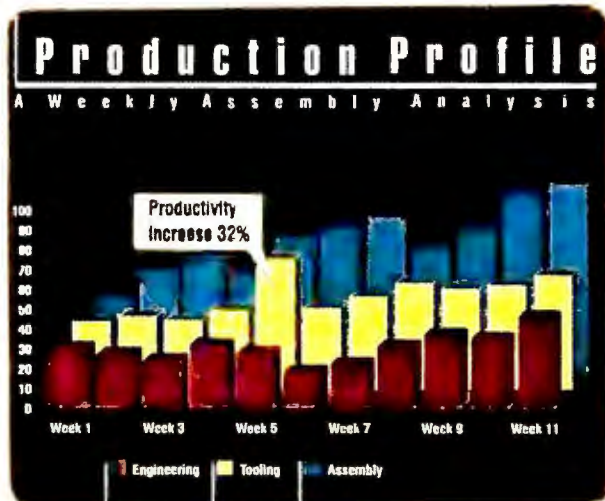
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INFOWORLD
JUNE 11, 1990

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PC MAGAZINE MARCH 13, 1990

PC/COMPUTING APRIL 1, 1990

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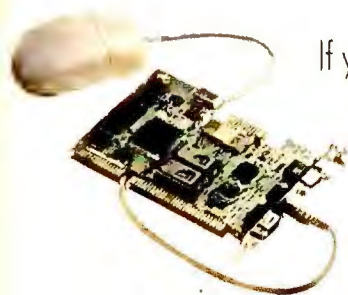
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Practical Peripheral's

IN BRIEF

Now that 9600-bps modem standards have settled down, you can boost throughput dramatically for not much more than you'd pay for a brand name 2400-bps modem.

Practical Peripherals

31245 La Baya Dr.
Westlake Village, CA
91362

800/442-4774,
818/706-2474 (fax)

Reader service no. 744

Intel Personal Computer Enhancement Operation

5200 N.E. Elam Young
Pkwy.
Mail Stop CO3-07
Hillsboro, OR 97124
800/538-3373

Reader service no. 745

PM9600SA V.32/V.42bis stands at the forefront of the conspicuously budget priced. It sells for a reasonable \$699, about \$500 less than its pay-for-the-name peers.

In addition to supporting V.32, the PM9600SA offers both MNP-5 and V.42bis error correction and data compression. That means you'll be able to swap error-checked, compressed files at any of the standard modem speeds, limited only by the capabilities of the modem on the other end. Configured properly, the modem can shuttle data at an effective throughput of 38,400 bps—but only with ideal file types under ideal circumstances.

Front-panel buttons let you switch on power and even get the modem to answer the phone. Among other things, status lights tell you the speed at which the modem is communicating with the PC's serial port and what error-correction mode—MNP or V.42bis—is in use. You control speaker volume using software, and the PM9600SA comes with a five-year warranty.

For a somewhat heftier



Practical Peripherals' PM9600 SA (above) and Intel PCEO's 9600EX are budget-priced 9600-bps modems with MNP-5 and V.42bis error correction and data compression for effective throughput of up to 38,400 bps.

price, Intel's V.32 modem, the 9600EX, has an equally impressive feature set and a five-year warranty. At \$799, you get the same V.42bis and MNP-5 support and the same top effective throughput of 38,400 bps. It too has front-panel indicator lights, including ones to signal use of error-correction and 9600 bps. How-

ever, the Intel's power switch and volume knob are in the back.

It comes with a copy of *Communications by Crosstalk*, a simplified version of DCA's *Crosstalk Mk. 4*, and like its rival is Hayes compatible, so it can speak to any 2400-bps modem. —Judy Heim

ImPort for Windows

Windows Graphics Bridge Is Created From DOS Presentation Packages

Got a library of *Harvard Graphics*, *Lotus Freelance*, or other DOS images you'd rather see in *Windows 3.0*? *ImPort for Windows* will translate a slew of graphics formats into the *Windows* Clipboard, from which they can be cut and pasted into *Micrografx's Designer*, *Aldus's PageMaker*, or other powerful *Windows* applications.

A *Windows*-capable ver-

sion of *Zenographics's* DOS-based graphics importer, *ImPort for Windows* supports *AutoShade* RND, *Harvard Graphics*, *Lotus Freelance*, *HPGL*, *PIC*, *SCODL*, *CGM*, and *AutoCAD's* *ADI*, *SLD*, and *DXF* formats. Unlike some of *Zenographics's* DOS translators, *ImPort for Windows* won't convert rasterized formats, which means it won't help you translate *TARGA* and

IN BRIEF

You can move a slew of DOS graphics formats into your *Windows* applications, bringing along fonts as well.

Zenographics

4 Executive Cir.
Irvine, CA 92714
714/851-6352,
714/851-1314 (fax)

Reader service no. 757

PCX files.

The \$195 *ImPort for Windows* is limited to *CGM* or *Windows Metafiles* output,

but these give you some appealing options. For example, you can use a *DXF* image in your *Corel Draw* slide show and then print to any *Windows* printer along the way. Another helpful feature, which the earlier *Metafile 3.0* lacked, is the ability to map fonts into your file formats. That *DXF* file-turned-slide can now have, for example, *Helvetica* bold titles.

ImPort for Windows requires 640K of memory and a hard drive; the program works with *Windows 2.xx* or *3.0*. —Mark Henricks

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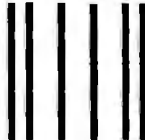
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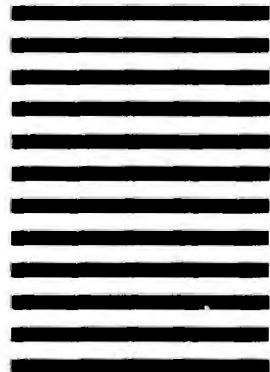
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Queen Victoria



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service than Her Majesty could ever imagine. Right from your personal computer.

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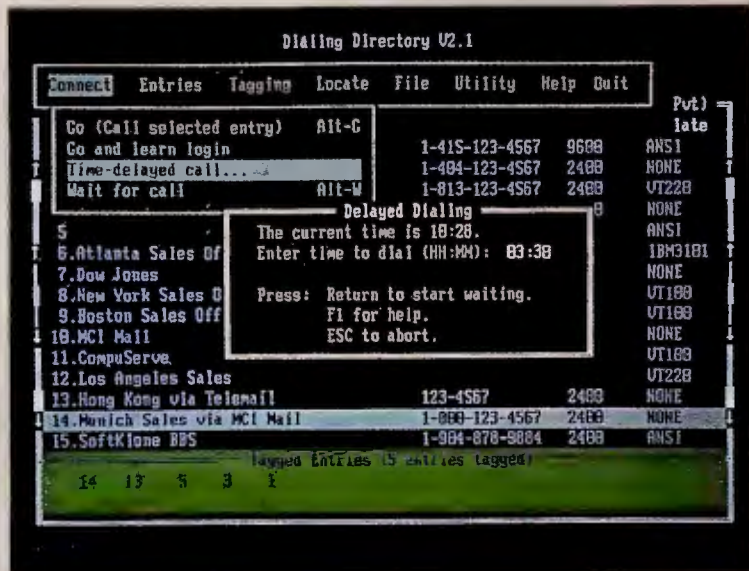
CompuServe®

Circle 33 on reader service card

UPDATE

New Versions of Your Favorite Products

Mirror III 2.0



Version 2.0 of Mirror III has a dialing directory interface.

In an effort to ease communication sessions and speed data transfer, SoftKlone has given version 2.0 of *Mirror III* a dialing directory interface with pull-down menus and mouse support, as well as support for more data transfer protocols. The \$149 communications program gains

support of ZMODEM, XMODEM, and an emulation of the MNP-5 error-correction/data-compression protocol. Upgrades are \$49. SoftKlone, 327 Office Plaza Dr. #100, Tallahassee, FL 32301; 800/634-8670, 904/877-9763 (fax).

Reader service no. 768

Ami 1.2

Version 1.2 of *Ami*, Samna's Windows word processor for the casual user, gains speed as well as compatibility with Windows 3.0. There's also a bundle of new features, led off by limited versions of the mail merge and macro recording found in *Ami Professional*. Other additions to 1.2 such as automatic footnoting, non-printing of notes, and an enhanced set of import/export filters are also the equivalents of features in *Ami Professional*. *Ami 1.2* retails for \$199; registered users of the previous version may upgrade for

\$49.95. The software requires a 286-based computer with DOS 3.0 or a later version, 640K of RAM, at least a Hercules or CGA graphics adapter, and a hard disk. Samna Corp., 5600 Glenridge Dr., Atlanta, GA 30342; 800/831-9679, 404/255-9460 (fax).

Reader service no. 763

BASIC Professional Development System 7.1

In an effort to bring it up to par with C development tools, Microsoft has enhanced the data base engine, debugger, and programming editor of its

BASIC Professional Development System. *BASIC PDS 7.1* gains version 3.1 of the popular CodeView debugger. Its Indexed Sequential Access Method data base engine has been enhanced to run faster than Novell's Btrieve tool or Fox Software's *FoxPro*, claims Microsoft. The \$495 version 7.1 requires either DOS 3.0 with a hard disk and 640K of RAM (EMS 4.0 memory is recommended as well) or OS/2 1.1. The upgrade from *BASIC PDS 7.0* is \$50, while upgrades from earlier versions cost \$195. Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 800/426-9400.

Reader service no. 764

Sylvia Porter's RapidTax

DacEasy RapidTax has been converted to *Sylvia Porter's RapidTax*, gaining both IRS instructions in simple English and tax tips from the popular financial columnist. The package includes a new interface with pulldown menus, electronic filing capability, and a function that will detect when an entry exceeds historical IRS guidelines and may trigger an audit. *Sylvia Porter's RapidTax* requires DOS 2.1 or a later version and 512K of RAM. It sells for \$79.95; state versions are an additional \$49.95. DacEasy, Inc., 17950 Preston Rd. #800, Dallas, TX 75252; 800/877-8088, 214/250-3752 (fax).

Reader service no. 766

Microsoft Word for Windows 1.1

Version 1.1 of *Microsoft's Word for Windows* incorporates the new 3-D look of *Windows 3.0* but, more important,

adds new file conversion and macro recording capabilities. *Word for Windows* gains color PCX and HPGL file filters. Moreover, it's now easier to read files from *Word for the Macintosh* and to export files to the character-based *Word 5.0*. Mail merge and paragraph-shading macros also have been added. Updates to the \$495 product are a mere \$7.50 for owners of version 1.0 and \$150 for users of character-based *Microsoft Word*. It requires a 286-based computer with 1MB of memory, a graphics card, a hard disk, and *Windows 2.11* or a later version. Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 800/426-9400.

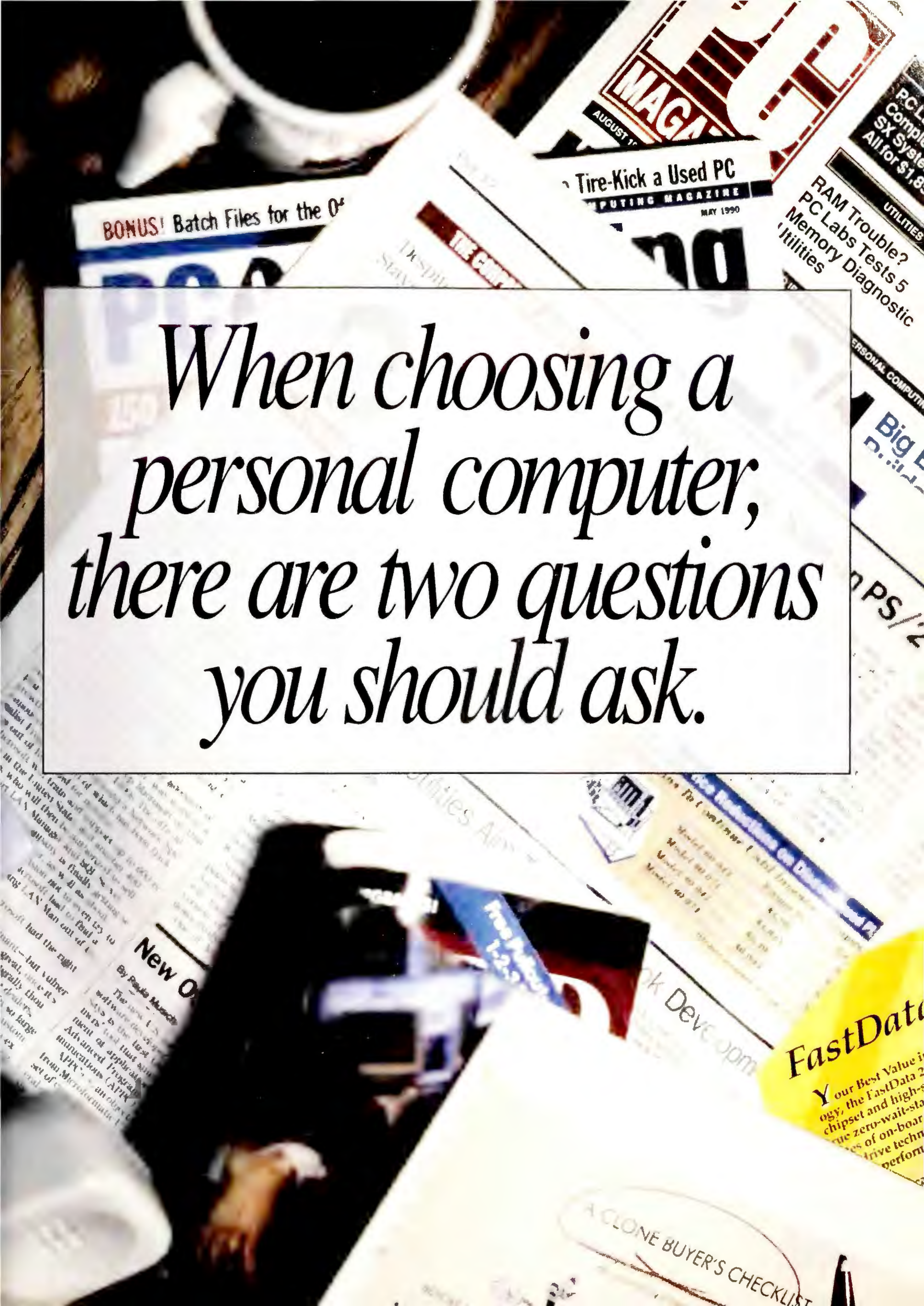
Reader service no. 765

Bernoulli Transportable, Portable, Dual

Iomega has increased the features and lowered the prices on its Bernoulli storage options and made each compatible across DOS, OS/2, and Macintosh platforms. The price of the 14-pound Bernoulli Transportable has been reduced to \$1399. The new Bernoulli Portable, whose 2½-hour nickel-cadmium battery adds another 2 pounds, costs \$1699. Both Portable and Transportable have the same new slim-line form factor and 22ms average access speed and share the same 44MB cassettes. Iomega Corp., 1821 W. 4000 S, Roy, Utah, 84067; 800/456-5522.

Reader service no. 767

For more information about any product, contact the manufacturer or circle the number on the reader service card. ●

The background is a collage of various items related to personal computing. At the top left, there's a white coffee cup. Below it, a magazine cover for 'COMPUTING MAGAZINE' is visible, dated 'AUGUST 1990'. To the right, another magazine cover features the text 'Tire-Kick a Used PC' and 'MAY 1990'. Further right, a section titled 'PC Labs' lists 'RAM Trouble?', 'PC Tests 5', and 'Memory Diagnostic Utilities'. Below this, another section mentions 'PERSONAL COMPUTING' and 'Big B...'. In the bottom right, a yellow banner for 'FastData' is partially visible, with the text 'Your Best Value is...'. At the bottom center, a person's hand is seen holding a black object, possibly a computer case or a bag. The overall theme is personal computing and technology.

*When choosing a
personal computer,
there are two questions
you should ask.*

Why FastData?

A personal computer is a large investment; before you choose, we want you to know what to expect when you purchase a FastData personal computer from FastMicro.

Superior Design.

You get more out of your FastData personal computer because we put more into it. We've been building PC's longer than most of the competition and we put that experience to work for you. We use proven designs that pass our stringent performance requirements and compatibility standards so it will be sure to pass yours.

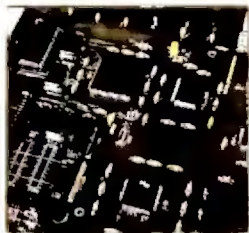


Better Components.

The whole is only as good as the sum of its parts; and FastData systems use some of the best parts in the industry. For example, each FastData system ships with a Keytronics keyboard; Keytronics costs a lot more than others, but the quality is worth it.



Our systems use exclusively Toshiba floppy drives, the industry leader. Standard equipment includes other quality components from Western Digital, Phoenix, Chips & Technologies, just to name a few.



Full Support.

Our team is standing by and ready to make your FastData computer perform to its greatest potential for you. When you buy a FastData computer, you're covered by Toll-Free technical support for life. And since we sell more software than other computer companies, we are uniquely qualified to give the proper support the customer deserves.



Service.

All FastData personal computers come with a full one year warranty, but that's just the start. In the unlikely event your computer is down, it is our goal to get back up and working as quickly as possible - and we back it up with action. Call us toll-free and we'll work with you to determine the problem; if a part breaks, we will send you the replacement part through our FastSHIP program - before the broken part is returned to us - and we'll pay the freight both ways. If our phone support or FastSHIP program can't solve your problem, we will service it on-site to most U.S. locations or replace your computer at no charge. Now that's service.



Selection.

Our face to face retail background has made us never forget that the customer comes first and that a personal computer is just part of a customer's overall needs. That's why FastMicro offers thousands of hardware and software products to enhance your new personal computer. In fact, our competition will probably tell you to call us when you need something to run on their personal computer.



Risk Free.

We pass the test for the choosiest of customers; in fact, FastMicro sells to over half of the Fortune 500 and Universities in 47 states (we're working on the rest). These people buy for a living and rely on us, you can too. You can do more than take our word on it - go ahead and purchase any FastData brand product from FastMicro and if you are not thoroughly satisfied after 30 days, you can return it for a full refund of the purchase price.



Circle 100 on reader service card

Which FastData?



\$1599 FastData 386/SX

Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and want to rip through their favorite programs, like Lotus and WordPerfect at blinding speeds. This machine is ideal to run the latest memory demanding and graphic software, right out of the box. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit color VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel 80386-SX processor. (20mhz optional)
- ✓ 2 megabytes of zero wait-state RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive. (Second drive add \$79)
- ✓ Standard chassis with keylock, speed and reset buttons. (Optional chassis add \$50)
- ✓ Five available drive bays.
- ✓ 200 watt power supply
- ✓ 14" VGA color monitor with 16 bit VGA card with 256K.
- ✓ Clock calendar, parallel port, and two serial ports. (Game port included on color systems)
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 available.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Phoenix BIOS.
- ✓ Compatible with DOS, OS/2, Windows, Xenix and Novell.
- ✓ FCC Class B approved.

System Price	40mb	65mb	80mb	100mb
Monochrome	\$1,269	\$1,369	\$1,519	\$1,619
VGA Color	\$1,599	\$1,699	\$1,849	\$1,949
VGA 1024	\$1,749	\$1,849	\$1,999	\$2,099



FastData 386/25 \$2299

The optimum combination of features, expandability, and power make the FastData 386/25 an ideal choice for those whose applications demand the most from a computer. Whether running as a network fileserver, CAD or graphics station, or power-user's workhorse, the FastData 386/25 handily meets the challenge. It comes configured with a whopping four megabytes of fast RAM, a superfast 22 millisecond 65 megabyte hard disk, and maximum VGA displaying 1024 by 768 resolution powered by a high-output 16 bit 512K VGA board. Plus, the FastMicro team will configure your FastData 386 exactly the way you want, without sending you shopping elsewhere. When evaluating 386-DX workstations, why even consider anything else?

Standard Features

- ✓ 25mhz Intel 80386-DX processor. (33mhz optional)
- ✓ 4 megabytes of zero wait-state RAM.
- ✓ 65 mb 22ms RLL hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive. (Second drive add \$79)
- ✓ Standard chassis with keylock, speed and reset buttons.
- ✓ Five available drive bays.
- ✓ 80387-DX coprocessor socket.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, and two serial ports. (Game port included on color systems)
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 available.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Phoenix BIOS.
- ✓ Compatible with DOS, OS/2, Windows, Xenix and Novell.
- ✓ FCC Class B approved.

System Price	65mb	80mb	100mb	200mb
Monochrome	\$1,819	\$1,969	\$2,069	\$2,469
VGA Color	\$2,149	\$2,299	\$2,399	\$2,799
VGA 1024	\$2,299	\$2,449	\$2,549	\$2,949

FASTMICRO

For information or to order call:

1-800-441-FAST

Hardware

PRINTERS

ALPS Allegro 500	309
Citizen	
200GX	189
GSX140	285

Citizen GSX140

Loaded with features, this 24 pin printer is a hot seller! It comes with 6 resident fonts, paper parking, and Epson & IBM printing modes. It does up to 192 CPS and has a unique LCD control panel that lets you set everything without DIP switches. Upgrade to color anytime for just \$39.

\$285



Diconix 150 Plus	329
Fujitsu	
DL3400	419
NEC	
P2200XE	259
P6200	479
P6300	639
LC290	2495

Okidata	
182 Turbo	225
320 (IBM)	335
390 (IBM)	469
393 (IBM)	999

Panasonic	
KXP1180	175
KXP1191	239
KXP1124	299
KXP1624	429
KXP4420 Laser	995
KXP4450/4455 Lasers	Call

Seiko Smart Label Printer	179
Star	
NX1000-II	167
NX2410	279
XB2410 / 2415	429 / 569
Texas Instruments Microlaser PS	1839

MONITORS

Mitsubishi	
1410 EGA	325
Diamond Scan 1381	479
NEC	
Multisync 2a	469
Multisync GS 2a	205
Multisync 3d	629
Multisync 4d	1095

Panasonic	
C1381 VGA 1024x768 new!	439



Panasonic Super VGA

\$439 The Panasonic C1381 will do VGA up to 1024x768 interlaced resolution. It has a dot pitch of .28 and is compatible with all standard VGA cards. Includes swivel base and VGA cable.

Princeton	
Max15	237
Ultrasync 12"	479
Ultrasync 14" (now 1024x768)	509
Ultra 16	835
Samsung	Call
Seiko	
CM1440	519
CM1450	659
Sony 1304 Multiscan	669
Zenith 1492	Call

BOARDS

ATI	
2400 ETC Internal	147
2400 ETC External	187
VGA Wonder 256	209
VGA Wonder 512	239
Brown Wagh Sound Blaster	157

Everex	
1200B Int Modem	55
2400B Int Modem	105
EGA 480 Card	79
RAM3000 16 bit RAM card	75
RAM8000 16 bit RAM card	169
Hercules Graphic Card +	169
Intel	
8087-2	115
287XL New!	209
387-DX20	369
387-SX16	319
Logitech ScanMan Plus	165



ScanMan Plus by Logitech \$165

The perfect companion to popular desktop publishing software, the ScanMan Plus comes with PaintShow Plus editing software. It scans from 100 to 400 DPI and up to four inches wide. Add just \$139, and CatchWord OCR software will let your ScanMan actually read text!

Orchid	
ProDesigner	229
ProDesigner II 512/1mb	299/349
Tiny Turbo 286	207
Tiny Turbo Xtra	267

Paradise	
Basic VGA - 8 bit	109
VGA 1024 256K	175
VGA 1024 512K	229

Paradise VGA 1024 \$175

The 16-bit VGA 1024 comes standard with 256K and is expandable to 512K & will do up to 256 colors. It does up to 1024x768 interlaced, is compatible with EGA & CGA software, & comes with drivers for most major software. Free Indiana Jones 256 color game included (while supplies last).



Practical Peripherals	
1200B Int Modem	59
2400B Int Modem	125
2400B Int with MNP	169

Prometheus	
Promodem 1200B Internal	48
Promodem 2400B Internal	98
Promodem 2400B Mini-Pocket	119
Promodem 2400G External	149

The Complete PC	
Answering Machine	239
Fax 4800	229
Hand Scanner 400	139

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Lancard/E Star 8 (Ethernet)	139
Lancard/E AT (16 bit Ethernet)	249

USRobotics	
2400 Baud Internal	119
2400 Baud External	149
Courier HST 14,400 Ext.	579
Courier HST 14,400 Int.	539

BOARDS, continued

Video 7	
VGA 1024i 256K	209
VGA 1024i 512K	237
Vega VGA	149
V-RAM VGA 512K	355
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WD1006V-MM2 MFM AT 1:1	99
WD1006V-SR2 RLL AT 1:1	129
WE1007V-SE2 ESDI AT 1:1	199

FastData Products

FastData 16 Bit VGA

The FastData 16 bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768. Its expandable to 512K and comes with a 30 day money-back guarantee.

\$99

256K Vers.

\$129

512K Vers.



FastData CGA Card	35
FastData MGP Card	35

FastData 2400 Baud Internal Modem

\$69 The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with BitCom software.



Parallel/Dual Serial/Game Card	35
XT 1.44 Dual Floppy Controller	35

FastData Monitors

Your best value, we have a complete line made for us by leading manufacturers like Samsung & Hyundai. Like all FastData products, you have a full 30 day money back guarantee. Shown is the VGA Color for \$319.



FastData Monitors

12" Amber Monochrome	79
14" Amber Monochrome	119
14" White Monochrome	119
14" White VGA Monochrome	129
14" CGA Color .52 dot pitch	199
14" VGA Color .31 dot pitch	319
14" Super VGA 1024 x 768i .28 dp.	399

DISK DRIVES

Colorado 40-120mb Int. Tape	249
Conner	Call
Mitsubishi	
60MB AT RLL MR535	269



Mitsubishi 65mb AT Kit

\$349 RLL encoding, 1:1 controller, and 22ms access time make this a very fast performer. The perfect upgrade for your 286 or 386 compatible, this kit comes with everything you need including controller and cables.

Seagate	
20MB XT Kit #225	239
30MB XT Kit #238	249
40MB AT #251-1	299

Toshiba	
360K Floppy	69
720K 3.5" Floppy	69
1.2MB 5.25" Floppy	79
1.44MB 3.5" Floppy	79

Toshiba 1.44mb Floppy Drive \$79

Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5" disks. Rails, add \$5.



POWER PROTECTION

American Power Conversion	
200DL UPS - XT Size	147
450AT UPS - 386 Size	317
Curtis	
Command Center	85
Ruby Plus	59
Datashield	
CPS-60 - 6 outlet surge	19
S-85 - 6 outlet surge EMI/RFI protection	49
S-100 - adds modem protection	57



FastData 286/12 \$899

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Keytronics keyboard. And since its a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drives
- ✓ Standard chassis (shown with optional chassis - \$50)
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Phoenix BIOS.
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, and two serial ports.
- ✓ Keytronics enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ Full documentation.
- ✓ FCC Class B approved.

System Price	40mb	65mb	80mb	100mb
Monochrome	\$899	\$999	\$1,149	\$1,249
VGA Color	\$1,229	\$1,329	\$1,479	\$1,579
VGA 1024	\$1,379	\$1,479	\$1,629	\$1,729

Software

DATABASE

Clarion Personal Developer	45
Clarion Professional Developer	Call
Clipper 5.0	459
DataEase	459
dBase III+	419



FoxPro \$417

The fastest, most powerful, Dbase language relational database available today. Includes windowing, desk accessories, memo fields, and report writer. The trace window lets you watch while FoxPro debugs your programs. Add a mouse and you can run it with point and click ease.

dBase IV	479
dBXL Diamond	129
Foxbase Plus	177
FoxPro	417
Paradox	419
Q & A	214
RapidFile	99
Rbase for DOS	447
Reflex	159

DESKTOP PUBLISHING & GRAPHICS

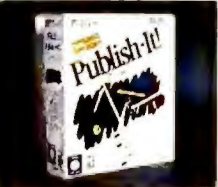
Autosketch	83
Corel Draw	309

Corel Draw \$309

Winner of all the top awards, Corel Draw gives you more for your money. It supports the new Windows & includes incredible drawing and editing tools. Includes over 100 typefaces and 300 pieces of clipart. CorelTrace converts scanned art to smooth vector images in seconds. This is the most complete illustration package we've ever seen!



DrawPerfect	265
Freelance Plus	307
GEM Desktop Pub.	159
Generic Cadd Level 2 Starter Kit	109
Generic Cadd Level 3	199
Harvard Graphics	275
Pagemaker	479
PC Paintbrush IV Plus	109
Perspective Jr.	69
PFS:First Publisher	89
Publisher's Paintbrush	149



Publish It! \$104

The top-rated, entry-level desktop publishing software runs well even on an XT. Includes the GEM/3 user interface with easy pull down menus and multiple size page views. Supports most popular printers and has a variety of built-in fonts and sizes.

Publish It!	104
Ventura Publisher Gold	519

FINANCIAL

Bedford Integrated Acct.	145
DAC Accounting 4.0	79
DAC Bonus Pack 4.0	157
Dollars & Sense	Call
Managing Your Money	113

Peachtree Complete III \$139

A super value! Includes General Ledger, Accts. Payable, Accts. Receivable/Invoicing, Purchase Order, Payroll, Inventory, Job Cost, Fixed Assets and more. Loaded with over 450 reports, automatic backup and helpful manuals.



Peachtree Complete III	139
Peachtree with Data Query	209
Quicken	35

INTEGRATED

First Choice	105
SmartWare II	Call
Windows 3.0	89
Works	89

MICE

Keytronics Professional	59
Logitech HiRes C9 Serial	65



Logitech C9 Serial Mouse

\$65 Our best-selling mouse is top rated also. Comes with software to adjust the resolution just the way you want it and includes driver software and Pop-Up-Dos to make your computer hum at your fingertips. For PaintShow, add \$15.

Logitech HiRes C9 Bus	76
Logitech Trackman Serial	75
Microsoft Serial or Bus w/ paint	95
Microsoft with Windows 3.0	147
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Turbo Pascal	90
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SPREADSHEETS

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Lucid 3-D	53
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Lotus 1-2-3 Version 2.2 \$325

The standard for spreadsheets, Lotus 1-2-3 version 2.2 is faster and more powerful than previous versions that made it famous. Includes add-in manager and more functions for greater flexibility. Also comes with Allways for great presentations made easy.

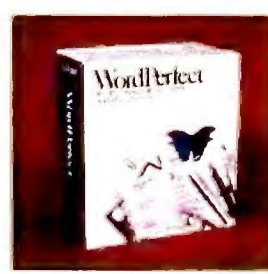


WORD PROCESSORS

GEM First Word Plus	52
Grammatik IV	49
Multimate 4.0	267
Professional Write	149
Rightwriter	45
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Word for Windows	309

WordPerfect 5.1

What can we say? WordPerfect is the #1 rated word processor and the top selling software in the U.S.A. Its got almost every feature imaginable and yet it is easy to use. The current version adds pull-down menus, mouse support, table creation and equation editor. Add this to the best software support in the business and you can't go wrong!



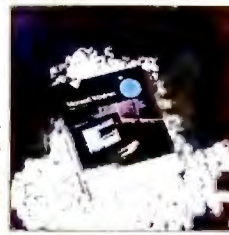
Word Perfect 5.1	239
Word Perfect Add'l Station	153
Word Perfect Library	67
WordStar Professional	Call

WINDOWS SOFTWARE

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Adobe Type Manager (UT)	59
Ami (WP)	115
Ami Professional (WP)	287
Asymetrix Toolbook	279
Corel Draw (GR)	309
DBfast/Windows (DB)	239
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FormTool Gold

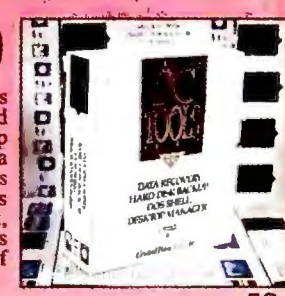
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HARDWARE

for a Windows World

THE RIGHT HARDWARE CAN MAKE WINDOWS SIZZLE. IN OUR FOURTH ANNUAL HARDWARE SPECIAL ISSUE, YOU'LL FIND HUNDREDS OF PRINTERS, SYSTEMS, AND DISPLAYS PERFECT FOR TODAY'S HOTTEST ENVIRONMENT.

We admit it: We're a little *Windows*-happy—so much so that we've taken this Hardware Special Issue and turned it on its head. Instead of looking at hardware in the usual way, we've rounded up hundreds of systems, printers, and displays and evaluated them with *Windows* in mind.

Why are we so wild about *Windows*? Well, it's not just us; the response to our *Windows 3.0* coverage has been phenomenal. The word is out: *Windows 3.0*'s improved interface, memory handling, and ability to multitask DOS applications make it fast and friendly enough to earn a place on almost any business PC.

Of course, you're not obligated to run *Windows* on any of the hardware examined here—we're just betting that you'll want to someday. There's hardware here for all types of users, from the entry level to the performance hungry.

GETTING IN THE DOOR

The cold, hardware fact is this: You need a 386SX, a 386, or a 486 system to reap the full benefit of *Windows 3.0*. These machines enable you to run the environment in its enhanced mode, which offers three key features: access to as much as 16MB of physical memory, multitasking for both DOS and *Windows* applications, and a virtual memory routine that swaps data to disk if memory runs short. Without those capabilities, you face the same

memory and performance restrictions that hurt earlier *Windows* versions.

The cheapest ticket to enhanced mode is an SX machine. Assistant Editor Susan Lusty compiled a Buyers' Guide of 85 16-MHz SX systems, each priced in a configuration specially suited to *Windows*. Loaded with a respectable 4MB of RAM, a good-sized hard disk (80MB to 110MB), and a VGA display, the machines range from over \$6000 to a mouth-watering \$1695.

For those with more to spend, we present the optimum *Windows* workstation. In a review of five small-footprint, 25-MHz 386 systems, Contributing Editor Scott Spanbauer assumes you want speed in a box that won't hog your desktop. High prices in this new category prevented us from awarding a Best Buy, but for those who savor Compaq reliability and support, the 386/25e is worth the expense.

A BETTER VIEW OF WINDOWS

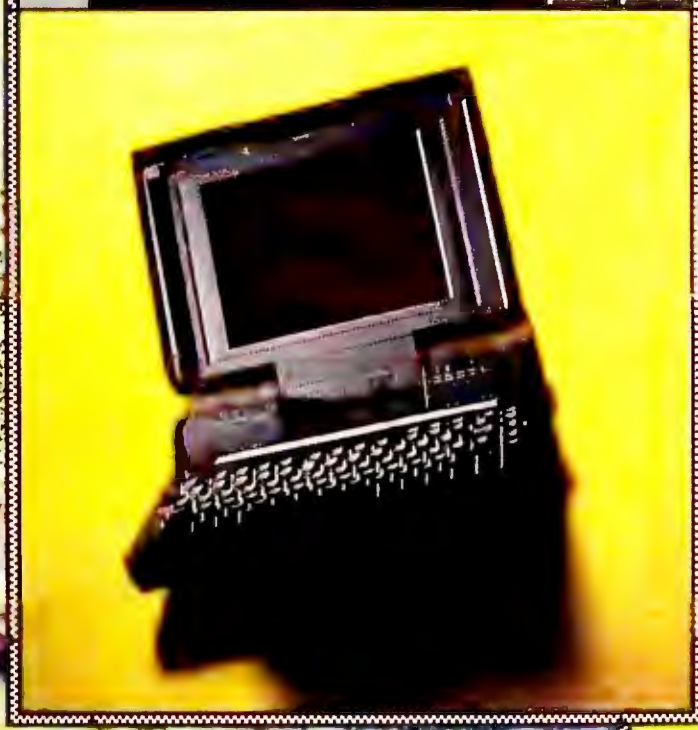
Look and feel are the key to *Windows*' ease of use, and what better way to enhance it than with an improved image? Contributing Editor TJ Byers and Editor Eric Knorr explore graphics one step beyond VGA in their Buyers' Guide to cost-effective monitors and video boards.

All the boards in the Guide come with special high-resolution *Windows 3.0* drivers that can make any

SYSTEMS



LAPTOPS



PRINTERS



Best Buys in Windows Hardware

Basic System



To exploit Windows 3.0 you need at least a 16-MHz SX. The August Best Buy Acer 1100SX, which we've set up for Windows with 4MB of RAM and a 100MB hard disk, can hold four drives and 8MB of fast RAM. Its built-in VGA can run Windows 3.0 at 800 by 600, also the NEC MultiSync 2A's maximum resolution. The Toshiba PageLaser 6, a March Best Buy, delivers excellent print quality for text and graphics, plus enough speed to serve a work group.

Optimal Workstation



The Compaq Deskpro 386/25e, the best small-footprint 25-MHz 386 machine we've reviewed, has enough power for tomorrow's demanding Windows applications. Hercules' economical Graphics Station Card—which you can upgrade to display millions of colors—drives NEC's MultiSync 4D at a supersharp 1024 by 768 resolution. The Best Buy-winning NewGen TurboPS/480 can provide several times the resolution of standard PostScript printers, without a performance penalty.

3.0-compatible application look much sharper than VGA. For a combined list price as low as \$500, a super-VGA board and an ordinary 14-inch multiscan monitor can increase resolution one-and-a-half times and the number of colors by a magnitude. For considerably more money, a graphics coprocessor board and a 16-inch monitor provide even greater resolution—plus blazing performance.

If you're willing to live with monochrome, our itinerant laptop reviewer, John Diebold, has a message for you: A new generation of VGA-equipped SX laptops proves that you *can* take Windows with you. These units aren't light, but they've got enough punch to knock

the sluggishness out of mobile computing. Here you'll find a clear Best Buy: the Toshiba T3100SX.

WINDOWS ON PAPER

One of the pleasures of a graphical environment is having an editable, accurate display of fonts and graphics as they'll look when printed out. Without the right printer, though, that preview is a pipe dream.

As Associate Editor Daniel Tynan and Editorial Assistant Cathy Smith explain, there's no point in settling for anything less than a LaserJet II compatible. Their Buyers' Guide lists dozens of clones that do justice to graphics

and print text quickly—some even serve a LAN better than a LaserJet.

Want a little more intelligence in your printer? Tynan and frequent contributor Ross Smith introduce you to six PostScript printers with built-in font-generating capabilities. Their review highlights fast printers with special high-resolution capabilities; the NewGen TurboPS/480 earns a Best Buy.

We can think of a host of reasons to buy a laser printer, an SX, a 386, or a high-resolution display. Arguably, you need such devices just to compute and stay competitive in the nineties. But if Windows is the main attraction, buy smart and keep the price of admission reasonable. ☛

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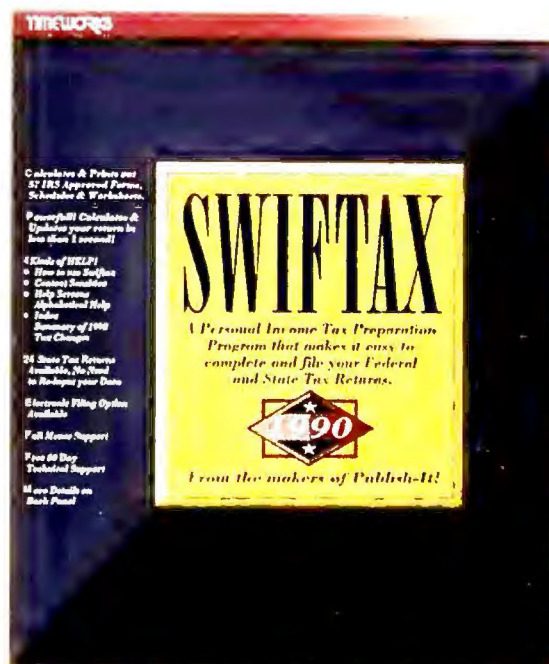
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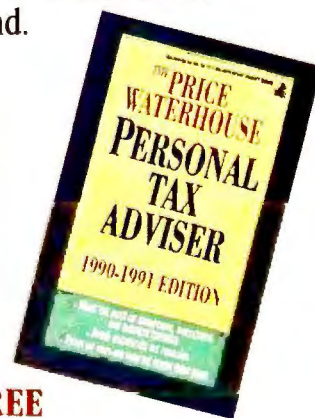
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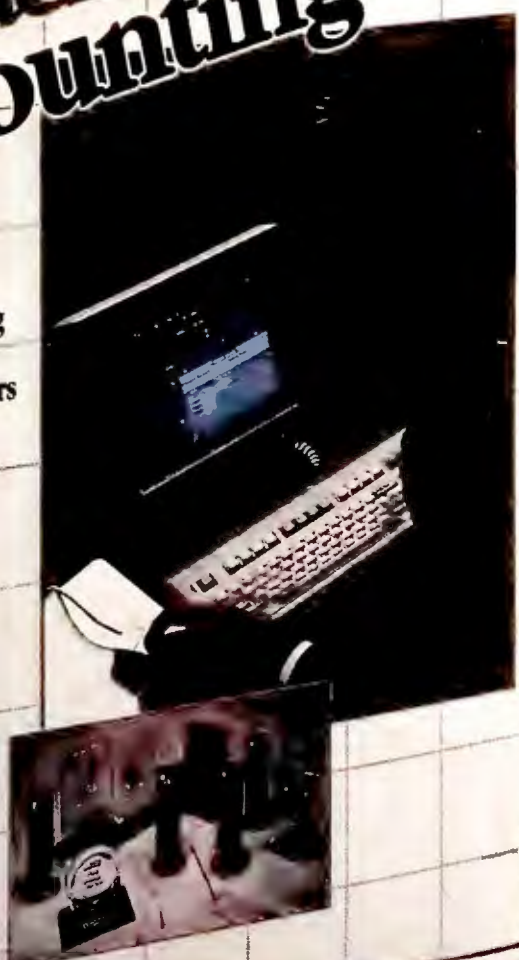
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HARDWARE SPECIAL ISSUE

25-MHz 386s: Great Performance in a Small Box

High-performance PCs don't have to be desk hogs. These alternatives offer enough power for serious Windows users.

Scott Spanbauer

Small-footprint 25-MHz 386 machines are the smartest desktop buy today—especially if you plan to run demanding graphics applications like *Windows*. These systems come with more than enough performance and RAM capacity to keep you productive through the next five years, for little more than what an AT cost in 1985.

They aren't your only choice, of course—just your best choice. *Windows* and its compatible applications are ravenous for speed and memory. While such slower machines as 16-MHz 386SXs make perfectly fine entry-level business systems, they provide merely acceptable *Windows* performance and may prove increasingly frus-



MARC SIMON



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FEATURES EVALUATION

Compact, but Room to Grow

The Compaq Deskpro 386/25e combines expandability with high performance and quality. The Tandy 4025LX and the Toshiba T8500 Model 25 cost less but can't match the Deskpro's speed or device capacity.

- Yes
○ No
◐ Deficient

	Compaq 386/25e	IBM PS/2 Model 70-A21	NEC PowerMate 386/25e	Tandy 4025LX	Toshiba T8500 Model 25
Standard features					
Street price ¹	\$6718	\$7012	\$5241 ²	\$6288	\$4702
List price ¹	\$7973	\$9364	\$7102 ²	\$6288	\$7922
80387/Weitek 3167 support	●/●	●/○	●/●	●/●	●/●
Disk caching software	●	●	● ³	● ³	●
Built into motherboard					
Hard disk connector	●	● ⁴	●	●	●
Mouse port	●	●	●	●	○
VGA	●	●	○	○	●
CPU-speed RAM					
Capacity	16MB	8MB	16MB	16MB	14MB
Expandability					
32-bit slots/number free	1/1 ⁵	2/2 ⁶	1/0 ⁵	2/0 ⁵	0/0
8/16-bit slots/number free	4/4	1/1 ⁶	4/3	6/5	3/3
8-bit slots/number free	0/0	0/0	0/0	0/0	1/1
Third/half/full-height bays	3/1/0	0/3/0 ⁷	0/3/0	2/2/0 ⁸	1/2/0 ⁷
300MB or larger hard disk available from manufacturer	●	○	○	●	○
Design and construction					
Switchless setup	○	●	○	●	○
Tilt-and-swivel monitor	●	●	●	○	○
Front-panel on/off switch	●	●	●	●	●
Front-panel reset button	○	○	○	●	●
Service and support					
Free on-site service	○ ⁹	○ ⁹	○	○	●
Toll-free support number	○ ⁹	○ ⁹	○ ⁹	○	●
Daily support (hours)	● ⁹	● ⁹	● ⁹	9½	10
Weekend support	○ ⁹	○ ⁹	○ ⁹	○ ⁹	●
Electronic bulletin board service	○ ⁹	●	●	●	●

¹ Except as noted, price based on 4MB RAM, at least 100MB hard disk, 1.2MB or 1.44MB 3½-inch floppy drive, VGA and color VGA monitor, at least one parallel and one serial port, 101-key keyboard, mouse, and DOS 4.01. If the vendor doesn't offer a mouse, we added \$99 to the street price and \$125 to the list price to represent the cost of a basic Microsoft Mouse.

² List price reflects the \$130 cost of adding DOS 4.01; the street price adds \$100.

³ SmartDrive (included with DOS 4.01).

⁴ ESDI connector.

⁵ Dedicated memory board slot(s).

⁶ Micro Channel slot(s).

⁷ 3½-inch form factor only.

⁸ Third-height bays are 3½-inch form factor.

⁹ Via dealer: Some variation will be found from one dealer to another.

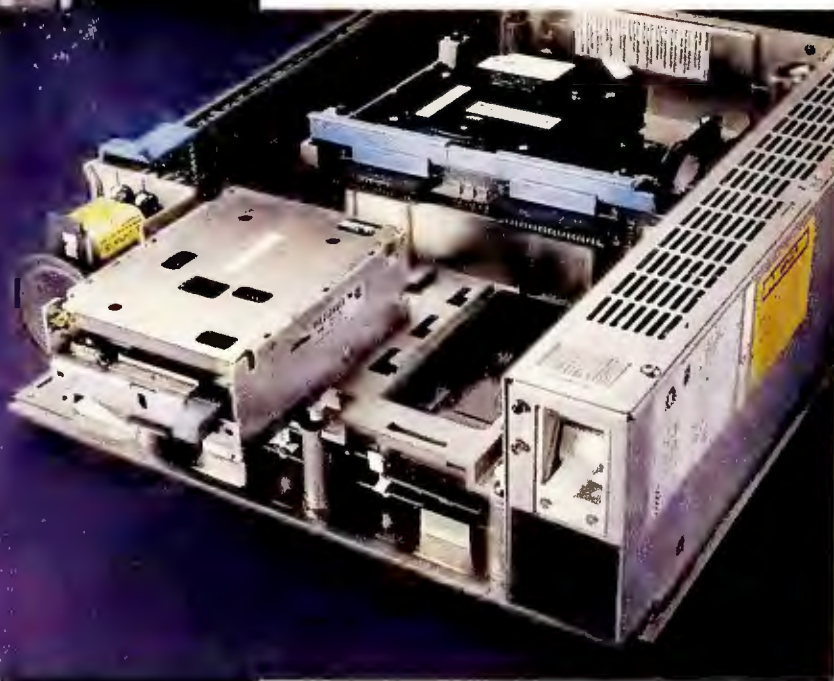
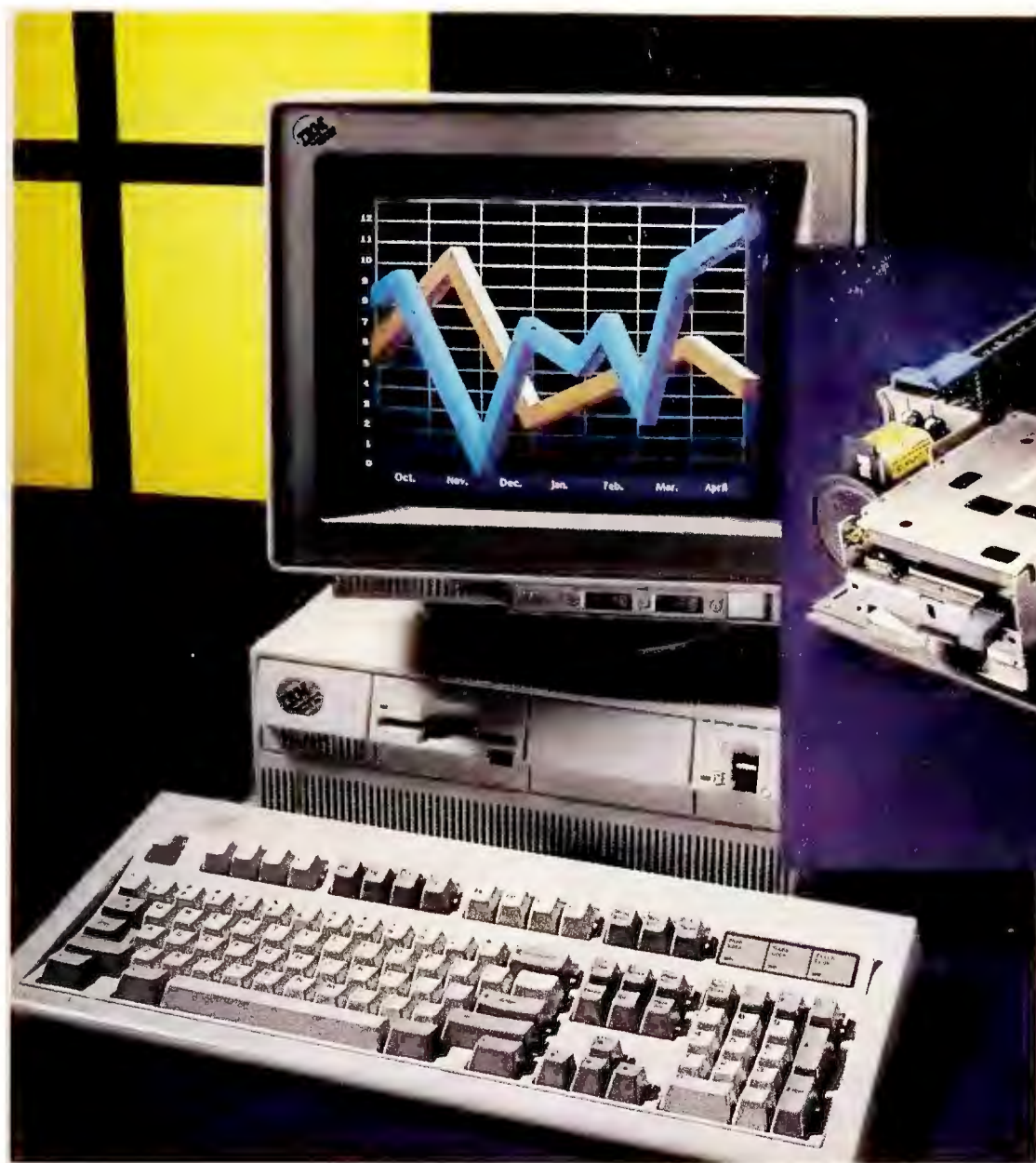
trating as new, feature-heavy *Windows* versions of *WordPerfect*, *1-2-3*, and *Ventura Publisher* appear. Conversely, both 486s and 33-MHz 386s are amazingly fast, but they command cutting-edge prices—and you just don't get that much more for your money.

Besides, 486s and 33-MHz 386s generally come in full-sized, desk-hogging boxes. Smaller, 25-MHz systems sacrifice some expansion slots and some hard disk expansion capacity, but they make the most of an even more finite resource—desktop space. And since more and more office PCs are being networked, the server can pick up some of the mass storage slack.

The key buying issues for these machines are performance and RAM capacity. The need for plentiful CPU-speed memory is particularly important in the world of *Windows*. Eventually, as RAM prices fall, a desktop *Windows* workstation loaded with a full 16MB of CPU-speed memory will be perfectly feasible. If the system you buy hits the wall at much less than that, you may spend the next five years wishing you'd planned a bit better. A good number of device bays and expansion slots and a reasonable price should be critical factors in your buying decision, along with quality of design and construction, warranty, and tech support (see the sidebar "Buying Smart" for more details).

We gathered five small-footprint 25-MHz systems for a knock-down, click-and-drag GUI fight. We set up and priced these machines in a standard configuration appropriate for today's *Windows* user: 4MB of RAM, one floppy drive, a 100MB or larger hard disk, at least one parallel and one serial port, a VGA video controller and color monitor, a 101-key keyboard, a mouse, DOS 4.01, and a disk cache.

To make sure you get real-world cost comparisons you can use to make practical buying decisions, we put our crack research team to work. All the prices in the following reviews are street prices obtained through an extensive nationwide phone survey and based on the



IBM's PS/2 Model 70-A21 is something of a speedster—and thanks to its easy-access chassis design (no cables or screws allowed), you won't need any tools to remove or replace components. However, it doesn't come cheap: This is the most expensive system reviewed.

standard *PC World* configuration just noted. (Three of the five manufacturers in this review do not sell a mouse, in which case we added \$99, the average street price of a mouse, to the price of their products.)

Compaq 386/25e

PROS: Top speed, top expandability

CONS: Pricey, cramped access to internal devices

If you've been around the PC block once or twice, the name Compaq is bound to conjure up two notions: high quality and high price. The Compaq 386/25e is no exception. It's the fastest system in the roundup, offers an excellent 16MB CPU-speed memory ceiling, and comes with lots of room for extra drives and expansion boards. It is, in simple fact,

the best small-footprint 25-MHz 386 in the world. Not surprisingly, it's also the second most expensive system reviewed.

You don't need a screwdriver to get under this computer's hood, as the case is secured by three thumbscrews. Once you're inside, however, life becomes more complicated. The 386/25e contains an impressive four free expansion slots and four drive bays—but at the expense of accessibility. The case is so densely packed that if you should ever want to extricate one of the front-mounted drives, you'll have to disconnect and remove the internally mounted 120MB IDE hard disk first. Similarly, if you accidentally pull a cable loose, the motherboard's connectors for the floppy and hard drives' cables are very difficult to reach.

Like many manufacturers, Compaq lets its dealers handle service and tech

support. Dealer support can be hit-or-miss, but it's common knowledge that Compaq has some of the most highly trained and qualified dealers in the business. Moreover, Compaq trainers make regular rounds, providing dealers with a steady supply of printed and video- and computer-based service updates.

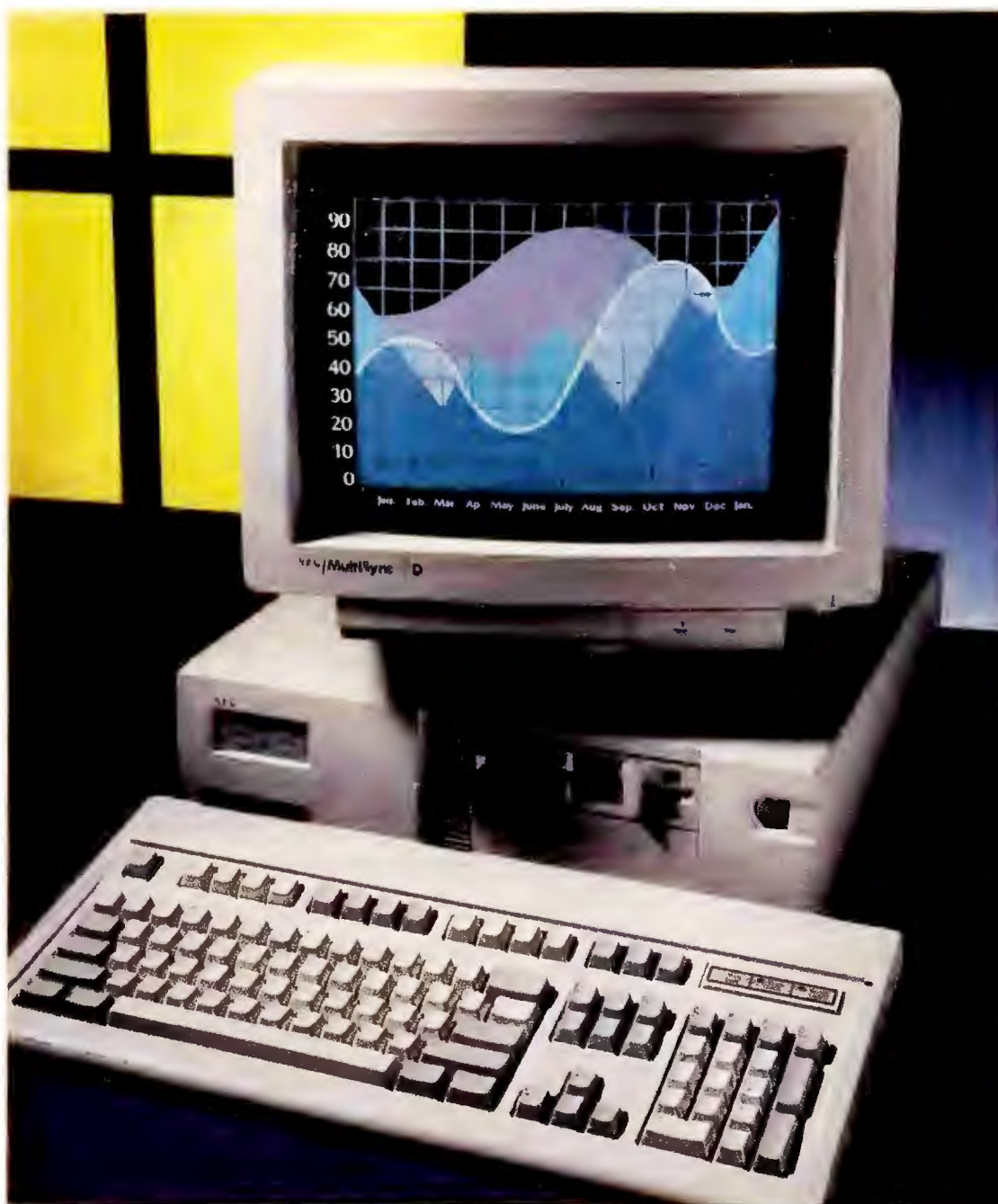
Though it has blazing speed and excellent expansion capacity, the 386/25's price is a little hard to swallow. But if you've got to have the best and you need it today, this Compaq fills the bill.

IBM PS/2 Model 70-A21

PROS: Good performance, unmatched chassis design

CONS: Prohibitive price, limited expansion capacity

Like Compaq's offering, IBM's system is anything but a bargain. In fact, at



NEC's PowerMate 386/25S is quite inexpensive, considering that its capacity for CPU-speed RAM is outstanding and Windows 3.0 is included. But performance is not impressive.

\$7012 on the street, it's the costliest system in this review. Unlike its Texas cousin, however, the Model 70-A21 suffers from substandard RAM and device capacity.

CPU-speed memory tops out at 8MB. If you ever need to expand beyond that (and in the world of *Windows* it's only a matter of time), you'll find the Model 70-A21's performance falling off, since the extra memory has to be placed in a relatively slow expansion slot. And since IBM gives you only three slots to begin with, your add-in options are severely limited.

Similarly, when it comes to a hard disk upgrade path, the Model 70-A21 gives you few choices. The standard 120MB hard disk comes preinstalled in a half-height bay with a proprietary

connector. IBM doesn't sell a larger drive to go into that bay. Moreover, the two externally accessible half-height bays are designed to accept only floppy or tape drives. Hence, there's no place to put a second hard drive.

IDE or ESDI drives deliver higher throughput than SCSI or ST506 units.

IBM is still the reigning champion of easy-access chassis design. There are no cables or screws, and everything inside the box can be removed and replaced without tools, from CPU-speed

memory to drives.

PS/2 machines have a well-deserved reputation for durability, and like Compaq, IBM handles service and support via a highly qualified dealer network. Nevertheless, this system's low fast-RAM capacity and astronomical price make it a bit like Cinderella's coach: In a couple of years, when your expansion needs hit the Big Blue wall, the Model 70 may start looking like a high-priced pumpkin.

NEC PowerMate 386/25S

PROS: Low price, excellent RAM capacity, includes Windows 3.0

CONS: Slow; largest hard drive option is 140MB

At \$5241, the second lowest street price in the roundup, NEC's petite PowerMate 386/25 is nicely priced and has an excellent 16MB CPU-speed RAM ceiling. It could have been a Best Buy, if not for its poky performance and merely average expandability.

Although there's an IDE hard disk connector on the 386/25S's motherboard, the company didn't have IDE disk drives available when our review unit was manufactured, so an expansion slot that would otherwise have been free was tied up with an ESDI hard disk controller. NEC promises that 45MB and 100MB IDE drives will be standard by the time you read this, and that the IDE-equipped systems will be substantially less expensive than its current ESDI drive systems.

In any case, the largest hard disk (ESDI or IDE) you can buy from NEC is 140MB. If you want more hard disk capacity than that, you'll need to add a second drive—and since this system contains only three half-height bays, a second hard drive rules out a second floppy or a tape drive.

One option you should plan on adding is a copy of DOS 4.01. The 386/25S comes standard with DOS 3.3, but our first round of testing revealed surprisingly poor performance with that

BUYING SMART: WHAT TO LOOK FOR IN A WINDOWS WORKSTATION

The relentless escalation of PC power over the last decade may seem to be the result of hidden forces, like the hand of some silicon god rippling the waters of technology. In fact, the major factor driving the development of hardware has always been the same: software. The latest star, Windows 3.0, works best on an 80386-based computer—one with plenty of power, scads of memory, and a large, fast disk drive to deliver no-wait GUI performance.

Performance

Especially under Windows, performance is determined by a number of factors, including processor, disk, and video controller speed. Since all the 25-MHz 80386 machines reviewed here are powered by identical CPUs, our performance tests—and the Excel under Windows test in particular—tend to reflect differences in disk and video throughput. (On CPU-intensive tests like the 1-2-3 one, for instance, scores for all machines were virtually identical.)

Because Windows involves a great deal of disk activity, a slow drive/controller/cache combo can have a dire impact on an otherwise high-performance system. We recommend systems with fast IDE or ESDI drives, since they deliver higher throughput than SCSI or old-fashioned ST506 or MFM-type units. In addition, IDE drives have the added advantage of saving a slot because the controller electronics are built onto the drive.

CPU-Speed RAM Capacity

Windows needs a lot of RAM. For one thing, when RAM runs short, Windows swaps data from memory to disk—preventing loathsome 'out of memory' messages but also causing a per-

ceptible slowdown. Although disk-swapping deceleration can be minimized by installing a permanent swap file and (most effectively) by keeping your hard disk unfragmented, it's best to avoid the problem altogether by making sure you've got plenty of RAM. You'll also need a generous amount of RAM for multitasking applications and for SmartDrive, Windows' performance-enhancing disk cache utility.

CPU-speed memory (fast RAM) is installed either on the motherboard or on a special high-speed memory bus. A low ceiling on fast RAM will force you to install additional memory on the slower 16-bit expansion bus, degrading performance. Our standard configuration includes 4MB—a reasonable minimum for today's Windows needs and more than enough for most non-Windows users. The next generation of Windows applications is already appearing, however, brimming with memory-gobbling features—and RAM prices are dropping. While 4MB of fast RAM seems like plenty today, it won't be long until 8MB is the basic buy-in.

Expandability

It's astonishing how quickly expansion slots fill up. Internal modems, network adapters, extra I/O ports, and video, mouse, and tape drive controllers all vie for the available system real estate. Fortunately, many devices that formerly needed expansion slots—such as mouse adapters, video controllers, and I/O ports—are now built onto the system board. For most users, four free slots should suffice, although if you rely on exotic peripherals such as CD ROMs and scanners, even four slots may not be enough.

Drive bays fill up too, especially in a small-footprint chassis, where they're in short supply to begin with. While hard-

disk capacity keeps rising, the sheer size of Windows itself, combined with Windows applications and their often large files, means that all but the largest drives will fill up a lot faster than you'd think. Our standard configuration is based on a 100MB hard disk, but the availability of a 300MB hard disk is critical. Moreover, storage devices seem to proliferate like unpaid bills; buying a system with less than four device bays is asking for trouble (unless it will be connected to a network).

Design and Construction

Look for a chassis that gives you easy access to internal switches, connectors, and peripherals. Important controls should be placed on the front panel. Windows will be easiest to use on a sharp color display with a tilt-and-swivel monitor.

Service and Support

Whether it comes from the manufacturer or the dealer, you should expect to receive a one-year warranty. Free on-site service is relatively rare but can be a lifesaver, especially for small businesses. (Fortunately, on-site service is often available from dealers as part of an extended warranty package that usually runs about \$200 a year.) Prompt and preferably toll-free telephone tech support can also save your grits. Look for the manufacturer or dealer that offers the longest support hours. We called a number of them, and the average number of daily support hours was nine; very few dealers offered 800 numbers or weekend support. All the dealers we talked to accepted tech support questions by fax. —S. S.

PC WORLD TEST REPORT

Compaq Holds the Performance Edge

The Compaq 386/25e is quickest overall of these small-footprint 25-MHz 386s—although not by much. The Tandy 4025LX follows close behind.

Microsoft Word

Compaq 386/25e	283
NEC PowerMate 386/25S	301
Tandy 4025LX	304
Toshiba T8500 Model 25	322
IBM PS/2 Model 70-A21	323

seconds 0 70 140 210 280 350

dBASE III Plus

Compaq 386/25e	197
Tandy 4025LX	201
IBM PS/2 Model 70-A21	213
Toshiba T8500 Model 25	525
NEC PowerMate 386/25S	714

seconds 0 140 280 420 560 700

1-2-3

NEC PowerMate 386/25S	72
Tandy 4025LX	72
Compaq 386/25e	73
IBM PS/2 Model 70-A21	73
Toshiba T8500 Model 25	77

seconds 0 15 30 45 60 75

Methodology

All the computer systems were tested with a 256K extended-memory disk cache except in the *Excel under Windows 3.0* and the *1-2-3* tests. All systems were tested with 4MB of RAM. Every computer was tested with the vendor's version of DOS. The systems had the following sizes of hard disks: NEC PowerMate 386/25S and Toshiba T8500 Model 25, 100MB; Tandy 4025LX, 105MB; Compaq 386/25e and IBM PS/2 Model 70-A21, 120MB.

Microsoft Word 5.0

Microsoft Word loads and quits the program, loads a document 50 and then 100 times, black-copies the entire document 100 times, performs multiple search-and-replace operations, and reprints and checks the spelling of a 90-page document. The document is scrolled in both graphics and text mode, saved 25 times, and printed to an output file. Although the results of the benchmark depend primarily on processor and memory access speeds, display adapter and hard disk speeds are also contributing factors.

dBASE III Plus 1.1

The dBASE III Plus test measures the time required to process a batch of 250 transactions. Each transaction consists of updating a record in the Accounts, Teller, and Branch files and in an indexed History file. In this benchmark, which uses a disk cache, sequential read performance becomes more important than random access.

AutoCAD

Tandy 4025LX	510
Compaq 386/25e	540
NEC PowerMate 386/25S	545
Toshiba T8500 Model 25	549
IBM PS/2 Model 70-A21	624

seconds 0 130 260 390 520 650

Excel under Windows 3.0

Compaq 386/25e	361
IBM PS/2 Model 70-A21	369
Toshiba T8500 Model 25	383
NEC PowerMate 386/25S	386
Tandy 4025LX	392

seconds 0 80 160 240 320 400

1-2-3 2.01

In this benchmark, a 1-2-3 macro executes a series of recalculations using five different formulas within a 75-by-75-cell matrix. Because there are few screen updates and no disk access is required, the results depend almost entirely on processor and memory access speeds.

AutoCAD 10

In this benchmark, a three-dimensional sample drawing is retrieved and displayed from multiple perspectives. A 3-D array is created using an AutoLISP routine, new elements are introduced, and a drawing is generated with filling on and off. The results of the test depend primarily on the speeds at which the processor and coprocessor operate and of which memory is accessed. The performance of the display adapter and of the hard disk also have same effect.

Excel under Windows 3.0

In this benchmark, Excel 2.1c running under Windows 3.0 executes these operations: transcendental calculations; cuts and pastes; charting; inserts and deletes; financial calculations; array functions; data base functions on a 100K, 500K, and 1500K data base; file operations; defined functions; and a large recalculation. The results of this benchmark depend primarily on processor and memory access speeds.



Data based on tests designed and conducted by National Software Testing Laboratories (NSTL), Conshohocken, PA 19428. All rights reserved.

version. Accordingly, we retested with 4.01 and its SmartDrive disk cache. We got much better results with 4.01, so we have added \$100 to the PowerMate's street price to cover the price of this

NEC option.

Also, plan on shopping around to find the dealer with the best support policies and options: NEC's centralized support is limited to an in-house BBS. For most

day-to-day problems, you'll be dependent on your dealer. Still, given its low price and high CPU-speed RAM ceiling, the PowerMate 386/25S should give you years of economical service.

Tandy 4025LX

PROS: Good performance, excellent expansion capacity, high fast-RAM ceiling

CONS: Pricey

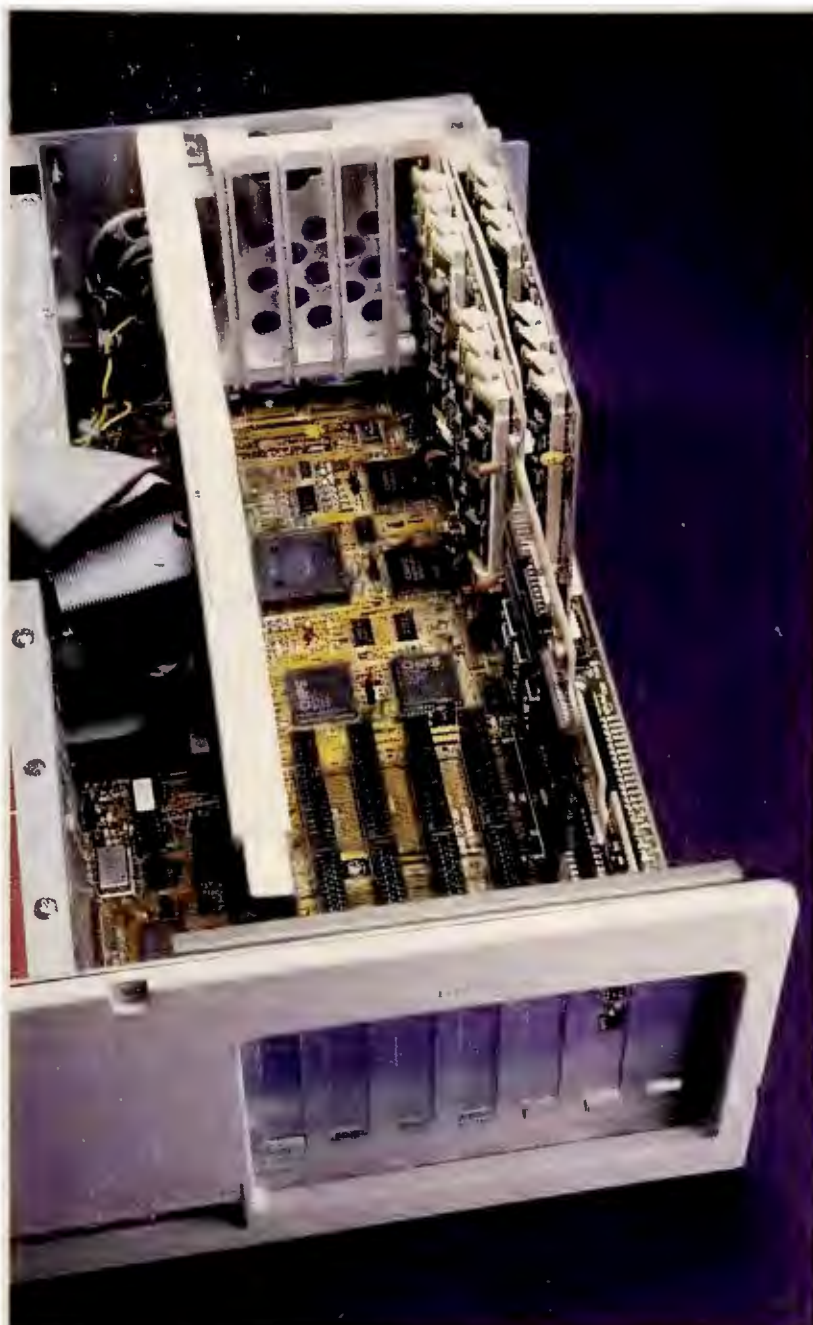
Tandy's 4025LX is a reasonably good value thanks to its high CPU-speed RAM ceiling, good performance, and generous complement of free slots and device bays. However, at \$6288 it's somewhat overpriced.

The 4025LX comes in two memory "models," 2MB and 8MB. While both can be expanded to 16MB, the 2MB model will go only to 4MB before you must discard all the 256K SIMMs you've paid for and replace them with 1MB SIMMs. The 8MB model is obviously more expensive to start with, but since it starts out with 1MB SIMMs, the upgrade process lets you keep the memory you've bought and simply add more. We recommend starting with the pricier 8MB system, since the upgrade path to 16MB will then be a lot cheaper.

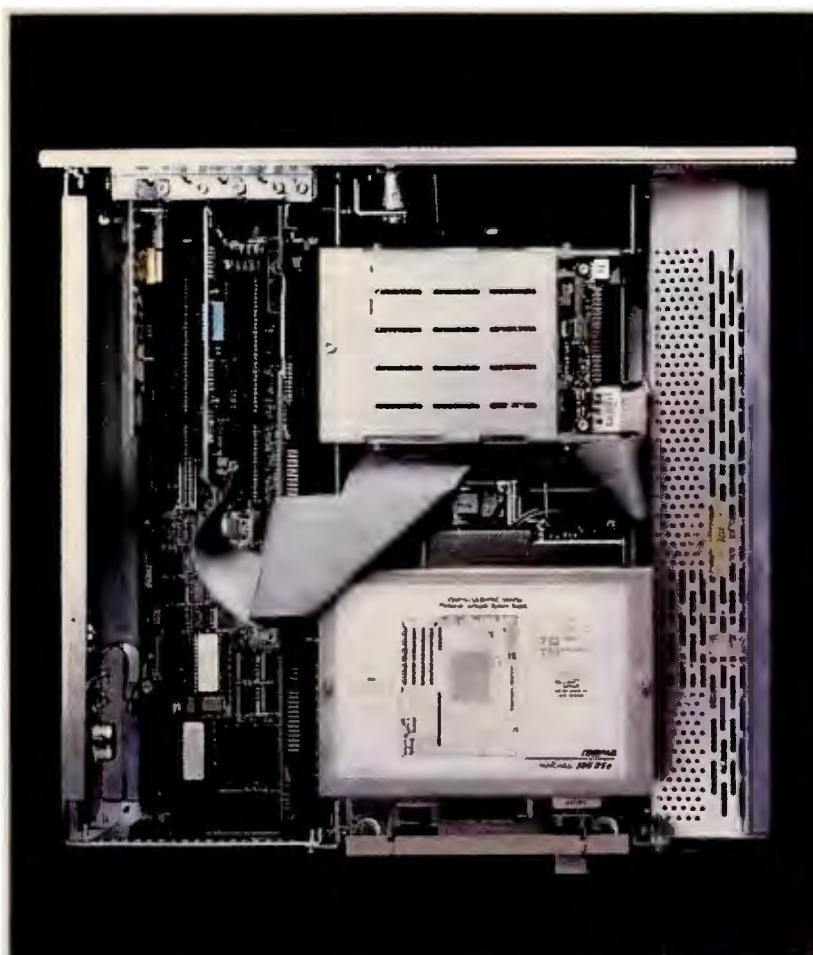
The 4025LX is slightly larger than the other systems in the roundup, but while it may take up a little extra space, its size comes with an attractive fringe benefit: outstanding expandability. Along with two half-height and two third-height drive bays, Tandy delivers five free expansion slots—the highest count in the roundup.

Tandy sells and supports its PCs through Radio Shack stores, which are generally close at hand. But Radio Shack has a reputation for frustrating customers who need parts and service in a hurry. Tandy also offers a central (not toll-free) tech support number. We called three times: The line was busy once, and twice we had to hold for several minutes before receiving service.

While the 4025LX's price is high, Tandy packs its slightly oversized case with plenty of room for CPU-speed RAM, drives, and adapter boards. Unless absolutely top performance is a must, you can't go too far wrong with this system.



The Tandy 4025LX is larger than the other systems here and gives you five free slots—the best count in the roundup.



Compaq's 386/25e gives you only four slots, but that's still better than most—and there's lots of room for drives.

Toshiba T8500 Model 25

PROS: Small, low price, easy internal access, free on-site service

CONS: Mediocre performance, limited drive capacity

The T8500 is the smallest system in this review and, at \$4702, the least expensive. Moreover, it offers free on-site service and weekend tech support—very rare commodities. But before you jump for this tempting tidbit, bear in mind that its performance is merely OK and that its low profile means less room for hard disk expansion.

The T8500's unique design lets you install boards in its four expansion slots and expand the system's SIMM memory via a handy side panel that eliminates the need to lift the monitor (being careful not to yank the cable), find a place to put it, clear space to slide the cover off, and find a place to put the cover before you can get inside the unit. (Although the panel design is an improvement, it would be even more convenient if the panel were secured with fewer than six screws.) The T8500 also provides a handy, front-mounted setup switch for configuring serial ports, IRQ addresses, and the like. There's no room inside for a 5¼-inch drive, but Toshiba will sell you an external one that hooks up to a connector on the back of the machine. This is the only system in the roundup to give you either a second serial port or a SCSI connector (which you can use to attach a chain of external drives). Unfortunately, it's also the only system in the roundup without a built-in mouse port.

The T8500 offers good CPU-speed RAM capacity: You can install 2, 4, 6, or 14MB—enough to keep you crunching graphics for several years. However, since there are only three drive bays (one of which holds the floppy drive), and the biggest drive you can buy from Toshiba is 100MB, your only choices for more disk capacity are to install a second 100MB drive in the remaining bay (leaving no room for an internal tape

EXECUTIVE SUMMARY

Windows Workhorses

25-MHz 386 systems fit forward-looking Windows users to a T.

Fast, small-footprint 25-MHz 80386 machines are getting cheaper every minute. Windows has a powerful hunger for speed, RAM, and storage, and those factors—along with price—separate the good buys from the bad.

Although none of the machines reviewed rates a Best Buy, three are worth serious consideration. The **Compaq 386/25e** is fast and expandable, but it's a bit pricey. The **Tandy 4025LX** is a less expensive but somewhat slower alternative. The **Toshiba T8500 Model 25** boasts an unbeatable price, but it's even slower than the Tandy and has a lower capacity for CPU-speed RAM.

	Compaq 386/25e	IBM PS/2 Model 70-A21	NEC PowerMate 386/25S	Tandy 4025LX	Toshiba T8500 Model 25
Performance	Excellent	Good	Fair	Good	Fair
CPU-speed RAM capacity	Excellent	Fair	Excellent	Excellent	Good
Expandability	Excellent	Fair	Fair	Excellent	Good
Design and construction	Good	Excellent	Good	Good	Good
Service and support	Good	Good	Good	Fair	Excellent
Price	Fair	Poor	Good	Fair	Excellent
Overall value	Good	Fair	Good	Good	Good

Reader service no.

805

806

807

808

809

How we rate small-footprint 25-MHz 386 systems

We rate these systems based on information in the Features Evolution and the PC World Test Report, combined with our opinions of quality, reliability, and user benefit.

Performance is the key to productivity with Windows. How quickly data appears in an on-screen window is affected by CPU, video controller, and disk drive characteristics. The standard deviation of the PC World Test Report benchmarks determines the ranges for the Executive Summary ratings.

CPU-speed RAM capacity refers to the amount of RAM installable on the motherboard or on a fast, 32-bit bus. This is a primary criterion because low capacity can significantly inhibit the performance of Windows applications. Only those machines with a 16MB or higher capacity receive an Excellent rating.

Expandability applies to the number of free slots and the number and density of mass storage devices supported. To receive an Excellent rating, a system must have at least four slots open and room for a total of four half- or third-height drives (five slots and three bays will also

do), and it must offer at least 300MB of hard disk storage (from combined hard drive options).

Design and construction includes quality of manufacture, accessibility of controls, and ease of setup. Excellent ratings are awarded to well-designed and -manufactured systems with switchless setup, quality monitors, and durable keyboards.

Service and support includes the length of warranty, quality and availability of phone support, documentation, support hours, and other support services. At least one year's full warranty, free on-site service, toll-free tech support, long support hours, and effective response are required for an Excellent rating.

Price ratings are awarded by calculating the standard deviation from the average street price.

Overall value takes into account all the above criteria. Because Windows 3.0 is a processor-intensive application with an unprecedented capacity to use memory, we put extra weight on performance and CPU-speed RAM capacity. Because space is limited inside these small-footprint systems, expansion capacities for drives and boards are also major evaluation factors.

drive) or to use the SCSI port to hook up external devices.

Toshiba is the only manufacturer in this roundup to offer free on-site support—a big plus that can save you a lot

of time and money if something goes wrong. There's also a toll-free tech support number that works on weekends, and a BBS. Get out a copy of *PC World* before you pick up the phone, though; all

ON **NOVEMBER 12,** NORTON 5.0, SPINRITE II, PC TOOLS, OPTUNE AND DISK TECHNICIAN™ WILL BE **OBSOLETE.**

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HIGHLY RECOMMENDED

When Accounting Today (May 1990) asked accountants which accounting software package they recommended to their small business clients, an overwhelming 29% said they recommend Peachtree Accounting— that's almost double the next largest competitor.

Reseller Management (March 14, 1990) asked resellers which accounting package they recommend and Peachtree came out on top again with 25% of resellers recommending it.

But accountants and resellers aren't the only ones giving Peachtree rave reviews.

"If you could find a definition for Peachtree in the dictionary, it might be 'value for your money.'"—PC Magazine 4/10/90

"It is, I believe, the best accounting package available for the price."—E.J. Bosmeny, CPA, Naperville, IL

"Complete III rivals packages costing 10 times as much."—PC Resource, July 1990

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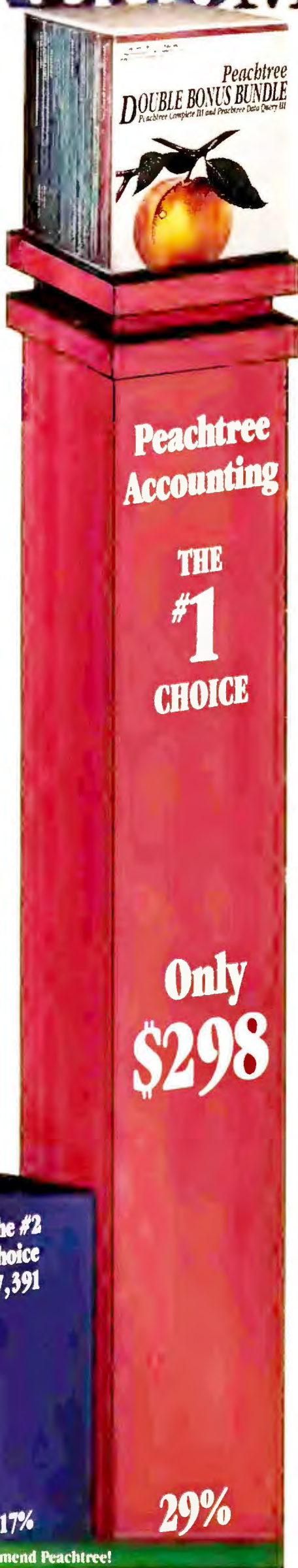
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three times we called, we were left hanging on hold for between 8 and 14 minutes.

The machine does have its shortcomings: It delivers less-than-thrilling performance, and if you need more than 200MB of mass storage, you'd better have plenty of desk space for external drives. Still, Toshiba's tiny T8500 offers easy internal access, an extra serial port, outstanding service and support, and the lowest price in the review. All in all, this is a decent buy.

Making Tough Choices

While none of these machines provides an ideal combination of price and power, three of them are still quite tempting. Compaq's 386/25e is the best small-footprint 25-MHz 386 money can buy—if money is no object. If you're not willing to drop big bucks, go with the slower Tandy 4025LX; it comes with a few built-in compromises, but its price is a lot more reasonable. Likewise, Toshiba's T8500 Model 25 is a compromise you can live with. It's even slower than the Tandy and holds slightly less fast RAM, and its slots and bays are comparatively less accommodating. Nonetheless, it's the megabargain of the roundup.

On the other hand, if you won't settle for anything less than a Best Buy, sit tight. Small-footprint 25-MHz systems with Compaq performance and a Toshiba price will probably be a lot more common six months from now. But remember, too, that by then a new breed of smaller, lower-priced 33-MHz powerhouses will be competing with the 25s for space on your desktop. As the technology gets better, the buying decisions just get tougher. ☹

Scott Spanbauer is a contributing editor for PC World. Rex Farrance and Susan Lusty contributed research to this article.

For more information about all products in this article, circle reader service no. 905.



UPGRADES FOR THE '90S #1

800-dpi Laser

The LaserJet Series III is a great deal. But if you're putting out documents that the world will see, you may want more. That's where LaserMaster's Series III Professional Printer Controller comes in. Depending on the board's configuration, you can get 800-by-800-dpi text and graphics output (bit maps are rendered at 800 by 300 dpi), 135 scalable typefaces, PostScript-like effects, and lightning-fast output of text and graphics. Another big plus: The LaserMaster board works with HP's Series II and in other printers based on Canon engines.

Installing the LaserMaster isn't daunting, just time-consuming. Plug the board into your PC, insert an adapter into the LaserJet's I/O port, and connect the two; then connect the printer and PC via a serial or parallel cable. Run the auto-install program, and pour the various drivers, printer fonts, and screen fonts on to your hard disk. Expect

to kiss 6MB to 11MB of disk space goodbye.

A LaserMaster-equipped LaserJet is as easy to use as a PostScript printer—and about ten times faster. Simply make 'LaserMaster Direct' the active printer in Windows 3.0, open PageMaker, and voilà! All the LaserMaster's fonts are at your beck and call. As upgrades go, the LaserMaster isn't the cheapest, but the results are damn impressive. List price: 2MB board with 400 by 400 output and 35 typefaces \$1495; same board with 135 typefaces \$2495; 4MB board with 800 by 800 output, 135 typefaces \$2995; 6MB board with 800 by 800 output, 135 typefaces \$3995; MCA versions \$500 extra. LaserMaster Corp., 7156 Shady Oak Rd., Eden Prairie, MN 55344-9887; 612/944-9330, 612/944-0522 (fax). —Robert Luhn

Reader service no. 734

Robert Luhn is a senior editor for PC World.

LaserMaster			
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Compaq 386/25e

Compaq Computer Corp.
P.O. Box 692000
Houston, TX 77269-2000
800/231-0900
LIST PRICE: Model 1 with 4MB RAM, 3½-inch 1.44MB floppy drive, one parallel and one serial port, one mouse port, VGA on the motherboard, 101-key keyboard \$5499; Model 60 same as Model 1 but with 60MB hard disk \$6399; Model 120 same as Model 1 but with 120MB hard disk \$6999
ACCESSORIES: 1MB memory module \$149, 4MB memory module \$1599, 1MB memory expansion board \$499, 4MB memory expansion board \$1999; 40MB hard disk \$899, 110MB hard disk \$1799, 320MB hard disk \$5899; 360K floppy drive \$275, 1.2MB floppy drive \$275, 1.44MB floppy drive \$275; 80/120MB tape drive \$899; 25-MHz 80387 coprocessor \$1399, Weitek 3167 coprocessor \$1499; 14-inch VGA color monitor \$699, 16-inch advanced graphics color monitor \$1699; advanced graphics 1024 board \$1299; DOS 4.01 \$150, OS/2 1.21 \$340
WARRANTY: one year parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
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IBM PS/2 Model 70-A21

IBM U.S. Marketing and Services

1133 Westchester Ave.
White Plains, NY 10604
800/426-2468
LIST PRICE: with 2MB RAM, 1.44MB floppy drive, 120MB hard disk, one parallel and one serial port, one mouse port, VGA on the motherboard, 101-key keyboard \$7495
ACCESSORIES: PS/2 486/25 Power Platform \$3995; 1MB RAM module \$495, 2MB RAM module \$995, 4MB RAM module \$2295, 2MB-8MB memory expansion option \$1395, 4MB memory expansion kit \$2695; PS/2 Micro Channel SCSI interface \$495; 80MB internal tape backup \$765; 5¼-inch 1.2MB floppy drive \$355, 1.44MB floppy drive \$263; 25-MHz 80387 coprocessor \$1330; 8512 14-inch VGA color display \$675; mouse \$101; DOS 4.01 \$150, OS/2 1.2 \$340
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EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: in-house-BBS
Reader service no. 806

NEC PowerMate 386/25S

NEC Technologies, Inc.
1414 Massachusetts Ave.
Borborough, MA 01719
800/632-4636
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(PM-520-1000), 1.44MB floppy drive (PM-520-2000), or 42MB hard disk and controller (PM-520-1150) \$4399; PM-520-1220 same as PM-520-1000 but with 100MB hard disk and controller \$5299; PM-520-1002 same as PM-520-1000 but with 8MB RAM \$5199
ACCESSORIES: 2MB CPU-speed RAM \$499, 8MB CPU-speed RAM \$1499; 42MB hard disk and controller \$800, 100MB 3½-inch hard disk and controller \$1700, 140MB 3½-inch hard disk and controller \$1900; 360K floppy drive \$300, 1.2MB floppy drive \$199, 1.44MB floppy drive \$199; 150MB tape drive \$1399; 25-MHz 80387 coprocessor \$1199; 800 by 600, 16-color super-VGA adapter \$250; NEC MultiSync 2A color VGA display \$799; DOS 4.01 \$130, OS/2 1.0 \$325
WARRANTY: one year parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: in-house BBS
Reader service no. 807

Tandy 4025LX

Tandy Corp.
1800 One Tandy Center
Fort Worth, TX 76102
817/390-3011
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one serial port, one mouse port, VGA adapter, 101-key keyboard \$5999
ACCESSORIES: unpopulated RAM board \$100, 1MB RAM \$300, 2MB RAM \$500; 105MB IDE hard disk \$899, 80MB SCSI hard disk \$999, 440MB SCSI hard disk \$2599; 360K floppy drive \$170, 720K floppy drive \$140, 1.2MB floppy drive \$170, 1.44MB floppy drive \$170; 160MB internal SCSI tape drive \$1099; 25-MHz 80387 coprocessor \$814; monochrome VGA display \$200, color VGA display \$500; PS/2 mouse \$50; DOS 4.01 \$140; Windows 3.0 \$149
WARRANTY: one year parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: toll number, M-F 8-5:30
OTHER SUPPORT: CompuServe and PC-Link forums
Reader service no. 808

Toshiba T8500 Model 25

Toshiba America Information Systems, Inc.
Computer Systems Division
9740 Irvine Blvd.
Irvine, CA 92718
800/457-7777
LIST PRICE: with 2MB RAM, 1.44MB floppy drive, 100MB hard disk, one parallel and two serial ports, VGA on the motherboard, 101-key keyboard, DOS 4.01 \$5999
ACCESSORIES: 2MB RAM module \$999, 8MB RAM module \$3999; 100MB hard disk expansion kit \$1199; external 360K floppy drive \$499; 80MB external tape drive \$1049; DOS 3.3 \$99, OS/2 1.1 \$325, BASIC 3.0 \$75
WARRANTY: one year parts and labor; free on-site service
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll-free number, M-F 9-7
OTHER SUPPORT: in-house BBS
Reader service no. 809

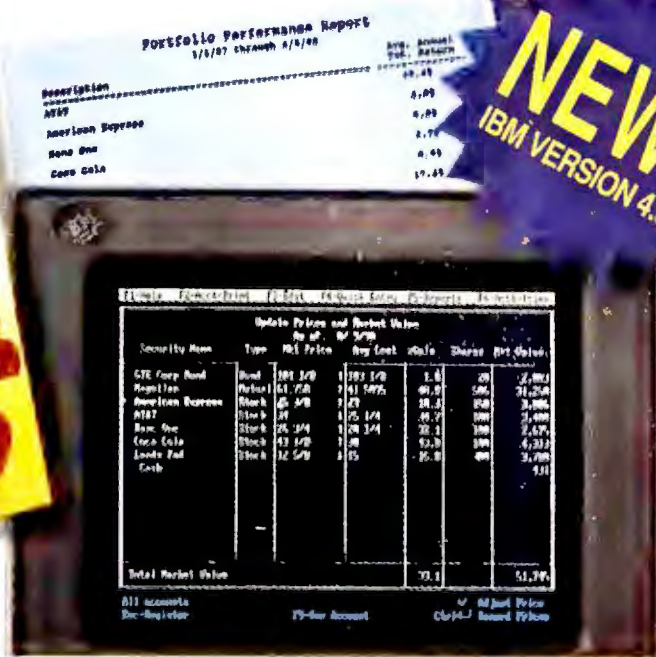
POWER TIP NO. 152

Last-Ditch Effort to Save Data

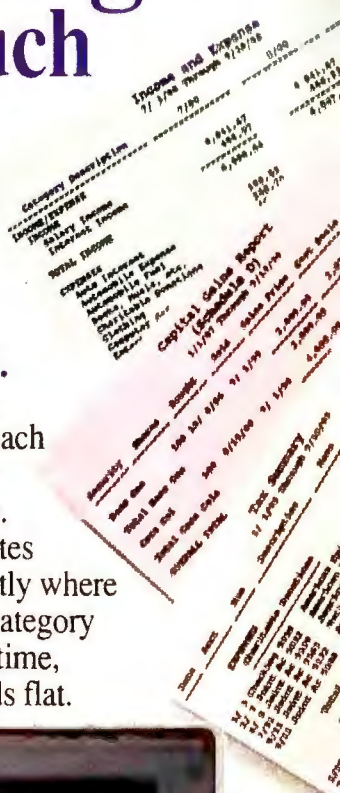
If your system hangs, try one last thing before you press <Ctrl>-<Alt>- and lose your data: Quickly and firmly sweep your hand across the keyboard twice, making sure to hit most of the keys. You may enter unintended commands and characters, but often your application will return to life.

Eric Knorr
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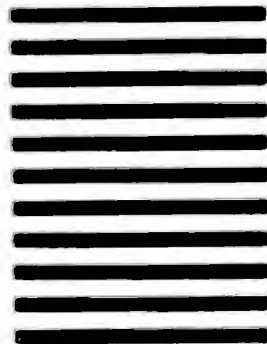
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CheckFree is more secure than conventional check writing. Payments are processed through the Federal Reserve System, so CheckFree never requires actual access to your account. Only you have access to your funds and only you authorize payments.

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PC Magazine, Best of 1989 Awards
January 16, 1990 issue

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PC Magazine

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Client Support: free access via Email. **Hardware Requirements:** IBM® PC/Compatibles with 384K usable RAM, MS-DOS® 2.1, two floppy drives or a hard disk system – or Macintosh® 512KE or higher, 800K drive. Hayes® compatible modem also required.

***Limitations:** Over 20 monthly transactions involve a nominal surcharge (\$3 per ten payments or portion thereof)

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Reprinted from the May issue of Home Office Computing.

If you're thinking about utilities, consider the utilities that do the thinking for you.

The Norton Utilities® 5.0 is more than just a powerful new version of a classic, award-winning bestseller.

It's the best thing to happen to PC utilities since we invented them in the first place.

That's because the people who brought you the legendary *UnErase*® and the revolutionary *Norton Disk Doctor*® have cooked up another remarkable innovation.

Intelligence.

It's built in to each and every one of the 20 utilities in this package.

Which means that each and every



The new Norton Utilities corrects problems other programs can't even detect. File Fix, for example, fully reconstructs damaged 1-2-3, Symphony® and dBase files.

person who uses a PC—yes, even out-right novices—can use the Norton Utilities to perform a variety of sophisticated support tasks.

Without the aid of a sophisticated support person.

Whether you want to maximize your PC's performance, minimize the chances of data loss and disk failure, or just get yourself out of a jam, you need to get yourself the new Norton Utilities.

Having the Utilities on your disk—or on your network—is like having Peter Norton at your elbow.

In fact, our enhanced user interface includes a unique new feature that works with you just the way Peter would.

Advise not only helps you identify your particular problem, it also recommends the appropriate course of action and executes the appropriate utility.

Automatically.

If the problem happens to be a corrupted hard disk, you'll see right away why the *Norton Disk Doctor II* is the most sophisticated utility of its kind in the world.

Disk Doctor II finds and fixes problems other programs can't even detect. Yet it's simple enough for beginners to use.

The same goes for *File Fix*, an invaluable new tool that delves into the complex internal structure of your Lotus® 1-2-3®, dBase® and compatible spreadsheets and databases to make repairs that would stymie even a skilled technician.

UnErase performs data searches automatically and shows you a list of all the deleted files on your disk. So all you have to do is point and shoot.

It also does something no other program can do: recover deleted files from anywhere on your network.

If all of that sounds like reason

enough to join the army of happy Norton Utilities users, it is.

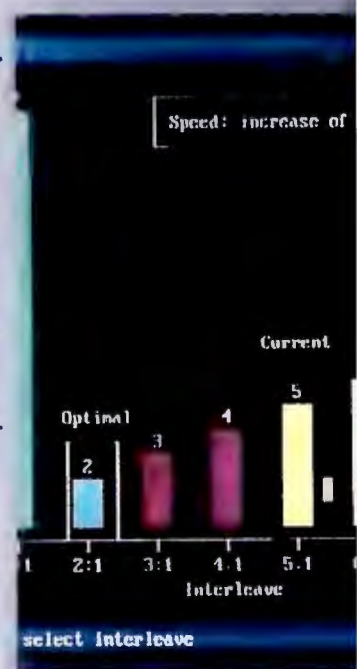
And we haven't even told you about the feature those users have most often requested.

Calibrate™ analyzes and adjusts the "interleave" of your hard disk, optimizing the read/write speed and dramatically

improving performance.

Of course, when it

Our new Calibrate utility revitalizes demagnetized disk areas and uses a low-level formatter to adjust your disk when the heads go out of alignment.



comes to improving performance, there's nothing quite like *Speed Disk*™.

It not only offers four different optimization methods, it figures out exactly how fragmented your disk has become and tells you which method to use.

Nobody has to tell you how serious it is when the power goes out. So you'll be glad to know that *Calibrate*, *Speed Disk* and *Disk Doctor II* are designed with a unique failsafe architecture.

If you lose power during a procedure, you won't lose your data.

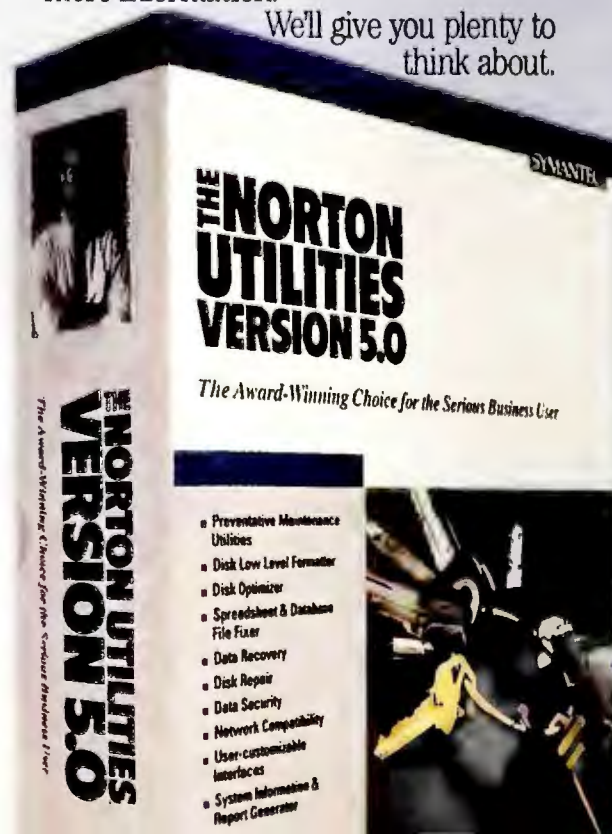
So don't lose another minute. Call 1-800-343-4714 Ext. 702W and demand

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Now everyone from novices to experts can safely perform in-depth preventative maintenance and file recovery with a few simple mouse clicks.



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(See package for details.)

HARDWARE SPECIAL ISSUE

PostScript Printers: Great Fonts Faster Than Ever

Looking for a printer that can meet the high demands of today's top graphics applications yet still serve your work group? We examine six heavy-duty PostScript printers that combine graphics flair with network functionality.

Ross Smith and Daniel Tynan



With a fast RISC processor, ample font-storage options, and the highest resolution you can get in its price range, the NewGen TurboPS/480 is an easy Best Buy. At a street price of \$6572, it's not inexpensive, but you won't find a more capable network PostScript printer.

Today's graphical applications give you lots of tools for dressing up your documents, but without the right printer, you can't take them anywhere. You can get by with a LaserJet Series II and a handful of soft fonts or a PostScript cartridge, or you can invest in the font-scaling Series III. But if you need to print large volumes of complex documents containing sophisticated images and a broad assortment of fonts, a LaserJet isn't enough.

The PostScript printers reviewed here give you the whole package: a slew of scalable typefaces, unbeatable graphics capabilities, and a time-tested PostScript standard that's supported by virtually every application and by high-resolution imagesetters. Moreover, the machines' ability to emulate the HP LaserJet proves that PostScript printers aren't just for desktop publishers anymore. In the graphical nineties, a PostScript device may be the only printer you'll need.

We looked at six PostScript printers that promise the power to support busy work groups. Most of the printers offer



Is your document being processed? A flashing green light (inset) is your only indicator—the Apple LaserWriter IINTX provides neither an LCD readout nor front-panel controls.

300-dot-per-inch (dpi) resolution and rely on PostScript interpreters licensed from Adobe Systems, the creator of this page description language. All come with at least 35 built-in typefaces, accept Adobe Type 1 downloadable fonts,

and pack enough RAM to handle the heap of fonts and graphics a work group is sure to send their way.

Two printers break the mold and deliver the best bargains. NewGen's 800-by-400-dpi TurboPS/480 and Qume's 600-by-300-dpi CrystalPrint Express not only offer higher resolutions but are built around ultrafast RISC processors. On the basis of speed and output quality, the NewGen and the Qume beat all comers. The Qume, however, takes second place to the NewGen, whose sharper output and hard disk option for storing extra fonts clearly make it the Best Buy for those who need a network graphical printer.

Neither of these printers uses Adobe-licensed PostScript, the absolute guarantee of PostScript compatibility. However, all nonlicensed printers in this roundup passed our rigorous PostScript compatibility tests without a glitch. If you still insist on the Adobe seal of approval, your best bet here is the QMS-PS 820 Turbo, which offers relatively fast operation and a hard disk option. Better still, wait for high-speed Adobe-licensed RISC printers, which should be available by mid-1991.



The QMS-PS 820 Turbo has solid network credentials, including multiple paper trays and an interface for hooking up a SCSI hard disk (such as the Apple drive shown here).

FEATURES EVALUATION

Goodbye LaserWriter, Hello NewGen

Only the NewGen TurboPS/480 combines superior font storage options with fast, RISC-based processing and the highest resolution in its class—an unbeatable combination.

- Yes
- No
- ◐ Deficient

	Apple LaserWriter IIITX	Kyocera Q-8010	NewGen TurboPS/480	QMS-PS 820 Turbo	Qume CrystalPrint Express	Texas Instruments OmniLaser 2115
Standard features						
Street price ¹	\$4712 ²	\$6287 ³	\$6572 ³	\$5874	\$4293 ⁴	\$6398 ⁵
List price ¹	\$7087 ²	\$7074 ³	\$7584 ³	\$7565	\$5724	\$8064 ⁵
Rated engine speed (ppm)	8	10	8	8	12	15
Duty cycle (pages per month)	5000	10,000	5000	10,000	10,000	25,000
Engine life (pages)	300,000	n/a	300,000	600,000	600,000	1.5 million
Processor	Motorola 68020	Motorola 68020 ⁶	Intel 80960KB	Motorola 68020	Weitek XL 8200	Motorola 68000
Cost of toner cartridge	\$129 ⁷	\$36.95	\$195 ^{7,8}	\$130 ⁷	\$27	\$39.50
Estimated cost per page (cents)	3.7	2.9	3.2	3.25	2.9	2.64
Maximum resolution (dpi)	300	300	800 by 400	300	600 by 300	300
Standard/maximum RAM	2MB/12MB	5MB/6MB	5MB/5MB	2MB/8MB	3MB/8MB	3MB/3MB
Interfaces						
Parallel	○	●	●	●	●	●
Serial	●	●	●	●	●	●
AppleTalk	●	●	●	●	●	●
Font options						
Number of standard scalable typefaces	35	35	35	39	39 ⁹	35
Accepts Adobe Type 1 fonts	●	●	●	●	●	●
Accepts Adobe Type 3 fonts	●	●	●	●	●	○
Accepts third-party downloadable fonts	●	●	●	●	●	●
Accepts font cartridges	○	●	◐ ¹⁰	○	○	●
Provides hard disk interface	●	○	●	●	○	○
Emulations						
HP LaserJet Series II	◐ ¹¹	●	●	●	●	●
HP LaserJet Series III	○	○	●	○	○	○
HP 7475A plotter (HPGL)	○	○	●	●	○	●
Epson FX	○	○	●	○	○	○
Diablo 630	●	●	●	○	○	●
Paper handling						
Standard/maximum capacity (sheets)	200/200	250/250 ¹²	200/200	400/400 ¹²	500/500	500/500
Dual cassette	○	○	●	●	●	●
Envelope printing	●	●	●	●	●	○
Label printing	●	●	●	●	●	●
Transparencies	●	●	●	●	●	●

**BEST
BUY**

¹ Includes 4MB RAM; letter- and legal-sized paper trays; and parallel, serial, and AppleTalk ports (if available).

² Price includes 6MB RAM.

³ Price includes 5MB RAM.

⁴ Estimate based on average street-price discount.

⁵ Price includes maximum 3MB RAM.

⁶ Includes Motorola 68881 math coprocessor.

⁷ Integrated toner, drum, and developer.

⁸ Cost of high-resolution cartridge; normal-resolution cartridge \$129.

⁹ Also provides 31 scalable, rotatable typefaces in PCL mode.

¹⁰ Available for \$149.

¹¹ Emulates LaserJet Plus.

¹² Optional 1000-sheet paper feeder available.

BUYING SMART: FINDING THE RIGHT LAN-DUTY POSTSCRIPT PRINTER

A network-duty PostScript printer should be dependable, expandable, and fast, as well as able to handle a big work load and to switch easily between PostScript and LaserJet emulations. The good news is that the most powerful printers aren't necessarily the most expensive. Here's what to look for:

Speed Graphics files can really bog down a network printer, so fast output is crucial. With simple text printing, the key element is engine speed (usually rated in pages per minute, or ppm); with calculation-intensive font scaling and graphics composition, it's the speed of the processor. The RISC-based Qume and NewGen have a big advantage here, blazing through most of our speed tests despite placing more dots on the page. The 300-dpi QMS-PS 820, powered by a Motorola 68020 processor, finished a strong third.

Output Quality If a PostScript printer doesn't give you razor-sharp text and graphics, why buy it? Look for crisp text and distinct lines, solid black fills, and reversed (white-on-black) text that's easy to read. All the 300-dpi printers generated superior output, but the high-resolution Qume had difficulty reversing text. Overall, none could match the quality of the 800-by-400-dpi NewGen.

Font Options Even 35 fonts may not be enough to satisfy every user on your network. Demand plenty of RAM for downloading extra typefaces, a healthy selection of add-in font cards or

cartridges, or—best of all—a hard disk option for auxiliary font storage. A hard disk lets you download a huge number of fonts just once, then access them as if they were resident in the printer. (List prices for dedicated 20MB disks range from \$699 to \$999.) With their SCSI hard disk interfaces, the Apple, NewGen, and QMS printers top this category.

LaserJet Emulation Because some applications still don't support PostScript, your graphical printer should provide flawless LaserJet emulation—and, ideally, switch between PostScript and HP modes automatically. All the units easily handled files formatted for the LaserJet Series II, though none offer full Series III emulation. Unfortunately, none of the printers can switch modes automatically—you have to send an escape code to the printer or use the printer's front-panel controls. This could wreak havoc in a network environment, where a printer set to the wrong mode can produce pages full of garbage.

Qume says it's solved half the problem: The CrystalPrint returns automatically to PostScript mode after printing a PCL file. Unfortunately, the unit we reviewed was unable to perform as claimed. And remember: All but the Kyocera require you to redownload fonts and macros every time you switch modes.

Paper Handling A network printer can never have enough paper or paper-handling options. Demand at

least one 200-sheet paper cassette (two are preferable) and the ability to accommodate letter- and legal-sized paper, envelopes, and labels. With its dual 250-sheet paper trays and envelope-printing skills, the Qume CrystalPrint nudges out the Texas Instruments Omni-Laser 2115 as paper-handling champ. If you need even greater paper capacity, consider investing in a 1000-page sheet feeder (QMS and Kyocera offer feeders costing \$795 and \$895, respectively).

Installation and Maintenance You want a printer that's fairly easy to install and maintain over the long haul. Look for easy-to-replace toner cartridges, accessible memory slots, and front-panel controls with an LCD display. A hefty duty cycle is also a must, but remember that the figures given here are vendor estimates; the printer's actual performance may vary. The TI's impressive 25,000-page monthly duty cycle indicates the greatest durability.

Price This roundup features street prices based on a survey of dealers across the country. Rather than averaging the selling prices of stripped-down models, we based our street prices on a recommended configuration for network duty: 4MB of RAM, at least one letter- and one legal-sized paper tray, and (if available) a combination of one serial, one parallel, and one AppleTalk port. In cases where street prices were unavailable, we based estimates on the average discount. —R. S. and D. T.

Apple LaserWriter IINTX

Only a short time ago, the Apple LaserWriter IINTX was *the* standard for office PostScript printers. But times have changed. Though capable of top-notch

PostScript output and excellent font handling—and relatively inexpensive at a street price of \$4712—the IINTX isn't the speediest printer. Feature for feature, the QMS-PS 820 is a better Adobe

PostScript machine.

The LaserWriter lacks a parallel port—never had it, never will—and as a serial port device, the IINTX is abominably slow. Fortunately, you can install a

\$299 AppleTalk interface card in your print server, which cuts print time in half. With one, the IINTX still lands in the middle of the pack for text and graphics printing. Output quality is good but no match for that of the Qume or the NewGen.

Otherwise, the IINTX provides the features required in a heavy-duty work-group printer. You can install up to 12MB of RAM, and you can daisy-chain up to seven external hard disks to its SCSI interface for storing massive font libraries. The LaserWriter uses the durable Canon SX engine and provides a slot for a 200-sheet paper cassette or a 15-sheet envelope tray. About the only feature missing is a second paper feeder.

Switching between emulations is relatively simple—just type a mode-switching command before printing. But installing the AppleTalk interface is an added hassle, and the printer's lack of front-panel controls or LCD display means that you're printing blind, guided only by a flashing indicator light.

In short, the LaserWriter is expandable and highly capable. But it's no longer the Apple of a PC user's eye.

Kyocera Q-8010

On paper, the Kyocera Q-8010 looks impressive: It's the only printer that includes a math coprocessor to chew on calculation-intensive PostScript operations (such as generating curves), and it offers a creative approach to handling PostScript and HP files. But it's the second slowest printer in the roundup, and its font options are minimal. There just isn't enough here to justify the Q-8010's \$6287 street price.

The 10-ppm Q-8010's print quality is good, but if you're looking for room to grow, you may be disappointed. The Q-8010 offers a maximum of 2MB of available RAM for downloaded fonts, yet there's no SCSI hard disk port, and cartridge options are limited to three typeface families for \$325 each.

The Q-8010 does take a clever ap-

proach to networking. The printer's serial, parallel, and AppleTalk interfaces can each be configured for a different emulation, and all can receive data simultaneously. Switching from PostScript to LaserJet mode requires just a few simple software commands, and the Kyocera is the only reviewed printer that maintains downloaded fonts and macros when you switch emulations. One 250-sheet paper tray and a respectable 10,000-page monthly duty cycle round out the package.

The Q-8010 is a unique machine with

solid networking capabilities. But it lacks the power and expandability to shine as a network PostScript printer.

NewGen TurboPS/480



The RISC-based NewGen TurboPS/480 offers the highest resolution of any printer in this survey and rates near the top in overall speed. With its top-flight output and support for an optional SCSI hard disk, it's worth every penny of its \$6572 street price. The

TONY CARLSON



UPGRADES FOR THE '90S # 2

Keyboard of a Thousand Faces

Finding a keyboard you like is tough enough; finding one that actually evolves as your work changes has been—until now—impossible. But thanks to the crafty folks at Datadesk, there's the Switchboard, a modular keyboard that lets you snap in a trackball, a keypad with 15 function keys, or an IRMA/3270 function keypad. The Switchboard even works with a Mac.

Installation is simple: Open a compartment on the keyboard, set a few DIP switches, and plug the keyboard into your machine. If you want to replace a module or move the installed modules around, just flip up the keyboard, push the appropriate button, and up pops the module. Unplug the data cable, and you're ready to mix and match.

The Switchboard features the famous snappy action you might expect from Datadesk, as well as the ability to swap the <Caps



Pick your module and snap it in—this mix-and-match keyboard accommodates almost any taste.

Lock> and <Ctrl> keys. The company plans to release other modules, including an LCD calculator, a numeric keypad for accountants, a digitizing table, a Dvorak keyboard, and more. List price: \$239.95, trackball module \$149.95, 15-function keypad \$49.95, 3270/Macro Key module \$99.95. Datadesk Int'l, 9314 Eton Ave., Chatsworth, CA 91311; 800/826-5398, 800/592-9602 (California), 818/998-0330 (fax).
—Robert Luhn

Reader service no. 733

NewGen easily rates the Best Buy of the roundup.

The PS/480 uses a proprietary PostScript interpreter, but unlike the Kyocera's, it's fast. The PS/480 placed just behind the Qume CrystalPrint in overall speed—especially impressive, considering that at 800 by 400 dpi it prints nearly twice as many dots on the page as the 600-by-300-dpi Qume. Text printing at the high resolution was less spectacular—the PS/480 finished last—but crank back resolution to 400 by 400, and you can improve speed on long text documents by 50 percent.

The NewGen's output is the best we've seen. NewGen even sells special high-resolution and high-density toner cartridges, for crisper text and graphics and denser black areas. The result is output approaching that of 600-dpi im-



The Qume CrystalPrint Express produces fast, high-resolution output, but don't bother looking for a hard disk interface or font cartridge slots—there aren't any.

POSTSCRIPT REACHES A NEW LEVEL

Lost June, Adobe unveiled PostScript Level 2, a leaner, more capable version of its industry-standard page description language. The new PostScript promises faster output, more memory for downloaded fonts, and the ability to tackle complex graphics that would choke a Level 1 printer. Other enhancements are clearly aimed at making developers' lives easier. Instead of creating functions from scratch (for drawing a box, say), developers can call on functions built into the Level 2 language. PostScript Level 2 drivers also should be easier to write and less prone to error. The end result should be foster programs with fewer bugs. The only catch? The first Level 2 printers won't be available until sometime in 1991.

The bigger question is whether you'll be able to upgrade your current PostScript printer to Level 2. The answer from most vendors is a

cautious maybe. The new PostScript likely will require more ROM chips than many printers have room for, which means you may have to replace the entire printer controller. However, don't turn that old PostScript printer into a boat anchor. Since Level 2 supports all Level 1 commands, your printer can still churn out files from applications that rely on Level 2 drivers. You just won't get the performance gains that a Level 2 printer offers.

At present, how large a speed boost Level 2 will deliver is unknown, and the current version of PostScript can still handle just about any graphic you throw at it. But as your use of complex text and images grows—and as graphics applications are rewritten to take full advantage of PostScript's new capabilities—you may want to move up a level. —D. T.

agesetters for about half the price.

Don't need higher resolution? NewGen also sells RISC-based 300- and 400-dpi printers at prices lower than any of the others reviewed here.

The PS/480 tops out at 5MB of RAM, of which only 1MB is available for downloaded fonts. However, an optional \$149 SCSI interface lets you add a dedicated hard disk. Serial, parallel, and AppleTalk interfaces are standard, as are software-switchable LaserJet, HPGL, and Epson LQ-800 printer emulations. The PS/480's Canon SX engine is rated conservatively at 5000 pages a month, but Hewlett-Packard, which uses a 300-dpi version of the same engine in its LaserJet III, gives it a maximum monthly rating of 16,000 pages—plenty for most network users. One drawback: The lack of a second paper cassette means you might want to buy a third-party sheet feeder.

At this price, the NewGen Turbo-PS/480 sets a new standard for performance and print quality. When you get into this range of resolution, you have more than a printer; you have a network imagesetter—and a *PC World* Best Buy.

PC WORLD TEST REPORT

High-Resolution Printers Trounce 300-dpi Machines

Even at 600 by 300 dpi and 800 by 400 dpi, respectively, the Qume and NewGen PostScript printers easily outperform the competition when printing complex graphics, thanks to their super-fast RISC processors.

■ Best Buy

WordPerfect long document

Qume CrystalPrint Express	124
QMS-PS 820 Turbo	172
Apple LaserWriter IINTX	176
TI Omnilaser 2115	231
Kyocera Q-8010	241
NewGen TurboPS/480	254

seconds 0 65 130 195 260

PageMaker

Qume CrystalPrint Express	118
QMS-PS 820 Turbo	133
NewGen TurboPS/480	149
Apple LaserWriter IINTX	212
Kyocera Q-8010	221
TI Omnilaser 2115	250

seconds 0 65 130 195 260

Methodology

Benchmarks were conducted using a 12-MHz Compaq Deskpro 286 Model 40 equipped with 640K of conventional RAM and 2MB of extended RAM. The Apple LaserWriter IINTX was tested attached to a LocalTalk card; if the printer were connected serially, the benchmark times would be two to three times slower. The Qume CrystalPrint Express and the NewGen TurboPS/480 were tested at their highest resolution settings. All the test files were printed to disk and then copied to the printer from a 2MB extended-memory RAM disk. Timing began when the print command was issued, and ended when the last page came to rest in the output tray. Print times for text and TIFF files were 5 to 10 percent faster for all printers the second time the same print job was run.

WordPerfect long document

An entire 20-page WordPerfect 5.1 document that contains multiple types and sizes of fonts, two tables, single- and double-line draw characters, and shading is printed.

Ventura Publisher

Qume CrystalPrint Express	104
NewGen TurboPS/480	110
QMS-PS 820 Turbo	136
Apple LaserWriter IINTX	171
Kyocera Q-8010	254
TI Omnilaser 2115	305

seconds 0 75 150 225 300

Corel Draw

Qume CrystalPrint Express	113
NewGen TurboPS/480	227
QMS-PS 820 Turbo	411
Apple LaserWriter IINTX	419
Kyocera Q-8010	422
TI Omnilaser 2115	1321

seconds 0 330 660 990 1320

PageMaker

A one-page PageMaker 3.0 newsletter containing multiple types and sizes of fonts, charts, tables, and a TIFF file is printed.

Ventura Publisher

A Ventura Publisher 2.0 page that includes a scanned image, bar charts, line drawings, and text set in various sizes of Helvetica is printed.

Corel Draw

A page created in Corel Draw 1.2 consisting of samples of complex, detailed, highlighted, and shaded clip art is printed.



Data based on tests designed and conducted by National Software Testing Laboratories (NSTL), Conshohocken, PA 19428. All rights reserved.

QMS-PS 820 Turbo

QMS's top-of-the-line PS 820 Turbo fulfills all the requirements for a network printer and then some. It sports a fast processor, good output, and the Adobe stamp of approval. If you must have an Adobe-licensed printer, this \$5874 model is the choice—but it can't match the NewGen's output quality.

Thanks to a 20-MHz Motorola 68020 processor, the PS 820 vied with the NewGen TurboPS/480 for second place

in overall speed, and even bested it in text printing. (Note, however, that the NewGen prints at better than three and a half times the PS 820's resolution.)

The QMS comes with 39 fonts (the standard 35 plus a Helvetica Condensed family) and 2MB of RAM, expandable to 8MB. As with the LaserWriter, a SCSI hard disk interface is standard. And the PS 820 Turbo has what the LaserWriter lacks: a parallel port to go with its serial and AppleTalk interfaces.

The QMS emulates HPGL plotters as well as the LaserJet; both are software selectable. The PS 820 Turbo is fairly easy to set up and operate, but you'll have to place a MODE=LPT1:,P command in your AUTOEXEC.BAT file—something not mentioned in the manual. Dual 200-sheet paper-tray options and a 10,000-page monthly duty cycle solidify its position as a durable network printer.

The QMS-PS 820 Turbo is probably

the fastest Adobe PostScript printer available in this price range, with all the features required for network use. Although it can't match the speed of the RISC-based printers, if guaranteed PostScript compatibility is your primary concern, the QMS is a good buy.

Qume CrystalPrint Express

The high-resolution Qume CrystalPrint Express is one of the fastest PostScript printers you'll find anywhere, and at an estimated street price of \$4293 it's the least expensive printer in the roundup. But its lack of font expandability and hard disk options pushes it out of the winner's circle.

With a Weitek RISC chip and a proprietary PostScript interpreter, the 12-ppm Qume CrystalPrint Express blazed through all our speed tests, finishing first at both 300-dpi and 600-by-300-dpi resolutions. Although the printer does a poor job of printing reversed text, print quality at Qume's highest resolution was generally superior to all but the NewGen's output.

The CrystalPrint Express comes with 39 fonts (the standard 35 plus Helvetica Light & Black) and 3MB of RAM, expandable to 8MB. But there are no provisions for auxiliary font storage, on either font cartridges or an optional hard disk, which is almost mandatory with a heavy-duty network printer.

The CrystalPrint Express has all the other essential network features: serial, parallel, and AppleTalk interfaces, dual 250-sheet paper cassettes, and a 10,000-page duty cycle. Its LaserJet emulation is especially impressive, offering 31 *scalable* typefaces and the ability to rotate text. Qume also claims the printer will return automatically to PostScript mode after a LaserJet document is printed. Unfortunately, we couldn't get this feature to work. Qume says the problem should be solved by the time you read this, which should make the CrystalPrint Express a formidable network printer indeed.

The CrystalPrint Express has most



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Be forewarned: The Expanz needs another round of tweaking before it's ready for the mass market. Although installation is relatively painless and the board works transparently, it balks at Compaq DOS 3.31, DOS 4.xx, and bootable disk partitions exceeding 32MB. And while Ex-



Scrounging for megabytes? The Expanz card can double or triple storage—and you just plug it in.

panz's data compression technique won't slow your drive down, performance will degrade over time because the board doesn't work with disk optimizers, defraggers, or unerase/unformat utilities. The Expanz can be a space saver: Just make sure you can live within its limits. List price: \$199. InfoChip Systems Inc., 2840 San Tomas Expwy., Santa Clara, CA 95051; 800/447-0200, 408/727-4190 (fax). —Robert Luhn

Reader service no. 732

of the qualifications for a network PostScript printer, including outstanding speed and an excellent price, but it stumbles in font handling and emulation switching. It's a good buy, but not the best.

Texas Instruments OmniLaser 2115

With a brawny 15-ppm Ricoh engine and robust paper handling, the \$6398 TI OmniLaser 2115 seems like the ideal network printer. Unfortunately, under

the hood of this Cadillac-priced printer is a Volkswagen motor. The OmniLaser is fine when printing long stretches of text, but it has a hard time making it up those steep graphics hills. Sleeker PostScript models have passed it right by.

Powered by a lightweight 10-MHz Motorola 68000 processor, the OmniLaser pushes out multiple pages of text reasonably fast but finished dead last in printing graphics. Output quality was good, but the printer itself was temperamental: Sometimes a document would print out, other times it would disappear

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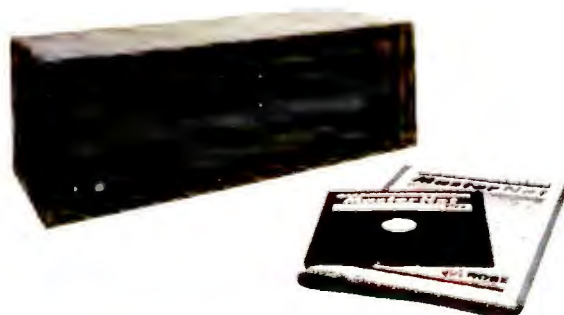
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EXECUTIVE SUMMARY

NewGen PS/480: Fast, Fabulous PostScript Output

The best of these PostScript printers offers speed, super resolution, and the power to handle heavy-duty work loads.

Now that most word processors and graphics packages support PostScript, you can buy a network-duty PostScript printer and give your whole work group easy access to scalable fonts and sophisticated graphics. That's good news if your office relies on Windows, OS/2, or anything else graphical. And thanks to recent improvements, you don't have to settle for slow print speed or ho-hum 300-dpi resolution.



NewGen's Turbo PS/480 easily captures the Best Buy ribbon, based on a combination of outstanding print quality (800 by 400 dpi), performance, and PostScript compatibility. The printer also features good font options, including an optional hard disk interface and the hardy Canon SX engine. The Qume CrystalPrint Express offers the fastest output, 39 internal fonts, and up to 8MB of RAM—but it can't match the Turbo PS/480's print quality or font options.

	Apple LaserWriter IINTX	Kyocera Q-8010	NewGen Turbo PS/480	QMS-PS 820 Turbo	Qume CrystalPrint Express	TI Omniscan 2115
Performance	Fair	Fair	Excellent	Good	Excellent	Poor
Print quality	Good	Good	Excellent	Good	Good	Good
Font options	Excellent	Fair	Excellent	Excellent	Fair	Fair
Paper handling	Fair	Fair	Fair	Good	Excellent	Good
LaserJet emulation	Good	Good	Fair	Good	Fair	Good
Installation and maintenance	Fair	Good	Good	Good	Good	Fair
Price	Excellent	Fair	Fair	Good	Excellent	Fair
Overall value	Good	Fair	Excellent	Good	Good	Fair
			BEST BUY			
Reader service no.	795	796	797	799	800	801

How we rate PostScript printers
We rate these printers based on information in the Features Table and the PC World Test Report, combined with our opinions of quality, reliability, and user benefit.

Performance measures overall speed in printing a variety of text and graphics files. Performance is the primary consideration for heavy-duty PostScript printers. The printers that require the least amount of time to print the files receive an Excellent rating.

Print quality is a subjective analysis of how good the output looks. To receive an Excellent rating, the printer must produce sharp fine lines and crisp text free from jagged edges. Black areas must be solid black, with no signs of smearing or fading, and white text on a black background should be sharp and easily readable. Special consideration is given to the crispness of the text and images produced by printers exceeding 300-dpi resolution.

Font options rates the number and availability of printer fonts. An Excellent rating in font handling means the printer provides the minimum 35 standard PostScript internal typefaces plus support for Adobe Type 1 soft fonts, sufficient RAM capacity for downloading at least two additional typeface families, and a hard disk interface for auxiliary font storage.

Paper handling refers primarily to paper capacity plus expansion options. An Excellent printer must handle letter- and legal-sized paper, envelopes, and labels, and provide two easily refilled paper cassettes with at least 200 sheets each for network operation.

LaserJet emulation measures the printer's ability to imitate a LaserJet Series II and switch between emulations. An Excellent printer should provide flawless LaserJet emulation, display the current mode on an LED panel, and switch automatically

between PostScript and LaserJet modes. Because none of the printers provides automatic switching, no Excellent rating was awarded.

Installation and maintenance is a subjective evaluation of how easy it is to set up and operate the printer, and of the printer's ability to handle a heavy work load. An Excellent printer provides front-panel controls and an LED display, easy access to consumables and memory slots, good documentation, and a monthly duty cycle of at least 10,000 pages.

Price ratings are awarded by calculating the standard deviation from the average street price.

Overall value weighs all of the above criteria, plus the price of the printer.

into a digital black hole.

The TI's font options also leave you wanting. You're stuck with 3MB of RAM maximum, there's no hard disk option, and though two cartridge slots are provided, you get only one typeface family per \$329 cartridge—hardly a bargain.

On the bright side, the TI is a rugged machine with great paper-handling options, though it won't accept envelopes. It features an impressive 25,000-page duty cycle and comes with dual 250-sheet paper cassettes you can fill without having to remove them from the

printer. Parallel, serial, and AppleTalk interfaces are standard, and the printer provides a broad range of printer emulations, including a flawless PCL 4.

The OmniLaser was one of the first PostScript printers available for the PC, and it's showing its age. At press time, TI was readying a 16-ppm version of its 68000-based MicroLaser that will list for about \$4000.

The Most Printer for the Money

All the printers in this roundup proved adequate to the task of producing qual-

ity PostScript output, but only a handful had the muscle to meet the heavy demands of network printing. The TI OmniLaser 2115 and the Kyocera Q-8010 are both too slow, and even the Apple LaserWriter IINTX falls short in some key performance areas.

If it's a matter of Adobe or die, the QMS-PS 820 Turbo is an excellent machine that's quite fast. Still, it's no match for the Qume CrystalPrint Express or the NewGen TurboPS/480 in either speed or output quality. While the Qume has a slight edge in performance

and price, the NewGen combines excellent speed and font handling with the highest resolution you can buy in this price range. For graphical computing in the nineties and beyond, the Best Buy PS/480 has the stuff to make your documents shine. ●

Ross Smith is a freelance writer and an electronic publishing consultant. His latest book, Learning PostScript: A Visual Approach, is available from Peachpit Press. Daniel Tynan is an associate editor for PC World.

WHERE TO BUY

Apple LaserWriter IINTX

Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
408/996-1010
LIST PRICE: with 6MB RAM, letter- and legal-sized paper trays, serial, AppleTalk, and SCSI ports \$7087
ACCESSORIES: 200-sheet paper trays \$89 each, 15-sheet envelope feeder \$89; 1MB RAM \$299, 4MB RAM \$999; integrated toner/drum/developer unit \$129; 20MB SCSI hard disk \$699, 40MB SCSI hard disk \$1299, 80MB SCSI hard disk \$1799
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
Reader service no. 795

Kyocera Q-8010

Kyocera Electronics, Inc.
100 Randolph Rd.
Somerset, NJ 08873
201/560-0060,
201/560-8380 (fax)
LIST PRICE: with 5MB RAM, letter- and legal-sized paper trays, parallel, serial, and

AppleTalk ports \$7074
ACCESSORIES: 250-sheet letter-sized paper tray \$62.95, legal- or A4-sized paper trays \$78.95 each, B5-sized paper tray \$131.95; 1000-sheet letter-sized paper feeder \$895, legal-sized adapter kit \$95; toner cartridge \$36.95, drum \$179.95, developer \$169.95; 1MB RAM \$520; Swiss 721, ITC Garamond, ITC Korinna font cards \$325 each
WARRANTY: 90 days parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: toll-free number, M-F 7-6
OTHER SUPPORT: BBS
Reader service no. 796

NewGen TurboPS/480

NewGen Systems Corp.
17580 Newhope St.
Fountain Valley, CA 92708
714/641-8600,
714/641-2800 (fax)
LIST PRICE: with 5MB RAM, letter- and legal-sized paper trays, parallel, serial, and AppleTalk ports \$7584

ACCESSORIES: 200-sheet paper trays \$89 each, 15-sheet envelope feeder \$89; SCSI interface \$149; standard high-resolution cartridge \$195, high-density toner cartridge \$195, integrated toner/drum/developer unit \$129
WARRANTY: 12 months parts and labor, carry-in (on-site service optional)
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll-free number, M-F 7-6
OTHER SUPPORT: BBS, CompuServe, and AppleLink forums
Reader service no. 797

QMS-PS 820 Turbo

QMS, Inc.
One Magnum Pass
Mobile, AL 36618
800/631-2692,
205/633-9064 (fax)
LIST PRICE: with 4MB RAM, letter- and legal-sized paper trays, parallel, serial, AppleTalk, and SCSI ports \$7565
ACCESSORIES: 200-sheet paper trays \$75 each, 15-sheet envelope feeder \$75; 1000-sheet paper feeder \$795; 2MB RAM \$995, 4MB RAM

\$1495; toner/drum/developer unit \$130; 20MB SCSI hard disk \$999, 40MB SCSI hard disk \$1499
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll number, M-F 8-5
OTHER SUPPORT: none
Reader service no. 799

Qume CrystalPrint Express

Qume Corp.
500 Yosemite Dr.
Milpitas, CA 95035
800/223-2479,
408/942-4052 (fax)
LIST PRICE: with 3MB RAM, letter- and legal-sized paper trays, parallel, serial, and AppleTalk ports \$5724
ACCESSORIES: 250-sheet legal-sized paper tray \$69; toner cartridge \$27
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: toll-free number, M-F 7-5
OTHER SUPPORT: none
Reader service no. 800

Texas Instruments OmniLaser 2115

Texas Instruments Inc.
Information Technology Group
P.O. Box 202230
Austin, TX 78720
800/527-3500
LIST PRICE: with 3MB RAM, letter- and legal-sized paper trays, parallel, serial, AppleTalk, and RS422 ports \$8064
ACCESSORIES: 250-sheet paper trays \$69 each; toner kit with two cartridges \$79, master toner pack with 24 cartridges \$948; Lubalin Graph, Souvenir, and Garamond PostScript font cartridges \$329 each
WARRANTY: 12 month parts and labor carry-in; 90 days parts and labor on-site, or 36,000 pages, whichever comes first
EXTENDED WARRANTY: on-site or carry-in
TECHNICAL SUPPORT: toll number, M-F 8-5
OTHER SUPPORT: none
Reader service no. 801



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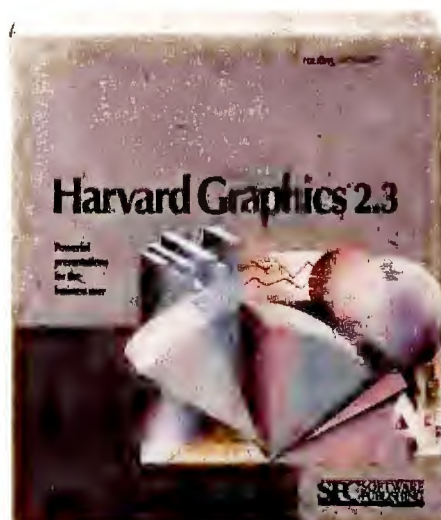
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HARDWARE SPECIAL ISSUE

Seven SX Laptops: Windows for the Road

Now you can take it with you. Seven SX laptops offer speed, displays, and hard disks suitable for wandering Windows users.

John Diebold



Laptops such as our Best Buy, Toshiba's T3100SX, are sufficiently powerful for Microsoft Windows, yet small enough to make suitable flying companions.



With the smallest footprint of the bunch, Compaq's SLT 386s/20 leaves room for a mouse, even on an airline tray. It's fast too, but the \$6318 estimated street price is high.

Not so long ago, only a masochist would have wanted to run *Windows* on a laptop. Gazing at a grainy image while waiting for *Excel* to repaint the screen was few users' idea of fun. But today, thanks to better displays, fast 386SX CPUs, and smaller, more efficient hard drives, opening *Windows* on the road is a reasonable option.

What do you need to take *Windows 3.0* for a ride? Most important, you need 4MB or more of CPU-speed RAM, good VGA graphics with 16 easily definable shades of "gray," and enough speed to keep *Windows* moving. Naturally, any laptop (whether running *Windows* or not) should be small and light and run at least 2 hours on its batteries. The hard disk should hold at least 40MB, with larger disks available if and when you need them (see the sidebar "Buying Smart" for more details).

You'll also need a serial port for your mouse or trackball; so far, bus mice are solely a desktop option, although some forthcoming laptops will pack PS/2 mouse ports or other options (see the sidebar "Portable Pointers"). Fortunately, serial ports are no problem: All these laptops have at least one.

PC World took a close look at seven

Windows-capable 386SX laptops. In order to help you draw useful comparisons between these machines, we configured and priced each of them with a VGA display, an internal modem, a built-in floppy drive, a 40MB hard disk (or the next larger available size), and at least 4MB of RAM. We timed how long these computers would run before their batteries ran out, and we weighed them

with all the paraphernalia you need when traveling. Finally, to find out what you'll really pay for these computers, we averaged street prices from more than 80 stores across the country.

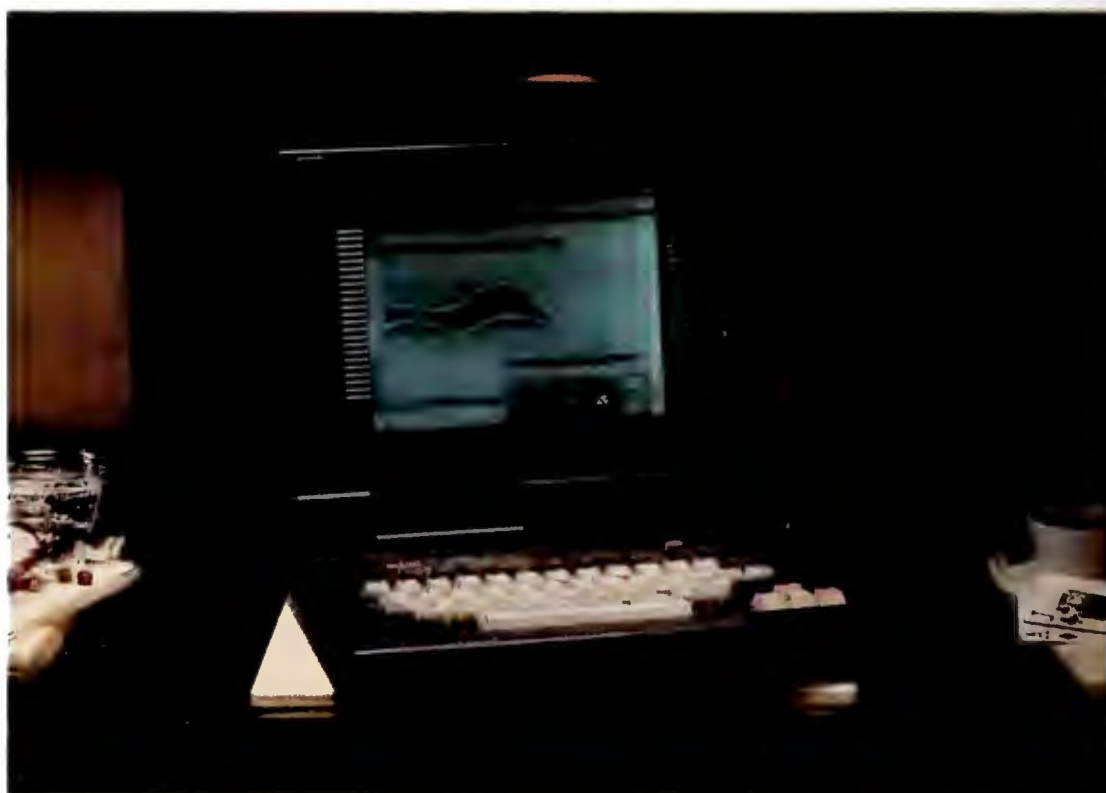
Toshiba's T3100SX won Best Buy honors for its long-lasting twin batteries, crystal-clear gas plasma display, high RAM capacity, and reasonable price. With a laptop like this, you need never leave *Windows* behind.

Compaq SLT 386s/20

PROS: Top speed, compact, long battery life, high memory capacity

CONS: Expensive, limited shades of gray

If you like your laptops small and fast, the diminutive SLT 386s/20—the only 20-MHz SX laptop available at press time—is the one you're looking for. It leads in memory capacity (you can stuff this powerhouse with 14MB of RAM) and is near the top in battery life. In fact, we ran it for nearly 3 hours in "normal mode" (with battery-saving features disabled). But the display has limited capabilities, and the estimated \$6318 street price is the second highest in the roundup. (Because the 386s/20



At \$4078, Dell's 316LT costs less than the competition, but its bulky size, relatively heavy weight, and short battery life make it a demanding traveling partner.

BUYING SMART: CHOOSING A WINDOWS MACHINE TO GO

If you simply run into your local Computers-R-Us store, plunk down a wad of cash, and ask for their best SX laptop, you'll probably live to regret it. But if you know what you're looking for and check out each model carefully, you'll get a good computer at a good price.

Memory Capacity Multitasking environments need a lot of RAM. When they don't get it, they swap programs to the hard disk, dragging down performance and battery life. An increase in RAM will reduce disk use, speed up Windows' performance, and provide a net increase in battery life.

Four megabytes of CPU-speed RAM (placed on the motherboard or in a high-speed slot) is probably adequate for most Windows users today, but if you plan on keeping your laptop for at least five years you'll want the option to expand it to 8MB or more.

Screen The G in GUI stands for graphic. Because Windows and its applications use complex screens, making full use of shape and color to convey information, they place severe demands on laptop displays. Look for a screen with VGA resolution, 16 discernible shades of gray within Windows, and an aspect ratio (width to height) that renders circles round and boxes square.

LCD displays can't turn pixels on and off quickly. As a result, text and graphics tend to fade slowly in and out. This can be really annoying when you move your mouse quickly and the on-screen arrow disappears. If you're buying an LCD laptop for Windows, try to arrange a pre-sale mouse demonstration. Or you can avoid the whole issue and go for the clearer, sharper image and quicker rewrite of a gas plasma display.

Performance Because they paint the screen pixel by pixel, GUIs run slower than text-based programs. Multitasking environments, in which the CPU handles several programs at once, are also slow. Hence, a multitasking GUI like Windows will crawl on a slow computer. The moral: Fast is good; fastest is best.

Portability Portability simply means weight and size. Even with a battery, an AC adapter/charger, power cables, and a carrying case, you shouldn't have to lug around more than 20 pounds. If your laptop is much larger than 500 cubic inches, it will be a hassle finding room for it on an airline table or under the seat.

Battery Life To keep you working longer, most laptops let you lower the backlighting, and they offer a power conservation mode that temporarily turns off power-consuming devices like hard disks and modems. But some components restart slowly, and no one likes a dim screen, so consider how long a laptop runs without such power-saving strategies. Two hours of battery life is the bare minimum you should accept.

When it's time to recharge, an indicator showing that battery charging is actually taking place is essential. Even better is a signal when charging is complete. Also worthwhile: the ability to change batteries without shutting down your laptop.

Keyboard The need for compactness always forces some compromises, but the closer a keyboard gets to the standard layout, the better. A separate numeric keypad is too much to expect, but you should demand 12 dedicated function keys, a set of cursor keys in the standard inverted T, and page control

keys in more or less the usual locations.

Expandability Considering the enormous storage requirements of Windows and its applications, the bigger your hard disk, the better. Even if you can't afford a big disk now, you don't want to be limited in the future. Look for laptops with at least 80MB or 100MB hard disk upgrade option.

Laptops don't offer much in the way of on-board slots, but some manufacturers have found room to squeeze one in. If you decide to add on ethernet or fax card somewhere down the line, you'll appreciate a slot to slide it into. An industry-standard slot will give you more choices than a proprietary slot.

Design and Construction A well-built laptop should be rugged without being too heavy. Look for lids and covers that don't fall off, a carrying handle that feels secure (and folds or slides out of the way when not in use), and a hinge sturdy enough that the display stays where it's put when opened.

Service and Support One-year warranties are standard, and you should accept nothing less. Telephone technical support—preferably toll-free—is a must. If support is offered only through dealers, make sure you can get it at any authorized store, not just the one where you bought your laptop, as service away from home is especially important.

To check the quality of support offered, we made a series of calls to the technical hot lines of manufacturers that offer direct support. We got prompt and courteous support from all of them. Such consistency cannot be guaranteed, however, when support is available through dealers. —J. D.

FEATURES EVALUATION

Toshiba Presses All the Right Buttons

Deeply discounted at many stores, Toshiba's T3100SX offers a large memory capacity, a gas plasma display, and excellent battery handling at a reasonable street price. Compaq's SLT 386s/20 is faster and more portable, but its street price is high and its screen has 8 instead of the usual 16 gray shades.

- Yes
○ No
◐ Deficient

	Compaq SLT 386s/20	Dell 316LT	Epson Equity LT-386SX	Grid 1450X	NEC ProSpeed 386SX	Toshiba T3100SX	Zenith SuperPort SX
Standard features							
Street price ¹	\$6318 ²	\$4078	\$4621	\$8345 ³	\$5169	\$5264	\$5039 ³
List price ¹	\$9026 ²	\$4078	\$6795	\$8345 ³	\$9026	\$9446 ³	\$7555 ³
CPU speed (MHz)	20	16	8/16	16	16	16	8/16
CPU-speed RAM capacity	14MB	8MB	4MB	5MB	9MB	13MB	8MB
Screen							
Type	LCD	LCD	LCD	LCD	LCD	plasma	LCD
Size (inches)	7 3/4 x 5 3/8	7 3/4 x 5 3/8	8 1/4 x 6 1/4	7 3/4 x 5	7 1/2 x 5 3/8	7 3/4 x 5 3/8	8 x 6
Portability							
Traveling weight (pounds) ⁴	18.6	20.4	22.7	13.3	22.1	18.9	18.6
Volume (cubic inches)	459	591	613	489	634	556	585
Battery life							
With power-saving features enabled (hours:minutes)	3:50	2:00	2:50	2:20	2:30	3:20	4:00
With power-saving features disabled (hours:minutes)	2:55	1:40	2:20	2:05	1:50	3:05	3:05
In-use battery change	○	●	○	○	○		○
Charger indicates charge in progress	●	○	●	●	●		○
Keyboard							
Dedicated cursor keys in inverted T	●	●	●	●	●		●
Dedicated page control keys	○	●	●	●	●		○
12 dedicated function keys	●	●	●	◐ ⁵	●		◐ ⁵
Expandability							
Standard 8/16-bit slots	0	0	1 ⁶	0	0	0	0
Standard 8-bit slots	0	1 short	0	0	0	0	0
Proprietary slots ⁷	0	0	0	0	1	1	0
Largest hard drive available	120MB	40MB	40MB	40MB	100MB	80MB	120MB
Service and support							
Warranty period (months)	12	12	12	12	12	12	12
Free on-site service	◐ ⁸	●	○	○	○	●	○
Central toll-free support number	○	●	○	●	○		○
Daily support (hours)	◐ ⁸	7-7	7-5	6-5	8:30-5:30	7-5	◐ ⁸
Weekend support	◐ ⁸	○	○	○	○	●	◐ ⁸
Central BBS	○	●	●	○	●		●
Central tech support fax number	○	●	○	●	○	●	○

¹ Price based on 4MB RAM, 40MB hard drive, DOS 3.3 or later version, 2400-bps internal modem, carrying case (except as noted).

² With 60MB hard disk.

³ With 5MB of RAM.

⁴ Including battery, carrying case, modem, AC adapter, and cables.

⁵ <F11> and <F12> not dedicated.

⁶ 3 1/2 length.

⁷ Dedicated RAM or modem slots not included.

⁸ Via dealer; may vary locally.

**BEST
BUY**

was not yet in stores at press time, we estimated the street price from discounts on other Compaqs.)

The SLT's 18.6-pound weight is lighter than most, but it's the compact size that makes this machine exceptionally portable. The 386s/20 is right at home on an airline tray table—you may even have enough room left for a mouse. But even though the display is pretty, this is the only laptop in the roundup that limits you to eight shades of gray.

There are no internal slots, but you can buy the SLT with a 120MB hard disk; no one offers a larger one, and the optional \$999 expansion chassis holds two standard 8/16-bit cards. You can detach the SLT's keyboard from the main unit to find a more comfortable place for it, but it has no dedicated page control keys, and the touch is soft.

Compaq handles service and support via dealers, but your warranty will be honored by Compaq dealers worldwide. Although the quality of service may change with location, Compaq dealers generally offer good support.

It all boils down to this: If you can stomach the high cost, you'll find the SLT 386s/20 more than satisfying, screen shortcomings notwithstanding. With dazzling performance, first-rate RAM capacity, and great portability, this Compaq may be all the computer you need, even at the office.

Dell 316LT

PROS: Very inexpensive, in-use battery change, fast

CONS: Heavy, bulky, short battery life

You can buy a 316LT—in the *PC World* configuration—direct from Dell for \$4078, the lowest street price of any laptop here. It did very well in our benchmarks, and its display and 8MB RAM ceiling are perfectly acceptable. The fine keyboard has dedicated page control keys and an excellent touch. But the machine's 20 pounds and 591 cubic inches make it a burden to carry.

The 316LT's battery is a good news/bad news situation. The good news is the light (1.7-pound) battery pack, which you can replace while an internal backup keeps the laptop going. The bad news is that battery life is short—we were able to keep the 316LT going for only an hour and 40 minutes—and there's no way to tell that the AC adapter is actually doing anything.

Dell's customer service policies are

the best in the business. You get free on-site service for the life of the warranty; a BBS; free, automated phone-for-a-fax service; and a toll-free support number that's staffed 12 hours a day.

While the 316LT is something of a heavyweight, its low price, solid keyboard, clear display, and respectable 8MB RAM capacity make it a very good (though not-so-portable) vehicle for GUIs on the go.



UPGRADES FOR THE '90S #4

True-Blue PostScript on the Cheap

If you love your LaserJet Series II but hunger for fonts-fonts-fonts, don't despair. With Adobe's new PostScript Cartridge, you get real (not just compatible) PostScript power for your printer. Plug this cartridge into your Series II's left slot, and you suddenly have a LaserWriter IINT at your command, complete with 11 scalable Adobe typefaces and four variants thereof; the ability to skew, rotate, and otherwise manipulate type and graphics; and surprisingly fast output—all for \$495. However, unlike JetWare's cartridge, Adobe's offering won't work in the Series IIP, IID, or III.

You even get matching screen fonts for *Ventura Publisher* and *Microsoft Windows* plus *LaserTool's Printer Control Panel*, which boosts output speed and automatically switches the LaserJet between PostScript and HP modes. Physically installing the cartridge is a snap, but installing the necessary utilities and generating screen fonts for



Adobe's cartridge isn't easy to install, but the output is fast and sharp, and the price is right.

Windows and *Ventura* is a convoluted process.

Luckily, configuring your program for PostScript printer output is pretty straightforward. With *Windows* and most DOS programs, you simply use a PostScript printer driver. Once you're set up, printing is transparent and surprisingly fast. Getting there isn't much fun, but the end result is a dream. List price: \$495, additional font cartridges \$395. Adobe Systems Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039-7900; 800/344-8335. —Robert Luhn

Reader service no. 725

PC WORLD TEST REPORT

Compaq Comes In a Lap Ahead

As you'd expect, the 20-MHz Compaq SLT 386s/20 beats all the 16-MHz laptops hands down. Among the 16-MHz machines, none establishes a clear performance advantage, although the Grid 1450SX and the Dell 386LT come out ahead when test results are combined.

■ Best Buy

Microsoft Word

Compaq SLT 386s/20	373
Toshiba T3100SX	562
Zenith SupersPort SX	615
Dell 316LT	616
Grid 1450SX	632
Epson LT-386SX	673
NEC ProSpeed 386SX	755

seconds 0 160 320 480 640 800

dBASE III Plus

Compaq SLT 386s/20	203
Grid 1450SX	260
Zenith SupersPort SX	350
Epson LT-386SX	356
NEC ProSpeed 386SX	425
Dell 316LT	454
Toshiba T3100SX	730

seconds 0 150 300 450 600 750

1-2-3

Compaq SLT 386s/20	104
Dell 316LT	162
Zenith SupersPort SX	165
Grid 1450SX	166
Toshiba T3100SX	166
Epson LT-386SX	200
NEC ProSpeed 386SX	202

seconds 0 40 80 120 160 200

Methodology

All the computer systems were tested with a 256K extended-memory disk cache except in the *Excel under Windows 3.0* and the *1-2-3* tests. Systems were tested with the following amounts of RAM: Compaq SLT 386s/20, Dell 316LT, Epson LT-386SX, and NEC ProSpeed 386SX, 4MB; Grid 1450SX, Toshiba T3100SX, Zenith SupersPort SX, 5MB. Every computer was tested with the vendor's version of DOS, and each system had a 40MB hard disk except the Compaq SLT 386s/20, which had a 60MB hard disk.

Microsoft Word 5.0

Microsoft Word loads and quits the program, loads a document 50 and then 100 times, block copies the entire document 100 times, performs multiple search-and-replace operations, and repaginates and checks the spelling of a 90-page document. The document is scrolled in both graphics and text mode, saved 25 times, and printed to an output file. Although the results of the benchmark depend primarily on processor and memory access speeds, display adapter and hard disk speeds are also contributing factors.

AutoCAD

Dell 316LT	435
Grid 1450SX	466
Toshiba T3100SX	499
NEC ProSpeed 386SX	544
Epson LT-386SX	602
Compaq SLT 386s/20	709
Zenith SupersPort SX	1125

seconds 0 230 460 690 920 1150

Excel under Windows 3.0

Compaq SLT 386s/20	514
Zenith SupersPort SX	814
Toshiba T3100SX	834
Dell 316LT	837
Grid 1450SX	846
NEC ProSpeed 386SX	996
Epson LT-386SX	1013

seconds 0 205 410 615 820 1025

dBASE III Plus 1.1

The *dBASE III Plus* test measures the time required to process a batch of 250 transactions. Each transaction consists of updating a record in the Accounts, Teller, and Branch files and in an indexed History file. In this benchmark, which uses a disk cache, sequential read performance becomes more important than random access.

1-2-3 2.01

In this benchmark, a 1-2-3 macro executes a series of recalculations using five different formulas within a 75-by-75-cell matrix. Because there are few screen updates and no disk access is required, the results depend almost entirely on processor and memory access speeds.

AutoCAD 10

In this benchmark, a three-dimensional sample drawing is retrieved and displayed from multiple perspectives. A 3-D array is created using an AutoLISP routine, new elements are introduced, and a drawing is generated with filling on and off. The results of the test depend primarily on the speeds at which the processor and coprocessor operate and at which memory is accessed. The performance of the display adapter and of the hard disk also have same effect.

Excel under Windows 3.0

In this benchmark, *Excel 2.1c* running under *Windows 3.0* executes these operations: transcendental calculations; cuts and pastes; charting; inserts and deletes; financial calculations; array functions; data base functions on a 100K, 500K, and 1500K data base; file operations; defined functions; and a large recalculation. The results for this benchmark depend primarily on processor and memory access speeds.



Data based on tests designed and conducted by National Software Testing Laboratories (NSTL), Conshohocken, PA 19428. All rights reserved.

Epson Equity LT-386SX

PROS: Removable hard drive, low price

CONS: Heavy, bulky, low memory capacity

At 23 pounds, this \$4621 machine (estimated street price) is the heaviest laptop reviewed. Moreover, its CPU-speed RAM tops out at a cramped 4MB. Display, battery life, and performance are acceptable but not outstanding. On the bright side, it has a removable hard drive (see *Product Outlook*, September 1990) and a standard 8/16-bit short slot.

The removable drive (20MB and 40MB versions are available) will come in handy if you need to lock your data in a safe or exchange large files with other LT-386SX users. The keyboard has a clacky feel, and while there *are* dedicated page control keys, and cursor keys in an inverted T, their nonstandard placement in the upper right corner will slow you down. As with the Compaq, support is handled directly through dealers, so the quality may vary.

Unless you must keep your hard disk and laptop separate, the Epson's only exciting feature is its low price. And you may be able to get the Dell for less.

Grid 1450SX

PROS: Small, fast, lightest in roundup

CONS: Expensive, low RAM capacity

You can easily take this small, fast, extremely light, well-built laptop anywhere business sends you, but you'll pay a high price for the privilege. At \$8345 (direct from Grid, in the *PC World* configuration), this is by far the most expensive laptop we looked at.

When it comes to portability, nothing beats the 1450SX's 13.3-pound weight and small size. This Grid's fast too, coming in first or close to first among the 16-MHz machines in most of our speed tests. The screen is clear and readable but not outstanding, and the 2 hours

plus of battery life is adequate. The big disappointment—aside from the high price—is the RAM capacity; you'll never get more than 5MB into this PC.

Grid occasionally offers discounts of 15 or 20 percent, so you may be able to get the pricey 1450SX for less than list. If portability is your main criterion in an SX laptop, the Grid is well worth considering. But if you want a machine for running *Windows*, look for one with a higher RAM ceiling.

NEC ProSpeed 386SX

PROS: 100MB hard disk option

CONS: Heavy, slow, low RAM capacity

The 22-pound ProSpeed 386SX falls down in several important areas. If you want to install more than 4MB of CPU-speed RAM, you'll need to use its one and only (proprietary) expansion slot—and even then you can get up to only



UPGRADES FOR THE '90S #5

The Palm-Sized Hard Disk

Plus Development's Hardcard proved that a hard disk doesn't have to be big and noisy. Disktec has taken this less-is-more approach to its logical extreme and produced the Disctec RHD 20, a minuscule, removable, 23ms 20MB hard disk that weighs only 7 ounces and needs only 1 watt but can take an amazing 100 g's of nonoperating shock. It's the perfect storage fix for anyone who has a laptop computer (such as a Toshiba 1100+ or Compaq LTE/286) or needs a hard disk that can be moved easily from machine to machine.

Although the Disctec is a deal compared to heftier totable drives like the Passport or Personal Data Pac, it's not much fun to install. You have to change jumpers, use FDISK, wrangle with the Disctec's confusing installation program, and dig through a manual larded with technical minutiae and conflicting instructions. A PC veteran can probably install and format



The Disctec is tough and small, and you can plug it into any laptop or PC via a cheap docking bracket.

the beast in about an hour.

Once tamed, the Disctec purrs like a kitten and travels like a champ. Just pluck the drive out of your PC, drop it into your briefcase, take your cross-country flight, and slide it into PC at the other end that's equipped with a Disctec docking bracket. This is as portable as computing gets. List price: \$595, docking bracket \$65 to \$100. Disk Technologies Corp., P.O. Box 1750, Winter Park, FL 32790; 800/553-0337, 407/628-4404 (fax). —Robert Luhn

Reader service no. 731

EXECUTIVE SUMMARY

Power, RAM, and Good Looks: Toshiba T3100SX

A great keyboard, room for plenty of RAM, and a fast, bright display turn out to be a winning combination.

All these laptops offer VGA displays, 40MB or larger hard disks, and at least 4MB of RAM capacity, making them reasonable choices for Windows users on the go. But not all flat-screen VGA displays are equal, and some laptops offer exceptional storage and RAM expansion. Portability, battery life, and performance also vary significantly.



The Best Buy **Toshiba T3100SX** scores on every level. It's got a great gas plasma display, dual batteries, solid expansion capacity, an excellent keyboard, and consistently high performance, all for a reasonable \$5264 (estimated) price. If the T3100SX is meat and potatoes, Compaq's **SLT 386s/20** is caviar and champagne. Its 20-MHz performance is beyond compare, and it's highly portable, but its screen is disappointing and its \$6318 (estimated) price is high.

	Compaq SLT 386s/20	Dell 316LT	Epson Equity LT-386SX	Grid 1450SX	NEC ProSpeed 386X	Toshiba T3100SX	Zenith SuperSport SX
Memory capacity	Excellent	Good	Fair	Fair	Good	Excellent	Good
Screen	Fair	Good	Good	Good	Fair	Excellent	Good
Performance	Excellent	Excellent	Fair	Excellent	Poor	Good	Good
Portability	Excellent	Fair	Poor	Excellent	Poor	Good	Good
Battery	Excellent	Fair	Good	Good	Fair	Excellent	Excellent
Keyboard	Fair	Excellent	Fair	Good	Good	Excellent	Fair
Expandability	Good	Good	Excellent	Poor	Excellent	Excellent	Good
Design and construction	Excellent	Fair	Fair	Excellent	Good	Excellent	Good
Service and support	Fair	Excellent	Poor	Good	Good	Excellent	Fair
Price	Fair	Excellent	Good	Poor	Good	Good	Good
Overall value	Good	Good	Fair	Good	Fair	Excellent	Good
						BEST BUY	
Reader service no.	775	776	777	778	779	780	781

How we rate 386SX laptops

We rate these machines based on information in the Features Evaluation and PC World Test Report; our researcher's data on street prices and the convenience of support; and the author's opinion of quality, reliability, and user benefit.

Memory capacity reflects what's required to multitask, now and in the future. You shouldn't even consider a laptop that can't hold 4MB. With 8MB, disk swapping can be nearly eliminated. A capacity of 10MB or more ensures ample multitasking room for the foreseeable future and earns an Excellent rating.

Screen measures display quality in terms of resolution and clarity. Conveniently placed brightness and contrast controls are important, too. An Excellent rating is awarded for displays with 16 easily distinguishable shades of gray (in Windows) and a Windows cursor that remains visible when you move the mouse. All these laptops have good-sized and well-shaped screens.

Performance assesses how fast these computers run. The 16-MHz machines were compared only

with each other, while the one 20-MHz computer was compared with the best 16-MHz's. Because of the GUI nature of this roundup, the Windows Excel test was given extra weight.

Portability evaluates how easy these laptops are to carry around. To earn an Excellent rating, a computer must weigh 15 pounds or less and/or take up less than 500 cubic inches of space.

Battery rates how long you can keep the computer running away from an AC outlet, as well as how easy it is to change and recharge batteries. For an Excellent rating, a laptop must deliver over two and a half hours of battery life without using its battery-conservation features. Other factors include in-use battery charging and a charging indicator.

Keyboard ratings reflect the effort required for a user to switch from a standard desktop keyboard to a still-not-standard laptop. An Excellent rating requires cursor keys in an inverted T, dedicated page control keys, something close to a standard layout, and (in this reviewer's subjective opinion) a firm, responsive feel.

Expandability is one area in which laptops can't compete with desktop machines, but the presence of a single on-board slot and an option for either a 100MB or a removable hard disk are still required for an Excellent rating. Extra points are given for a slot that accepts industry-standard boards.

Design and construction are of utmost importance when you're shaving a \$5000 computer under the airline seat in front of you. Since a team of garillas wasn't available, we've relied on the reviewer's impressions and some estimation of the past performance of the manufacturers.

Service and support are essential when you're on the road, cut off from the office gurus and easy access to backup computers. An Excellent rating requires a toll-free technical support number and BBS or fax support.

Pricing scores street (not list) price and is based on our phone survey of dealers in seven major computer markets across the country.

Overall value combines the above criteria, with extra weight given to CPU-speed RAM capacity, screen, performance, and price.



Small and very light, Grid's 1450SX still leaves little room on an airline tray to roll a mouse. Furthermore, the \$8345 price tag is very high.

9MB. The display is somewhat streaky, with lines occasionally emanating from objects on screen. Furthermore, it's big, heavy, and slow.

On the other hand, if you can live with 4MB, there's a good selection of boards for that single slot—everything from ethernet and SCSI to the interface for

NEC's 4-slot expansion chassis. If you don't mind spending an extra \$800, you can buy the ProSpeed with a 100MB hard drive, the second largest disk option in the roundup. But its battery pack ran for only 110 minutes.

The midpriced ProSpeed is available for around \$5100 in the *PC World* config-

uration. But you can get a better machine—like the Dell—for less money, and a *much* better one—the Toshiba T3100SX—for about the same price. You're better off passing this one by.

Toshiba T3100SX



PROS: Excellent battery life, sharp gas plasma display, fine RAM capacity

CONS: None

If you're planning to travel with *Windows*, Toshiba's \$5264 T3100SX—with a great keyboard, first-rate battery life, spectacularly sharp gas plasma screen, and 13MB memory ceiling—is the laptop for you. Even in its least impressive areas, such as size, weight (18.9 pounds), and performance, it comes in no worse than average.

Despite the power-hungry gas plasma screen, the T3100SX's battery life proved excellent, with its twin batteries lasting just over 3 hours. Furthermore, thanks to those twin batteries and their accessible bays, you won't have to power

PORTABLE POINTERS

If you're going GUI, you need a pointing device. And if you think it's hard finding room for a mouse in the clutter on your desk, try rolling one on an airline tray table that's barely big enough for your laptop!

A trackball uses less room than a rodent and seems a reasonable alternative—but you're still not likely to fit one on the leftover corner of an airline tray. You could, of course, put the trackball in your lap, if you don't mind attracting stares from your fellow passengers.

The best solution is a pointing device built into the laptop. Craig Culver's Isopoint is an elegantly intuitive gadget

that's making its first commercial appearance in Grid's GridCase 1550SX. (The GridCase shipped too late for inclusion in this roundup, but a report appears in *Product Outlook*.)

The Isopoint is a small cylinder about the size of a soda straw, placed beneath (and parallel to) the space bar. Sliding the cylinder from side to side with your thumb moves the cursor left and right; rolling it controls vertical position. Culver's invention is compact, integral to the keyboard, and can be used without moving your fingers from the keyboard.

Unfortunately, the Isopoint is just beginning to slide and roll its way into the



The Isopoint lets you "mouse around" without leaving the keyboard.

world. You may have to wait awhile before you evict that mouse from your pocket. —J. D.

down to change a battery.

The T3100SX includes one built-in proprietary slot, but the only available board so far is an ethernet adapter. The optional \$999 expansion chassis can handle five standard 8-bit cards. The keyboard is the best in the roundup, with a close-to-standard layout and a firm but responsive feel.

This is a fine laptop system: Its 13MB RAM capacity, beautiful gas plasma display, long-lasting, easy-to-change batteries, great keyboard, and reasonable street price combine to earn it a Best Buy citation.

Zenith SupersPort SX

PROS: Outstanding battery life, 120MB hard disk option

CONS: Mediocre keyboard

With the exception of its long-lasting battery and large hard disk option, the only word for the Zenith Data Systems (ZDS) SupersPort laptop is "average." Its weight (18.6 pounds), size, display, and RAM capacity (8MB) are all respectable, and it comes in a bit above the norm on our speed tests. All of this is available at a low—but not exceptionally low—street price of \$5039. Only the keyboard falls below par.

The battery is a dumbbell-shaped lump that snaps easily into place. At nearly 5 pounds, it feels like a dumbbell, too. But there's a lot of juice in those 5 pounds; we were able to keep the Zenith going for just over 3 hours unplugged. If you like, you can slide three standard 8-bit cards into the SupersPort's \$599 optional desktop expansion chassis. Again, support is handled only through dealers, and while ZDS trains dealers in this area, the quality may vary.

ZDS's version of DOS 3.x conflicts with Microsoft's *Windows 3.0*, so ZDS offers its own licensed edition of *Windows*. If you're running ZDS's DOS 4.1, you can use Microsoft's *Windows* with no trouble, but it's worth getting ZDS's version anyway, as it gives you easier access to all 16 shades of gray.

In this company, "average" isn't bad; the SupersPort SX is a good *Windows* platform. But you can get a much better screen and higher RAM capacity with the Toshiba T3100SX—without paying a lot more for it.

Top of the Laptops

The clear winner here is the midpriced Toshiba T3100SX, whose long-lasting, easy-to-change batteries, clear gas

plasma screen, and 13MB RAM capacity earn it a Best Buy rating. In a two-way tie for second place are the fast, powerful (but expensive) Compaq SLT 386s/20 and the very low priced (but heavy and short-battery-lived) Dell 316LT.

No monochrome laptop can offer the colorful graphics, full keyboard, and expansion options of a desktop machine, but the gap is narrowing. As this round-



UPGRADES FOR
THE '90S

The 3MB Floppy

Tired of using a mess of floppies to back up your hard disk? Interested in a floppy drive that's two to four times as capacious and fast as your existing floppy? If the answer to either of the above is yes, consider the Practidisk ED, one of the first 3½-inch, 2.8MB floppy drives for the PC, XT, AT, and compatible systems. The drive is surprisingly easy to install and can read, write, and format 720K and 1.44MB 3½-inch disks. You can't boot your PC from it, but if extra storage is a must and you balk at buying a Bernoulli Box or another hard disk, this is one solution.

The Practidisk ED easily wins the No Sweat Award. Plug the floppy disk controller into a free slot, connect it to one of the PC's power supply cables, and connect the controller to the slim external drive. Run an automatic setup program, and you're ready to roll.

The drive is compatible with just about any program (including disk optimizers) or DOS command (you do have to use a



This plug-and-play drive uses 720K and 1.44MB disks, stores 2.8MB for \$9, and may be the standard by 1992.

supplied utility to format floppies, though). Better yet, it's compatible with other 2.8MB offerings—including the high-capacity floppy drives that IBM's rumored new line of desktop computers will reportedly use. Now *that's* planning for the future. List price: external drive and kit \$598, internal drive and kit \$478, 2.8MB floppy \$9 each. Practical Computer Technologies, 3972 Walnut St., Fairfax, VA 22030; 703/385-3332, 703/385-0326 (fax). —Robert Luhn

Reader service no. 726

Five lessons other companies have yet to learn about PostScript® printing.

1 Genuine Adobe® PostScript®. You need a true Adobe PostScript printer. The Silentwriter2 290 printer from NEC. Some companies emulate PostScript with clone interpreters or add-on cartridges. Others have limited font capabilities. But that's not the way to produce eye-popping newsletters, or 3D charts. We've known this since we introduced our first Silentwriter LC 890 printer back in 1987.



4 Memory. With a full 2 MB of standard memory, there's simply no more worry. Since now you have more than enough memory to print a full page of text and graphics (letter or legal size) without losing valuable data. Plus the optional user-installable 2 MB of additional memory satisfies your need to store downloadable fonts and overlays.

2 MS-DOS® and Macintosh® Connectivity. That's right, the 290 works with both Macintosh and PC-compatibles. And with its standard Centronics parallel, RS-232C, RS-422 and AppleTalk™ interfaces, the 290 is ideal for stand-alone or network environments.

3 WYSIWYG Screen Fonts. As in What-You-See-Is-What-You-Get. Our printer support kit included with every 290 we sell includes software that lets you see all of the printer's 35 scalable typefaces before you print them out. Also included are diskettes that allow you to install the fonts on any Macintosh or under Microsoft® Windows™ in the MS-DOS environment.

5 Software. The Silentwriter2 290 is the printer of choice for MS-DOS or Macintosh users working with hundreds of the most popular software packages. With an installed base of over 100,000 Silentwriters, our experience with printer software is hard to beat. Meaning you get more than just a printer, you get answers.

Since NEC began making PostScript® printers, we've learned how to stay ahead of the competition. Sure, other PostScript printers can do some of these things, but only NEC puts them all together in the Silentwriter® 2 290, the printer that goes to the head of the class. To find out more about the Silentwriter2 290, call us at 1-800-NEC-INFO. In Canada, 1-800-343-4418.

NEC

Word's out.

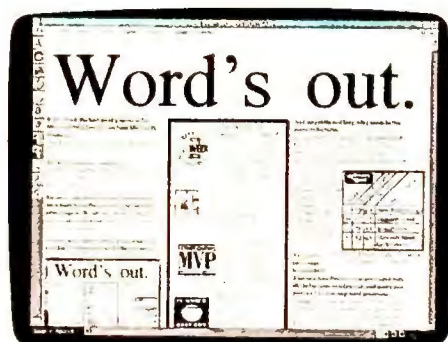
See us at
COMDEX/Fall '90
Booth 208

If you think the best word processor for Microsoft Windows comes from Microsoft, think again.

Ami Professional has set the new standard for word processing.

But don't take our word for it.

Everybody from the corporate users polled by PC Week to the editors of PC World and Software Digest says so.



They may look like desktop publishers, but Amí and Amí Professional are what word processing should have been all along. Amí is yours for just \$199, Amí Professional for \$495.

Because only Amí and Amí Professional were built from the ground up to take full advantage of Windows. Which is why they're recognized as the easiest and most intuitive of all word processors.

It's also why experts acknowledge that Amí and Amí Professional make the best use of Windows' WYSIWYG environment. Instead of relying on archaic "page previews" like Word for Windows, Amí lets you create, see, and edit all elements of your document — text, graphics, even footnotes, headers and footers — in a variety of fully editable views.

Graphics are easier to handle, too. Because Amí "frames" (which can also contain text for page-within-page formats) are true "pick up and place" objects that can be quickly and accurately positioned and sized on screen.



MICROSOFT
WINDOWS
Version 3.0 Compatible Product

Requires IBM AT, PS/2 or compatible (80286 or better CPU); CGA, EGA, VGA or Hercules compatible displays; MS-DOS 3.0 or higher. A free runtime version of Microsoft Windows 2.11 is available to all purchasers of Amí and Amí Professional.

The Demonstration Version of Amí Professional is a fully functional version of the product, except for the thesaurus, some import/export filters, and the ability to save files. The demonstration version requires Windows 2.11 or Windows 3.0.

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PC Week Poll of Corporate Satisfaction*

- Amí Professional received a score in Ease of Use of the User Interface that was fully 10 points higher than the next highest score, and came in 14 points ahead of the score WordPerfect 5.1 drew from its buyers.



July 1990
Amí Professional Version 1.18

PC Magazine Editor's Choice

- Of all GUI word processors, Amí Professional has the widest variety of features and is perhaps the most enjoyable to use.



PC Computing MVP

- A stunning achievement, one that no other PC word processing product — not even Microsoft's estimable Word for Windows — can claim to have reached.



PC World Best Buy

- Amí Pro's easy to use formatting tools are hard to resist. If your documents typically include graphics, it's your Best Buy.



Infoworld Excellent Value

- Easily handles graphics mixed with text, imports a host of text and graphics formats effortlessly, and does other office chores such as mail merge with ease and power.



And we get the nod for giving users better access to features. Our unique dialog boxes provide visual feedback that lets you see the results of your choices immediately, without having to reformat the document until you know exactly how it will look.

Rating	Overall Evaluation	Overall Power	Program Name
★★★★	7.9	6.9	Amí Professional
★★★★	7.7	7.7	Microsoft Word
★★★★	7.6	8.1	Word Perfect
★★★★	7.2	6.7	Microsoft Word for Windows

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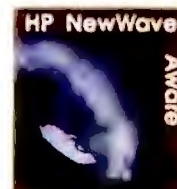
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up clearly shows, traveling with windows can mean more than just looking at clouds. ☼

John Diebold is a marine geophysicist specializing in graphics-based analysis of seismic data.

For more information about all products in this article, circle reader service no. 903.

WHERE TO BUY

Compaq SLT 386s/20

Compaq Computer Corp.
P.O. Box 692000
Houston, TX
77269-2000
800/231-0900
LIST PRICE: Model 60 with 2MB RAM, 3½-inch 1.44MB floppy drive, 60MB hard disk, one serial and one parallel port, battery pack and AC adapter/charger \$6799; Model 120 same as Model 60 but with 120MB hard disk \$7499
ACCESSORIES: 1MB RAM \$699, 2MB RAM \$1299, 4MB RAM \$2599; 20-MHz 80387SX coprocessor \$999; 2400-bps internal modem \$599; expansion chassis \$999; external storage module \$299; 5¼-inch 1.2MB floppy drive for external storage module \$275; 3½-inch 1.44MB floppy drive \$275; 60MB tape drive \$799; carrying case \$89; DOS 3.31 \$120, OS/2 1.21 \$340
WARRANTY: 12 months, carry-in
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
Reader service no. 775

Dell 316LT

Dell Computer Corp.
9505 Arboretum Blvd.
Austin, TX
78759-7299
800/426-5150,
512/338-8700 (fax)
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 20MB

hard disk, one parallel and one serial port, two batteries and charger \$2999; same as base model but with 2MB RAM \$3099, with 4MB RAM \$3299, with 8MB RAM \$3699; same as base model but with 40MB hard disk \$3199
ACCESSORIES: 16-MHz 80387SX coprocessor (factory installed) \$399; 2400/9600-bps data/fax modem (factory installed) \$399; spare battery \$79.95; nylon case \$79.95, leather case \$199; DOS 3.3 \$99.95, DOS 4.01 \$119, OS/2 1.1 \$299
WARRANTY: 12 months parts and labor, on-site
EXTENDED WARRANTY: up to 48 months, on-site
TECHNICAL SUPPORT: toll-free number, M-F 7-7
OTHER SUPPORT: in-house BBS
Reader service no. 776

Epson Equity LT-386SX

Epson America Inc.
20770 Madrona Ave.
Torrance, CA 90503
800/289-3776
LIST PRICE: with 2MB RAM, 3½-inch 1.44MB floppy drive, 20MB hard disk, one parallel and one serial port, DOS 4.01, battery and AC adapter \$5298; same as base model but with 40MB hard disk \$5598
ACCESSORIES: 2MB RAM card \$799, 2400-bps internal modem \$299, carrying case \$99
WARRANTY: 12 months parts and

labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
Reader service no. 777

Grid 1450SX

Grid Systems Corp.
47211 Lakeview Blvd.
Fremont, CA
94538-5003
800/222-4743
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 20MB hard disk, one parallel and two serial ports \$4795; same as base model but with 40MB hard disk \$5295
ACCESSORIES: 2MB RAM \$1090, 4MB RAM \$2180; 80387SX coprocessor \$506; MNP-5 2400-bps internal modem \$595; carrying case \$125; AC power supply \$210; battery pack \$299, enhanced battery pack \$399; DOS 3.3 \$150, DOS 4.01 \$150
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll number, M-F 9-5
OTHER SUPPORT: none
Reader service no. 778

NEC ProSpeed 386SX

NEC Technologies, Inc.
1255 Michael Dr.
Wood Dale, IL 60191
708/860-9500
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 40MB

hard disk, one serial and one parallel port, DOS 4.01, AC adapter \$5799; same as base model but with 100MB hard disk \$6599
ACCESSORIES: 1MB RAM \$599, 2MB RAM \$1099, 4MB RAM \$1999; MNP-5 2400-bps internal modem \$499; expansion chassis \$899; battery cartridge \$199; carrying case \$139
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll number, M-F 8:30-5:30
OTHER SUPPORT: none
Reader service no. 779

Toshiba T3100SX

Toshiba America Information Systems, Inc.
Computer Systems Division
9740 Irvine Blvd.
Irvine, CA 92718
800/457-7777
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 40MB hard disk, one parallel and two serial ports, DOS 4.01, batteries and AC adapter \$5999; same as base model but with 80MB hard disk \$6799
ACCESSORIES: 2MB RAM \$999, 4MB RAM \$2999; 2400-bps modem \$349; battery pack \$129; external recharger \$399; expansion chassis \$999; expansion chassis interface card \$199; carrying case \$99; OS/2 \$325

WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll-free number, M-F 7-5
OTHER SUPPORT: CompuServe forum, in-house BBS
Reader service no. 780

Zenith SupersPort SX

Zenith Data Systems
1501 Feehanville Dr.
Mt. Prospect, IL 60056
800/553-0331
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 40MB hard disk, one serial and one parallel port, DOS 3.3, battery pack and AC adapter \$5499; same as base model but with 120MB hard disk \$6499
ACCESSORIES: 2MB RAM \$799; 80387SX coprocessor \$799; 2400-bps internal modem \$399; rapid-charge battery pack \$289; expansion chassis \$599; carrying case \$59; Zenith Data Systems Windows 3.0 \$149
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: CompuServe forum, in-house BBS available for purchasers of service plan
Reader service no. 781

ON SITE: PUTTING WINDOWS TO WORK

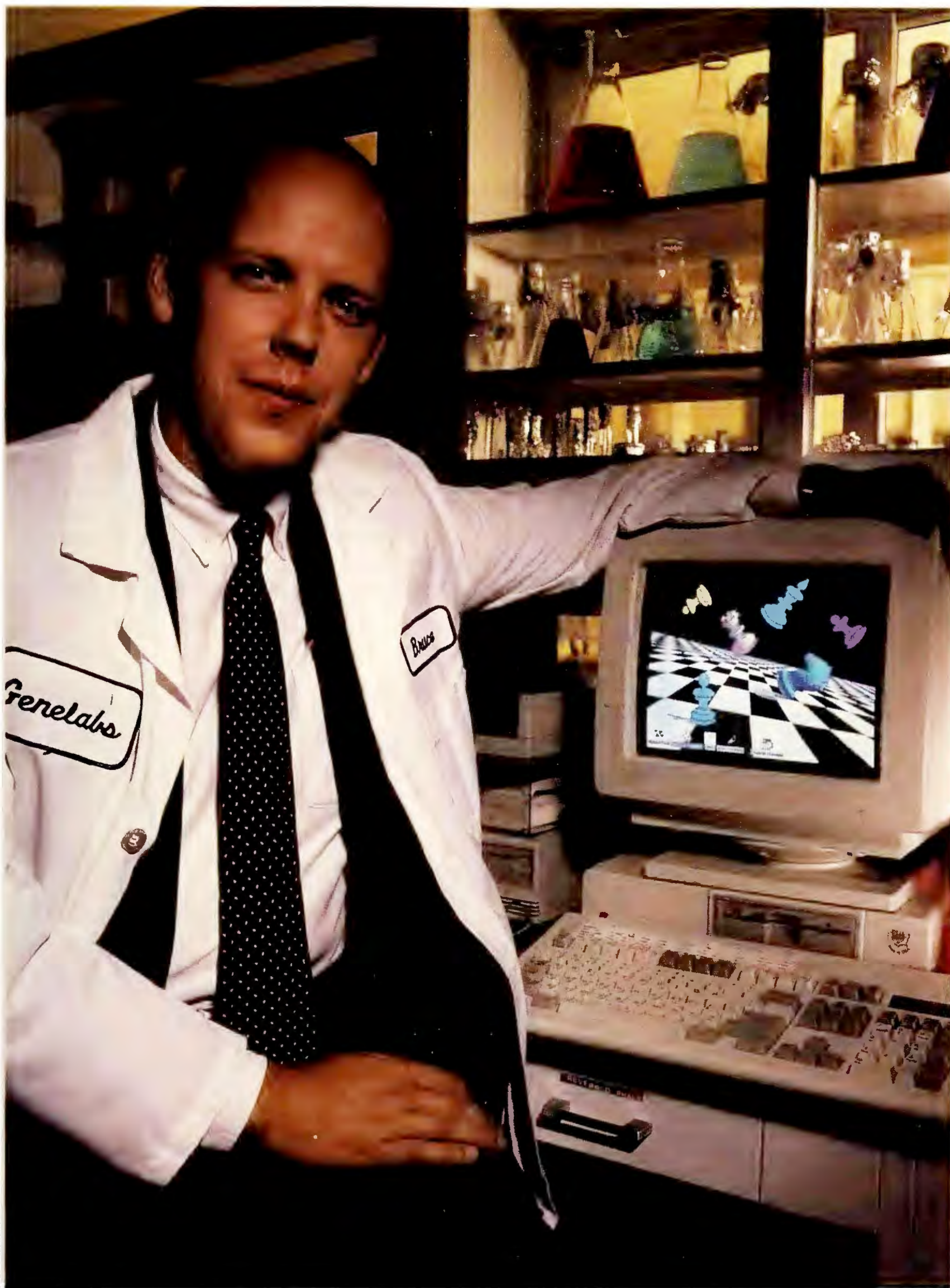
WHETHER THE PATH TO WINDOWS IS ROUGH OR SMOOTH DEPENDS ON YOUR APPROACH. THREE COMPANIES MAKE THE MOVE—AND LEARN VALUABLE LESSONS.

The benefits of *Windows 3.0* sound irresistible. But is the transition from character-based computing to a graphical world as smooth as Microsoft would have us believe? The answer depends largely on two factors: how quickly you make the switch, and what kind of hardware your organization currently uses.

PC World talked to *Windows* users at organizations ranging in size from a municipal office to a giant bank. We discovered that users take widely varying approaches in implementing *Windows* and often assess the costs and benefits differently.

We also found a spectrum of opinion on how much PC horsepower you want and need to run *Windows*. Some users worked quite happily with 286s, while others recommended more powerful hardware than you might think you need. No one we interviewed, however, was purchasing less than 386SX machines.

ALICE LAPLANTE



ANDY FREEBERG

Genelabs' Bruce Hallberg took a low-pressure approach to switching to Windows, offering it to any employee who wanted to make the switch.

Users were unanimous on another point: Don't expect immediate savings on support dollars when you adopt a graphical user interface (GUI). Despite what many vendors claim, *Windows* requires plenty of training and support.

USERS DEMAND A GUI

For the 26 PC users at city hall in San Carlos, California, it was practically love at first sight when they met *Windows* in late 1988 in the form of *Excel*. Within 18 months, the city had completely changed its computing habits. Microsoft's *Excel*, *Word for Windows*, and *PowerPoint*; Zenographics' *SuperPrint*; FutureSoft's *DynaComp*; and Micrografx's *Charisma* are the current software standards, says Brian Moura, assistant city manager.

Once the employees decided to jump on the *Windows 3.0* bandwagon, upgrading the existing hardware—eighteen 286 systems and eight 386SXs—became a top priority. The greatest cost was adding memory chips to ten systems that had only 1MB of memory, since Moura saw that the minimum configuration would need at least 2MB. Each machine that needed to be upgraded cost the city \$80. Another expense was unanticipated: The ROM BIOS on the office's AST Premium 286 machines was incompatible with *Windows 3.0*. The BIOS upgrade for each Premium 286 machine cost \$95. (Labor

added further to the total upgrade cost.)

PC users enjoy a lot of flexibility in the small city office, and they played the leading role in the decision to go to a *Windows* environment. The transition from character-based applications to *Windows* packages was gradual and was paced according to each user's wishes.

"Our former spreadsheet standard was 1-2-3, and everyone left that on their machines until they felt ready to switch over to *Excel*," says Moura. As individual users grew familiar with *Excel*, they began to use other *Windows* applications. Employees are currently moving from *WordPerfect* to *Word for Windows*; Moura estimates it will be 6 to 12 months before the switch is complete.

Because the transition from the character-based DOS environment to *Windows* was so gradual, support and training were almost nonissues; the employees helped each other by sharing tips and suggestions. To encourage that kind of support, Moura organized a monthly user group.

"I knew *Excel* and *Windows* were firmly entrenched when one employee suggested at the last user group meeting that everyone erase 1-2-3 from their hard drives in order to make room for new *Windows* applications," says Moura. He believes that users' willingness to become proficient in more than one application represents a big productivity edge for *Windows*.



UPGRADES FOR THE '90S #7

Crunch Those Numbers!

Spreadsheet jockeys, CAD freaks, statisticians, scientists, programmers, and other number crunchers, your dreams have come true. If you yearn to fill that empty 80387 math coprocessor socket in your 80386-based PC with some real power, Cyrix Corporation has a deal for you. For the same money as Intel's chip, the company will sell you the 83D87, a math coprocessor that's totally compatible with Intel's chip but calculates 20 percent to 300 percent faster.

The chip also uses less power, which means a longer life for it and your computer.



Intel is out of the picture, thanks to the FasMath, an 80387 clone that's 20 percent to 300 percent faster.

Installing the FasMath—or any processor— isn't for PC novices, but an experienced user or competent dealer can make the upgrade, which consists of finding the 80387 socket in your system and plugging the FasMath into place. Once there, anything that can tap a math coprocessor—1-2-3, AutoCAD, Framework—will run like a greased banana peel. List price: \$647 to \$994, depending on the speed of the chip. Cyrix Corp., 1850 N. Greenville #184, Richardson, TX 75081; 800/327-6284. —Robert Luhn

Reader service no. 727

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TAKING A CONSERVATIVE APPROACH

Genelabs, a biotech research firm in Redwood City, California, that develops antiviral drugs, also committed to *Windows 3.0* under relatively low-pressure, low-cost circumstances. *Windows* currently runs on 60 workstations, and the company hopes eventually to install it on a total of 100 desktops. Bruce Hallberg, MIS director, says his goal is to offer *Windows* to any employee who wants it.

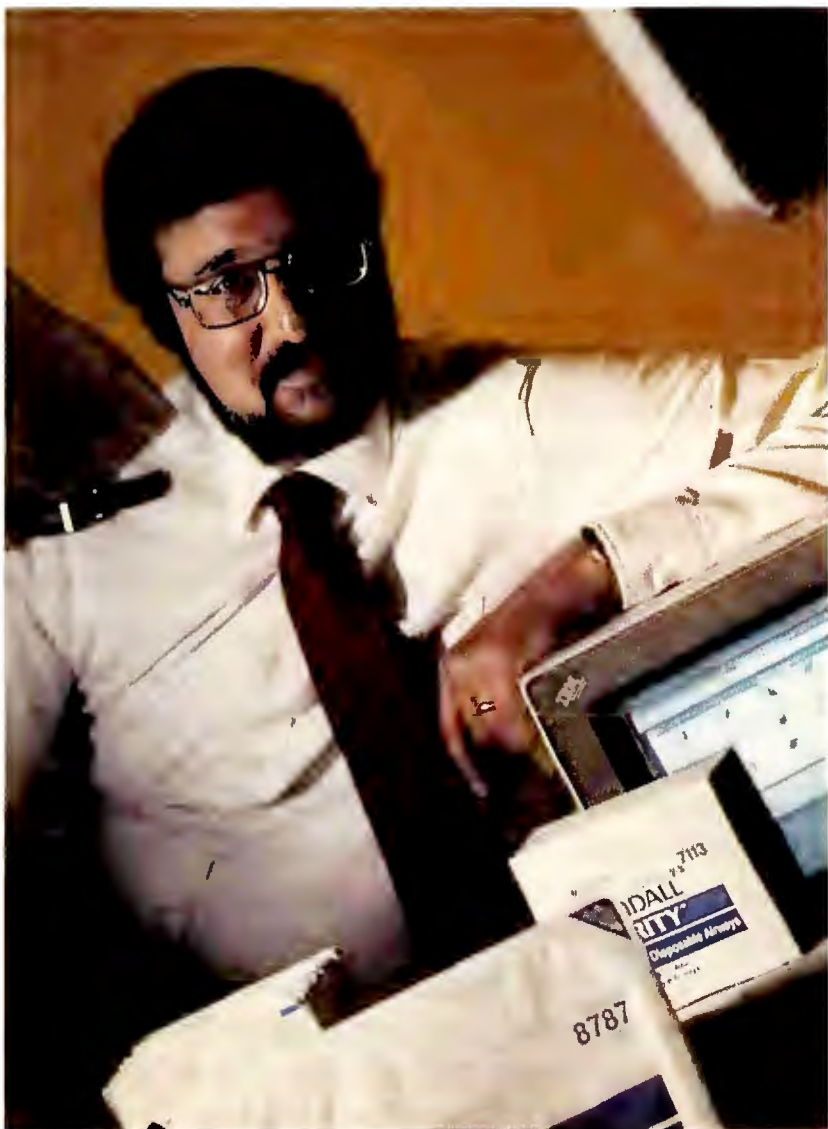
A research organization in which most employees come from academia, Genelabs found Macintoshes in high demand. But Hallberg simply did not have the resources to give each staff scientist a Mac, and *Windows* was the best alternative, providing the graphical interface without the high cost. PCs currently outnumber Macs at Genelabs 8 to 1.

The company runs *Windows* on 286 machines, using popular off-the-shelf software like *Microsoft Word* and *Excel*. Genelabs can get away without using 386s because employees have little need for multitasking—a feature that increases requirements for horsepower and memory. “Mostly my users want to get the benefit of the graphical interface,” Hallberg explains.

“Our new standard PC is a 386SX,” he says. “We’re not buying 286 systems any longer, but we don’t have to throw away the ones we have, either. Users can still get the benefit of



BOB HOLMGREN



SETH RESNICK

the interface without the expense of an upgrade”—a cost that could run as high as \$500, depending on the PC. All of Genelabs’ machines—286s and 386s—needed memory upgrades at \$300 to \$500 apiece. The company’s installed base of IBM PC XTs isn’t adequate for running *Windows*, so the organization is selling the XTs to employees cheap or donating them to charity.

Hallberg says the chief advantage to the somewhat conservative adoption scenario he chose was cost savings: Previously, his firm simply couldn’t afford to implement a graphical interface on a companywide scale. “Costs are lower if you wait,” he reasons. “Certainly the 386SX is a lot cheaper now than it was two years ago. Also, *Windows* software is more mature. Frankly, for an R&D company such as ours, waiting a couple of years makes a big difference. We get the advantages of a GUI but at a substantially lower cost.”

Like many *Windows* users, Hallberg sees the environment as an interim standard rather than a permanent one. “OS/2 will replace *Windows*, but not for a couple of years,” he predicts. “At that time, we can look at our hardware require-

Kendall Healthcare Products’ Roy Wilsker (left) and Brian Moura (above), assistant city manager with the city of San Carlos, California, both found that upgrading their users’ systems was the top priority when it came time to move to Windows 3.0. Both organizations now buy only 386 systems for users running Windows.

ments and reevaluate the situation. Because Presentation Manager applications will have the same interface as *Windows 3.0* applications, however, users will be in a good position to switch over with little fuss."

READY TO TAKE A (CAREFUL) PLUNGE

At Kendall Healthcare Products in Mansfield, Massachusetts, employees are making the move to *Windows* gradually. A cautious approach was the only way to move toward a GUI, says Roy Wilsker, manager of end-user computing. "The idea of such an interface was terrific, but the product wasn't worth the heartache and expense until recently," he says.

Wilsker and his staff have been evaluating *Windows* for several months, not only in standard benchmark and technical tests but also in real-world applications. *Windows 3.0* currently runs on about 30 machines among systems and administrative support staff, handling office automation tasks such as word processing, spreadsheet, and data base management. In these prototype installations, Wilsker and his staff have duplicated actual business use to see whether the new environment will hinder day-to-day work.



JONATHAN LEVINE

Manufacturers Hanover Trust made an early commitment to Windows, an investment that has paid off handsomely, says the bank's senior technical officer, Stephen Morse.

"Often the best way to implement a new technology is not through a full-blown pilot but in a staggered way," Wilsker says. The company is installing *Windows* department by department, being careful not to disrupt the real business that must go on. "Our worst fears are that a technology will work so poorly that a department won't be able to function."

Kendall Healthcare is an independent \$400 million firm, with about 500 employees at the Massachusetts location. Most PCs in the organization are connected to IBM midrange systems; the firm has everything from 8088 to 80386 PCs installed on users' desks, but 8088 and 80286 machines dominate. As a result, upgrading hardware will be a top priority—and a staggering expense—as the company moves to *Windows*.

Approximately 150 users want to upgrade to *Windows* immediately, but only a handful—15 or 20—have the hardware to support the environment. "We figure we're going to have to increase the hard disk sizes and memory on 386 machines, get rid of a lot of old PCs and XTs, and replace them with newer machines," says Wilsker. He estimates that the replacement cost could be as high as \$3000 per system.

"When we decided that we were probably going to go with *Windows 3.0*, one of the first things we did was revise our entry-level-system requirements," Wilsker says. Kendall Healthcare now buys only 386 and 386SX systems, each with at least VGA, an 80MB hard drive, and 3MB of RAM. The company has instituted a hand-me-down policy for its older-technology PCs.

A key reason for adopting *Windows* was the hope that the move will lessen the demands on Wilsker's staff, reducing the number of calls to the "help desk" as well as the need for training classes. So far, this hasn't happened. Instead, Wilsker finds he is just getting different kinds of calls. When users started playing with *Ami Professional* or *Word for Windows*, for example, Wilsker started hearing more sophisticated questions about hot linking spreadsheets to word processors, importing graphics, and other desktop publishing issues. "The new interface and functionality raise user expectations and actually create more support calls," Wilsker says.

ON THE BLEEDING EDGE—HAPPILY

Manufacturers Hanover Trust jumped into *Windows* feetfirst three years ago and hasn't looked back. The New York bank's wholesale banking sector started experimenting with *Windows* in 1987 and first implemented version 2.03 in a pilot project within the systems department. Currently, more than 2500 copies of *Windows* are installed, with both professional employees and support staff using it for word processing and financial analysis.

Manufacturers Hanover saw three reasons for committing to *Windows*, according to senior technical officer Stephen Morse: to provide users with a consistent interface from one application to another; to give them the ability to multitask,



UPGRADES FOR THE '90S # 8

386 Your AT

The 80386 is clearly the microprocessor for the '90s—but if you're stuck with an 80286-based PC from the '80s, you can make a cost-effective upgrade: Pop a 16-MHz or 20-MHz 386 FastCache-SX board into any 8/16-bit slot. You'll get 85 percent of the speed of a comparable 386SX PC, the ability to run 16- and 32-bit software (Windows, Desqview 386, Xenix, and more), plus a socket for the 80387SX math coprocessor. The board even uses the RAM already installed in your system.

However, installing the FastCache-SX isn't for upgrade newcomers. The ugly stuff includes

taking out your computer's 80286 and 80287 chips, plugging a special cable into the FastCache board and the va-



Installing this 386 turbo board isn't for novices, but the card is cheap and plenty fast.

cated 80286 socket, and installing software that switches on the board's caching scheme. Once the FastCache is in place, your

machine will zoom like an F-16.

Note: Some 6-MHz and 8-MHz IBM ATs will require a \$50 BIOS ROM upgrade from MicroWay. The company's cache can also conflict with some SCSI drives, so you may have to disable it. Remember, there's no gain without pain in Upgrade Land. List price: 20 MHz \$595, 16 MHz \$495; installation kit for 6-MHz AT \$50, cable kit for 8-MHz AT \$95; Phoenix BIOS \$50, 16-MHz 80387SX \$280, 20-MHz 80387SX \$300. MicroWay, Research Park Box 79, Kingston, MA 02364; 508/746-7341, 508/746-4678 (fax). —Robert Luhn

Reader service no. 728

and to enable them to share data among applications via Windows' DDE capability.

Morse says he and other bank officials saw the attraction of these features in their first Windows demonstration. "There was no doubt this was the future," he says. He was also given a generous charter from the bank's senior managers: Spend as much as you want in order to provide employees with the best strategic advantage. As a result, in terms of hardware, Manufacturers Hanover thought big—really big—for 1987, providing employees with fully loaded 386 systems. Last year the ante was raised even higher, and 486 systems are now being installed as the standard machine for all Manufacturers Hanover employees.

The first year, at least 500 Windows workstations were rolled out. The bank was confident that the long-term advantages would justify the initial outlay. "It was popular to say when the 386 was first introduced that only 'power users' would need them," says Morse. "So we redefined the term to mean people who needed a casual approach to power—people who couldn't afford to be worrying about bumping against a technology ceiling."

Another strategy that may have been unique for 1987 was

the decision to eliminate hard disk drives on Windows systems and network all workstations together. The key issue was security—the information being processed was strategic, and the bank couldn't afford to take chances with data loss or corruption—but an additional benefit was lower costs for both systems and service contracts.

To be sure, installing the fledgling Windows environment on a network was risky, and working out bugs and incompatibilities was time-consuming. Being a Windows pioneer meant Morse and his colleagues spent a lot of time working with software vendors struggling to bring out the very first Windows packages, and this commitment turned out to be very expensive: Not only did the bank put up "seed money," it also allowed employees to take substantial time away from their bank jobs to work on third-party software.

But the risks and expense of being a Windows pioneer were worthwhile, Morse says. "We now have a strategic system in place at a time when other organizations are only getting started." ■

Alice LaPlante is a freelance writer in Palo Alto, California.



A crisper, more colorful screen means a better work environment—especially if you use Windows. Our guide to 126 boards and monitors points the way to cost-effective, better-than-VGA graphics.

DISPLAYS THAT OUTSHINE VGA

T J
BYERS
AND
ERIC
KNORR

You're on the showroom floor, and a salesman (call him Harry) has you buttonholed. All you want is a VGA board and a monitor. But Harry insists that for just a little more money, you'll get more than twice the resolution and a magnitude more colors. An alarm goes off in your head. You've heard this routine before. "Sounds good, Harry, but what software can I use with it?"

Good question.

At resolutions higher than VGA, you can't depend on widespread software compatibility. Boards that throw more pixels on the screen than the IBM VGA's 640 by 480 usually come with their own meager assortment of software drivers on disk. Each driver, once you take the trouble to install it, lets you run a single program at a fixed beyond-VGA resolution. Most boards include drivers for a few CAD, business, and desktop publishing applications, plus (last but not least) *Windows*.

If you're a *Windows* user, Harry's deal may be a hot one. Install a *Windows* driver for a beyond-VGA resolution, and most *Windows* applications will benefit—without your having to install a separate driver for each one. You get smaller text that's still quite readable, often enabling you to see more of each application when several windows share the screen. In other words, a sharper image can make *Windows* really sing.

With the benefits of *Windows* foremost in mind, we've designed this Buyers' Guide to help you navigate the territory beyond VGA. As usual, we start with the most important question: What will you use your hardware for? Based on your response, we suggest the best configurations, which you can match against our listing of 126 boards and monitors. But first let's decode some jargon and prepare you for close encounters with fast-talking salespeople.

TWO STEPS FORWARD

What lies beyond VGA? Graphics hardware solutions for professional CAD and desktop publishing abound, ready to soak up any amount

of money you'd care to spend. But in this guide, we assume you're concerned with graphics hardware for mainstream business PCs, particularly *Windows* workstations. We'll focus on the most popular, cost-effective boards and monitors—those that support 800 by 600 and 1024 by 768 resolutions in either 16 or 256 colors.

When you buy a VGA graphics board, you usually get at least 800 by 600 capability—which is why just about every advertisement for a VGA board uses the term *super VGA*. If you want a super-VGA board that does 256 colors at this resolution, or one that raises the stakes to 1024 by 768 at 16 colors, you'll generally pay only \$50 to \$100 more than the basic board's typical \$100 to \$300 street price.

Buying a monitor needn't cost you a bundle either. A typical *multiscan* monitor, which handles both 800 by 600 and 1024 by 768 resolutions, goes for \$500 to \$600 on the street—only \$75 to \$150 more than a typical VGA-only monitor. Of course, multiscans are also fully compatible with the VGA standard, and both VGA and multiscan monitors can han-

dle any number of colors.

You won't go broke buying a basic super-VGA board and a multiscan, but you may experience difficulties in performance and image quality—especially at 1024 by 768. At that resolution, your super-VGA board may turn super slow; up the color ante from 16 to 256, and you may wait all day. Moreover, most multiscans support only *interlaced scanning* at 1024 by 768. That means the electron gun inside the monitor takes two passes to create an image instead of one, causing screen flicker.

How do you solve these problems? Easy: Spend more money. Boards with special *graphics coprocessors* can speed performance immensely, but they add anywhere from \$300 to thousands of dollars to the street price. As for monitor quality, multiscans that look good at 1024 by 768—that is, those that support *non-interlaced* scanning at that resolution—cost as little as \$200 more.

If you long for the room to manipulate multiple applications freely, and money is no object, you might want to consider a large monitor. Garden-variety multiscans generally

measure no greater than 14 inches diagonally; at 1024 by 768, text can be a bit small for easy reading. Take the step up to a 16-inch monitor, and you'll easily pay double the price of a 14-inch unit. And since you'll be running at 1024 by 768, you'll also want a pricey graphics coprocessor board. Prices are dropping all the time—NEC recently reduced the list price of its noninterlaced, 16-inch MultiSync 4D to \$1500—but few *Windows* business users can justify such big-screen luxury.

WORD PROCESSING, SPREADSHEETS, AND DATA MANAGEMENT

If you use general business applications, you spend most of your time manipulating text, even within a graphics environment like *Windows*, and a basic super-VGA board running at 800 by 600 in 16 colors on a 14-inch multiscan should do just fine. You'll be able to see more on screen—about one and a half times the *Windows* desktop at standard VGA resolution. Text will be slightly smaller, but the characters will be sharp and easy to read.

You might not even need to buy new hardware to get 800 by 600 resolution. Remember that nearly every VGA board made does 800 by 600, so there's a good chance yours can. Moreover, you might have a multiscan monitor and not even know it. So if you're not sure what kind of monitor you have, check our multiscan table. If you don't see your model, contact the manufacturer: You may have a multiscan that's been discontinued.

If your VGA is built into the PC's main system board, you've probably got VGA-only hardware. In that case, going beyond VGA means starting from scratch. Not only do you need to buy and install a new board and monitor, but you'll

NEW MONITORS REDUCE EYESTRAIN

Recent studies show that the eyestrain and fatigue you experience from staring at the screen are caused in large part by screen flicker, which occurs when the screen image fades before the PC has time to refresh it. The effect, similar to an old-time nickelodeon show, occurs at a rate so fast you may not see it—but your eyes feel it.

The best way to reduce flicker is to increase the number of

times per second the screen is redrawn. In technical terms, this is known as increasing the refresh rate.

A new standard proposed by the Video Electronics Standards Association (VESA) increases the refresh rate from the current 60-Hz standard (redrawing the screen 60 times a second) to 72 Hz for 640 by 480 and 800 by 600 resolutions. This strain-relieving technique offers the added bonus of

slightly crisper text and graphics.

Currently, only top-of-the-line multiscan monitors (noninterlaced 1024 by 768 models) support the new refresh rate. But help may be on the way. A number of European countries are demanding 72 Hz as a minimum standard, which should increase manufacturing volumes and lower the cost of this healthy technology. —TJB

KNOW YOUR OPTIONS

All the Way With Super VGA—And Beyond

Like the yellow brick road, the path beyond VGA splits three ways. Fortunately, the destinations are clearly indicated, depending on what applications you emphasize.

What is your application?

GENERAL BUSINESS APPLICATIONS

\$700–\$1300



super-VGA
graphics card
at 800 x 600
in 16 colors



14-inch
multiscan
monitor

PRESENTATION GRAPHICS

How often do
you preview
slides?

twice
a month
or less



super-VGA
graphics card
at 800 x 600
in 256 colors



14-inch
multiscan
monitor

three
times
a month
or more



graphics
coprocessor
board



14-inch
multiscan
monitor

\$950–\$1400

\$1500–\$2000

DESKTOP PUBLISHING

What are
your desktop
publishing
needs?

in-house
reports,
customer
updates, etc.



super-VGA
graphics card
at 1024 x 768
in 16 colors



14-inch
multiscan
monitor

newsletters,
marketing
materials,
etc.



graphics
coprocessor
board



16-inch
multiscan
monitor

\$950–\$1400

\$2300–\$3200

MULTISCAN MONITORS

Manufacturer	Product	Price	Screen size (inches)	Dot pitch (mm)	RESOLUTIONS SUPPORTED					Supports digital boards	Warranty (years)	Reader service number
					VGA	800x 600	Interlaced 1024x768	Non-interlaced 1024x768	72-Hz refresh			
AAMAZING TECHNOLOGIES	CM-61428S	\$639	14	0.28	Y	Y	Y	N	N	N	1	868
	CM-61728	\$1799	17	0.28	Y	Y	Y	Y	Y	N	1	868
	CM-8426	\$899	14	0.26	Y	Y	Y	Y	Y	Y	1	868
ACER TECHNOLOGIES	7015	\$695	14	0.28	Y	Y	Y	N	N	Y	1 ¹	869
	AcerView 33	\$745	14	0.28	Y	Y	Y	N	N	N	1 ¹	869
	AcerView 35	\$995	14	0.26	Y	Y	Y	Y	Y	N	1 ¹	869
AMAX ENGINEERING	Impression AX414E	\$499	14	0.28	Y	N	Y	N	N	N	1	870
AMDEK	SmartScan II	\$749	14	0.28	Y	Y	Y	N	N	N	1	871
COMPAQ COMPUTER	Advanced Graphics Colar	\$1699	16	0.29	Y	N	Y	Y	Y	N	1	872
ELECTROHOME	ECM 1310	\$1259	14	0.31	Y	Y	Y	N	N	Y	1	874
GOLDSTAR TECHNOLOGIES	1450 Plus	\$699	14	0.31	Y	Y	N	N	N	N	1	875
	1460 Plus	\$799	14	0.28	Y	Y	Y	N	N	N	1	875
	1610 Plus	\$1199	16	0.31	Y	N	Y	N	N	N	1	875
HITACHI/NSA	14MVX	\$895	14	0.28	Y	Y	Y	N	N	N	2	876
IBM	8514	\$1665	16	0.31	Y	N	Y	N	N	N	1	877
	8515	\$950	14	0.28	Y	N	Y	N	N	N	1	877
IOCOMM	ThinkSync Trio CM-4210	\$549	14	0.28	Y	Y	Y	N	N	N	1	878
LEADING TECHNOLOGY	1428S	\$399	14	0.28	Y	Y	N	N	N	Y	1	879
MAGNAVOX	6CM320	\$799	14	0.28	Y	Y	Y	N	N	N	2	880
	7CM320	\$799	14	0.28	Y	Y	Y	N	N	N	2	880
MITSUBISHI	FA3435ATK	\$1280	14	0.28	Y	Y	Y	N	N	Y	1	881
	Diamond Scan 14	\$889	14	0.31	Y	Y	Y	N	N	Y	1	881
	Diamond Scan 16L	\$1945	16	0.31	Y	Y	Y	Y	Y	N	1	881
NANAO	Flexscan 8060H	\$899	14	0.31	Y	Y	Y	N	N	Y	1	882
	Flexscan 8060S	\$939	14	0.28	Y	Y	Y	N	N	Y	1	882
	Flexscan 9070U	\$1779	16	0.28	Y	Y	Y	Y	Y	Y	1	882
NEC TECHNOLOGIES	MultiSync 2A	\$799	14	0.31	Y	Y	N	N	N	Y	1	883
	MultiSync 3D	\$1049	14	0.28	Y	Y	Y	N	N	Y	1	883
	MultiSync 4D	\$1799	17	0.28	Y	Y	Y	Y	Y	Y	1	883
PACKARD BELL	Model 8510	\$899	14	0.28	Y	Y	Y	N	N	N	1	884
PANASONIC	PanaSync C1381	\$699	14	0.28	Y	Y	Y	N	N	N	1	885
	PanaSync C1391	\$799	14	0.28	Y	Y	Y	N	N	Y	1	885
PC CRAFT	VGAM/1024	\$595	14	0.28	Y	Y	Y	N	N	N	1	886
PRINCETON	Ultra 1200	\$849	14	0.28	Y	Y	Y	N	N	Y	5/2 ²	887
	Ultra 1400	\$899	14	0.28	Y	Y	Y	N	N	Y	5/2 ²	887
	Ultra 1600	\$1375	16	0.31	Y	Y	Y	N	N	Y	5/2 ²	887
RELISYS	RE5155	\$745	14	0.31	Y	Y	Y	N	N	Y	1	888
	RE1520	\$995	15	0.31	Y	Y	Y	Y	Y	N	1	888
SAMPO	AlphaScan	\$789	14	0.31	Y	Y	Y	N	N	Y	1	889
SAMSUNG	SyncMaster 1	\$799	14	0.31	Y	Y	Y	N	N	Y	1	890
	SyncMaster 2	\$729	14	0.31	Y	Y	Y	N	N	N	1	890
	SyncMaster 3	\$799	14	0.28	Y	Y	Y	N	N	N	1	890
SEIKO	CM-1440	\$849	14	0.25	Y	Y	Y	N	N	N	1	891
	CM-1450	\$999	14	0.25	Y	Y	Y	Y	Y	N	1	891
SONY	Multiscan CPD-1302	\$995	14	0.25	Y	Y	Y	N	N	Y	1	892
	Multiscan CPD-1304	\$1095	14	0.25	Y	Y	Y	Y	Y	N	1	892
TATUNG	CM-1496X	\$749	14	0.31	Y	Y	Y	N	N	N	1	893
	CM-1498X	\$799	14	0.28	Y	Y	Y	N	N	N	1	893
	CM-1495G	\$899	14	0.31	Y	Y	Y	N	N	Y	1	893
TAXAN	Super Visian 790	\$799	14	0.28	Y	Y	Y	N	N	N	1	894
	Multi Visian 795	\$1095	14	0.26	Y	Y	Y	Y	Y	N	1	894
TVM PROFESSIONAL	SuperSync 2A +	\$695	14	0.28	Y	Y	N	N	N	N	2	895
	SuperSync 3A	\$745	14	0.28	Y	Y	Y	N	N	N	2	895
	SuperSync 5A	\$1099	15	0.28	Y	Y	Y	Y	Y	N	2	895
T.W. CASPER	TM 5156H	\$315	14	0.31	Y	Y	Y	N	N	N	1	896
VIEWSONIC	ViewSanic 4	\$599	14	0.28	Y	Y	Y	N	N	N	1	897
	ViewSonic 5	\$995	14	0.25	Y	Y	Y	Y	Y	N	1	897
XTRON	CM 140UV	\$388	14	0.28	Y	Y	Y	N	N	N	1	898

¹ Includes four months on-site service.

² Two years replacement warranty on CRT; five years on all labor and replacement for all other parts.

For more information about all products in this table, circle reader service no. 909.

also have to find the system manual and figure out how to disable the built-in VGA.

PRESENTATION GRAPHICS

Let's say that doing the occasional slide show is part of your job. If you use presentation graphics software to create your slides, then you want to see a reasonably accurate representation of them on screen *before* you send the finished image files to a slide service.

Slide jockeys should opt for boards with 256-color drivers. Professional-looking slides often use subtle background shading, and presentation graphics packages that support 256 colors—such as *Charisma* or *PowerPoint* under *Windows 3.0*—need that many hues to simulate shading adequately on screen.

The downside is that a 256-color image at any resolution—even 640 by 480—hobbles performance consid-

erably, and with super VGA you may bide your time waiting for that colorful screen to redraw.

That won't be a problem with a graphics coprocessor board, worth springing for if you create slides more than two or three times a month. Otherwise, you can probably live with the sluggish performance of a super VGA running at 640 by 480 or 800 by 600 in 256 colors, since the slowdown occurs only when you work with a 256-color application; with ordinary 16-color business applications, speed is unaffected.

DESKTOP PUBLISHING

Not everyone can afford a full-page monitor or a 23-inch, two-page display, and not every desktop publisher needs one. If you primarily use business applications but do light desktop publishing on the side, it makes sense to opt for less expensive hardware.

Still, if you put out a regular newsletter or create marketing materials on a budget, you need 1024 by 768 resolution at a minimum, along with a 16-inch monitor so you can read tiny type on a full (or close to full) page. You also need a high-performance coprocessing board. With a super VGA, you'll likely endure painfully slow performance as you pour, reformat, scroll, zoom, and redraw.

For less demanding publishing tasks, such as customer updates or important in-house reports, you can use super VGA at 1024 by 768 with a 14-inch multiscan as a kind of page preview. It'll be slow, but with fewer graphics and less fine tuning, you won't need to interact as much with the display. And it's still faster than printing out proof after proof.

Now that both *PageMaker* and *Ventura* run under *Windows*, you can install a *Windows 3.0* driver and take your

pick. Every video board worth its salt has a 1024 by 768 driver for *Windows* as well as for *Ventura* under *GEM*. Unfortunately, 1024 by 768 drivers for such capable light-duty programs as *Publish-It*—an excellent program for occasional users—are hard to find.

Finally, unless color output is a must, serious desktop publishers prefer monochrome boards and displays: Why pay for color when you can invest in higher resolution instead? But for users of *Windows* business applications who employ *PageMaker* part time, it's not worth sacrificing color, an integral part of the *Windows* environment, especially in version 3.0. Losing it would take away half the fun.

WHEN YOU KNOW WHAT YOU WANT...

The rest is easy. Well, sort of. Assuming we've helped you decide which beyond-VGA setup you want to buy, the next



UPGRADES FOR THE '90S #9

A Faster, More Efficient Memory Manager for Windows 3.0

As *Windows 3.0* users know, more is better—especially when it comes to memory. Although *Windows'* HIMEM.SYS and EMM386.SYS do a fair job of managing a 386-based system's memory, there is in fact a better way to do it: QEMM-386 5.1 from Quarterdeck Office Systems.

Run QEMM-386's speedy au-

tomatic install program, then load *Windows* in any mode, and you'll notice how perky the environment becomes. That's because QEMM-386 5.1 frees up conventional RAM by enabling you to place drivers, TSRs, and network programs and shells in the space between 640K and 1024K. Run *Windows* in real or standard mode, and QEMM-386 takes over the role of expanded memory manager.

Not only is QEMM-386 faster and more efficient than *Windows'* own memory manager, it

uses only a fifth as much RAM. The program will even let you run 386-specific programs (such as *Paradox 386*) in *Windows'* real mode. Other *Windows 3.0*-compatible memory managers are on the way, but for now, QEMM-386 5.1 leads the pack. List price: \$99.95. Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405; 213/392-9851, 213/314-3214 (fax). —Robert Luhn

Reader service no. 825

SUPER-VGA BOARDS

COLORS AVAILABLE FOR WINDOWS 3.0

Manufacturer	Product	List price with RAM	RAM increments	VGA 640x480	800x600	Interlaced 1024x768
AHEAD SYSTEMS	VGA Wizard VGA Wizard Deluxe	\$199/\$259 \$299/\$369/\$449	256K/512K 256K/512K/1MB	16/256 16/256	16/256 16/256/256	0/16 0/16/256
AMAX ENGINEERING	Impression Card	\$134/\$184	256K/512K	16/256	16/256	0/16
AST RESEARCH	AST-VGA Plus	\$329	256K	16/256	16	0
ATD TELEVIDEO	ATD VGA	\$147	256K	16	16	0
ATI TECHNOLOGIES	VGA Wonder +	\$379/\$479 ¹	256K/512K	256	16/256	0/16
BOCA RESEARCH	Super VGA by Baca	\$195/\$245	512K/1MB	256/256	256/256	16/256
CARDINAL TECHNOLOGIES	VGA400 VGA500 VGA600 VGA700	\$299 \$369/+ 256K ² \$389 \$499/+ 512K ²	256K 256K/512K 512K 512K/1MB	16 16/256 256 256	16 16/256 16 256	0 0/16 16 16/256
DIAMOND COMPUTER SYSTEMS	SpeedStar VGA	\$445/\$495	512K/1MB	256	256	16/256
EVEREX SYSTEMS	Viewpoint VGA Viewpoint VRAM	\$239/\$299 \$499/\$699	256K/512K 512K/1MB	256 16/256	16 16/256	0 16/256
GENOA SYSTEMS	SuperVGA 6300 SuperVGA 6400	\$249 \$299	256K 512K	16 256	16 256	16 16
HEADLAND TECHNOLOGY	Video Seven V-RAM VGA Video Seven VGA 1024i	\$597 \$347/\$397	512K 256K/512K	256 256	16 16	0 16
LEADING TECHNOLOGY	VGA Level 16+ VGA Super 16	\$99 \$127/\$177	256K 256K/512K	16 16/256	16 16/256	0 0/16
MAXLOGIC	MaxVGA/16 MaxVGA 1024	\$199 \$239/\$299	256K 256K/512K	16 16/256	16 16	0 16
METHEUS	Premier VGA	\$499/\$599	256K/512K	16/256	16	0/16
MICRO EXPRESS	Extended VGA Card	\$249/\$289/\$369	256K/512K/1MB	16/256/256	16/256/256	0/16/256
MICRO-LABS	VGA Solution Ultimate VGA	\$275/\$325 \$350/\$425	256K/512K 512K/1MB	16/256 256	16/256 256	0/16 16/256
ORCHID TECHNOLOGY	PraDesigner/E PraDesigner II	\$329/\$364 \$469/\$569	256K/512K 512K/1MB	256 256	16/256 256	16 16/256
PACKARD BELL	PBS VGA	\$289	512K	256	256	16
PRISM IMAGING SYSTEMS	EXCELSIOR	\$899	1MB	256	256	256
SIGMA DESIGNS	SigmaVGA Legend	\$449/\$569	512K/1MB	256	16/256	16/256
SOTA TECHNOLOGY	Sota VGA 16+	\$295/\$345 ³	256K/512K	16/256	16/256	0/16
STB SYSTEMS	VGA 800/16 PowerView VGA PowerGraph VGA ErgoVGA	\$219 \$249/\$269 \$349/\$399/\$499 \$349/\$399/\$499	256K 256K/512K 256K/512K/1MB 256K/512K/1MB	16 256 256 256	16 16 16/256/256 16/256/256	0 16 16/16/256 16/16/256
TATUNG	OmniVGA OmniVGA/HR VGA/AD	\$449 \$289/\$339 \$580	512K 256K/512K 512K	256 16/256 256	256 16/256 256	16 4/16 16
TRIDENT MICROSYSTEMS	TVGA 8916	\$245/\$295/\$495	256K/512K/1MB	256	16/256	4/16/256
VIEWSONIC	P800 P1024 1024AM	\$189 \$209 \$269	256K 256K 256K	16 16 16	16 16 16	0 4 4
WESTERN DIGITAL IMAGING	Paradise VGA Plus 16 Paradise VGA 1024	\$329 \$369/\$469	256K 256K/512K	16 16/256	16 0	0 16
ZYMOS	Super RVGA II	\$449/\$578	256K/512K	16/256	16/256	0/16

¹ Price includes mouse part and mouse.

³ Price includes mouse part.

² RAM upgrade not available from company.

step is to familiarize yourself with the features to consider when choosing among comparable boards and monitors. The following covers the basics for super-VGA boards,

graphics coprocessor boards, and multiscan monitors.

Super-VGA Boards

The list prices of super-VGA boards veer wildly from \$99 all

the way to \$899, so take a good close look at what you're getting. In most cases, pricier boards run faster, offer higher resolutions, and support more colors.

COMPATIBILITY All the boards listed come with special high-resolution drivers for *Windows 3.0*. Outside of *Windows*, you'll likely find 132-column text drivers for 1-2-3,

Non-interlaced 1024x768	BIOS relocation available	Has DIP switches to set	Runs in 12.5-MHz bus	Supports 72-Hz refresh	Warranty (years)	Reader service number
0/16	Y	N	Y	Y	1	840
0/16/256	Y	Y	Y	Y	1	840
0	Y	Y	Y	N	1	841
0	Y	N	Y	N	2	842
0	N	Y	N	N	1	843
4/16	Y	N	N	Y	2	844
16/256	Y	N	Y	Y	5	845
0	Y	Y	Y	Y	1	846
0/16	Y	N	Y	Y	1	846
16	Y	Y	Y	Y	1	846
16/256	Y	N	Y	Y	1	846
16/256	Y	N	Y	N	5	847
0	Y	Y	N	N	2	848
16/256	Y	Y	Y	N	2	848
16	Y	Y	Y	Y	1	849
16	Y	Y	Y	Y	1	849
16	Y	Y	Y	N	7	850
0	Y	Y	Y	N	7	850
0	Y	Y	N	N	1	851
0	Y	N	N	N	1	851
0	Y	Y	Y	Y	2	852
0	Y	Y	Y	Y	2	852
0/16	Y	N	Y	N	2	853
0/16/256	Y	N	Y	Y	2	854
0	Y	Y	N	N	3	855
16/256	Y	N	N	N	3	855
16	Y	Y	Y	Y	4	856
16/256	Y	Y	Y	Y	4	856
16	Y	Y	N	N	1	857
256	Y	Y	Y	Y	unlimited	858
16/256	Y	Y	N	Y	1	859
0/16	Y	N	Y	N	2	860
0	Y	N	Y	N	2	861
16	Y	N	Y	N	2	861
16/16/256	Y	N	Y	N	2	861
16/16/256	Y	N	Y	Y	2	861
0	Y	Y	Y	Y	1	862
4/16	Y	Y	Y	Y	1	862
16	Y	N	Y	Y	2	862
0	Y	Y	Y	Y	2	863
0	Y	Y	N	N	1	864
0	Y	Y	N	N	1	864
0	Y	Y	N	N	1	864
0	Y	Y	Y	N	3	865
0	Y	Y	Y	N	3	865
0	Y	Y	N	N	2	867

For more information about all products in this table, circle reader service no. 908.

Symphony, and *Framework*, plus 800 by 600 and 1024 by 768 drivers for *Ventura* and *AutoCAD*.

Never buy a board and monitor without test-driving

the two together. In the worst cases, at beyond-VGA resolutions, you may get jittery images that no amount of fiddling with monitor controls can stabilize. In addition, if you plan

to run a super-VGA board at 1024 by 768, it's a good idea to buy a board that does both interlaced and noninterlaced scanning at that resolution. The capability doesn't cost much, and you may want to upgrade to an interlaced monitor later.

Don't forget that you can always fall back on good old VGA. Every multiscan and virtually every software package sold supports the IBM VGA standard, which all super-VGA-board manufacturers have implemented. This standard enables you to run even old software written for the CGA, EGA, and original IBM monochrome boards. In addition, most super-VGA boards go IBM's one better by running software written for the Hercules Graphics Card.

PERFORMANCE You can't tell which boards are fastest just by looking, and testing can be deceptive unless benchmarks match your work routine precisely. However, a couple of general guidelines can help you narrow the field.

First, if you use a 286 machine, don't worry about the board's performance: The 286 processor will be the bottleneck, not the super-VGA board. Second, if you use a fast 386 and don't mind spending money on speed, get a board that uses VRAM. It doesn't make a board fast by itself (many factors come into play), but it is expensive, so manufacturers don't use it on slow boards.

Two other features can help move those pixels along. Video BIOS relocation, a routine that automatically copies from firmware on the video board into a system's fast memory, speeds performance with some applications. (It also can cause compatibility problems with some systems, which is why all the boards listed let you turn the feature off.) Fur-

thermore, if you use a PC that lets you turn up the speed of the expansion bus from the usual 8 MHz to 12.5 MHz, you can get a substantial performance boost if your super-VGA board is compatible with that speed.

VIDEO MEMORY Every super-VGA board has at least 256K of RAM, which is enough to display 800 by 600 graphics at 16 colors. For 1024 by 768 at 16 colors or 800 by 600 at 256 colors, you need 512K of RAM; for 256 colors at 1024 by 768, you need a full 1MB. Some boards' RAM capacity is fixed, but most come with 256K and can be upgraded to 512K. The latter arrangement provides the most flexible, cost-effective solution for most business users.

INSTALLATION If you plan to use your super-VGA board as a plain old VGA, installation is usually just a matter of sticking the board in an expansion slot and hooking up a VGA-only or multiscan monitor. To get super-VGA capabilities, however, you need to run an installation routine and select the appropriate driver. *Windows 3.0* makes this easy: When the setup routine detects a VGA, you select *Other*, and *Windows 3.0* will prompt you to put the driver disk in the A: drive.

Most boards come with a wide selection of software options that you'll probably never touch. Should you need to activate a special emulation mode or disable features that cause compatibility problems, however, it's nice to have a board that lets you do this with a utility. Otherwise you'll have to fiddle with DIP switches, and unless the switch block is accessible from the board's rear bracket, that means opening up your PC.

QUALITY A nice long warranty is the best quality assurance. But when you explore beyond-VGA resolutions, soft-

GRAPHICS COPROCESSOR BOARDS

COLORS AVAILABLE FOR WINDOWS 3.0

Manufacturer	Product	List price with VRAM	VRAM increments	VGA 640x480	800x600	Interlaced 1024x768
ARTIST GRAPHICS	XJi	\$1795/\$2395	384K/768K	0	16/256	0
ATI TECHNOLOGIES	8514/Vantage	\$699/\$849	512K/1MB ²	0	0	16/256
	8514/Vantage + VGA	\$899/\$1049	512K/1MB ²	256	16	16/256
	8514/ULTRA	\$899/\$1099	512K/1MB	0	0	16/256
	8514/ULTRA + VGA	\$1099/\$1299	512K/1MB	256	16	16/256
COMPAQ COMPUTER	Advanced Graphics 1024	\$1299/\$1638	512K/1MB	256	0	16/256
DESKTOP COMPUTING	AGA 1024	\$1095	1MB	256	256	256
HERCULES COMPUTER	Hercules Graphics Station	\$1024	1MB	256 ³	256	256
HEWLETT-PACKARD	IGC 10	\$995	512K	16	16	0
IBM	8514/A	\$1290	512K/1MB	0	0	16/256
MATROX	MG-104	\$1395	512K	16	0	16
	MG-108	\$1695	1MB	16	0	256
	PG-1024	\$1995/\$2595	512K/1MB	0	0	0
NEC TECHNOLOGIES	MultiSync Graphics Engine	\$999/\$1499	512K/1MB	16/256	16/256	16/256
NUMBER NINE COMPUTER	#9GX Levels 1, 2, 3	\$895/\$1195/\$1495	512K/1MB/2MB	16/256/256	0	0
SOTA TECHNOLOGY	340i	\$995/\$1295	512K/1MB	256	16/256	16/256
VECTRIX	VX1024	\$895/\$1095	384K/768K	0	0	0
	EX1280	\$1995/\$2595	640K/1280K	16/256	16/256	16/256
VERMONT MICROSYSTEMS	Cobra Plus	\$1495/\$2695	384K/768K	16/256	16/256	16/256
WESTERN DIGITAL IMAGING	8514/A	\$899/\$1198	512K/1MB	0	0	16/256
	8514/A Camba	\$1099/\$1398	512K/1MB	16	16	16/256
ZYMOS	Rendition II	\$1495/\$2095	512K/1MB	16/256	16/256	16/256

¹ With optional module.

² Uses DRAM.

³ Can display 32K colors at 640 x 480.

ware driver quality is almost as important as hardware reliability. Some drivers are better written than others, and the only way to find the best is to compare boards' speed and image quality on identical monitors.

Graphics Coprocessor Boards

Here's where the fast crowd lives, both in speed and in price. Take IBM's offering: Introduced three-and-a-half years ago, the IBM 8514/A was one of the first beyond-VGA boards intended to make 1024 by 768 a mainstream phenomenon. Prices have dropped considerably since then, but the 8514/A still costs \$1290, and the 16-inch, interlaced 8514 monitor paired with it goes for \$1665.

The competition is divided

into two camps. One group of manufacturers has cloned IBM's 8514/A board; the other group uses Texas Instruments' 34010 coprocessor. Though the 8514/A-compatible boards tend to be less expensive than the 34010 boards, pricing is spread all over the map. Maximum resolution and colors, along with the ability to emulate VGA, have the biggest effect on price.

COMPATIBILITY Obviously, to run VGA software, you need VGA capability. Most graphics coprocessor boards have optional VGA modules or provide VGA pass-through, a feature that enables you to use the VGA you already have. Coprocessor boards generally provide a greater selection of drivers than do super-VGA boards, but most of them are for desktop publishing and

CAD applications.

Of course, if you plan to use *Windows* exclusively, you don't need VGA capability. All you need is *Windows* compatibility, which all these boards have. Step outside *Windows*, and you'll find that more business software supports the 8514/A than the 34010.

As with super-VGA boards, make sure you try out the graphics coprocessor board with the monitor you'll be using. Note that all the graphics coprocessor boards listed drive noninterlaced monitors running at 1024 by 768, but that a few won't interlace at that resolution.

PERFORMANCE Some graphics-intensive applications will run up to 25 times faster on a graphics coprocessor board than on a VGA. The 8514/A and 34010 camps continually tout benchmarks

claiming one type is faster than the other, but seeing is believing. Ask for a demo running your primary application before you buy. In some applications, the speed advantage of a graphics coprocessor board over a fast super-VGA board may be too little to justify the higher price.

VIDEO MEMORY Nearly all the boards listed use VRAM, which makes memory upgrades more expensive than with super-VGA boards. Fortunately, all but two come with enough VRAM to do 1024 by 768 at 16 colors.

Even though graphics coprocessor boards have enough memory, only about half of them run at 800 by 600 resolution. If you're considering a board with 1024 by 768 capability, you'll have to get a monitor to match (read: expensive).

INSTALLATION There's

Non-interlaced 1024x768	Processor type	VGA pass-through	VGA capability	Warranty (years)	Reader service number
16/256	34010	Y	1	5	825
0	8514/A	Y	N	2	826
16/256	8514/A	N	Y	2	826
0	8514/A	Y	N	2	826
16/256	8514/A	N	Y	2	826
16/256	34010	Y	N	1	827
256	34010	Y	N	1	828
256	34010	N	Y	2	829
16	34010	Y	N	1	830
0	8514/A	N	N	1	831
16	8514/A	Y	1	1	832
256	8514/A	Y	1	1	832
16/256	34010	Y	N	1	832
16/256	34010	Y	Y	1	833
16/256/256	34010	Y	1	2	834
16/256	34010	Y	Y	5	835
16/256	34010	Y	N	1	836
16/256	34010	Y	Y	1	836
16/256	34010	Y	1	5	837
16/256	8514/A	Y	N	3	838
16/256	8514/A	Y	Y	3	838
16/256	34010	Y	1	1	839

For more information about all products in this table, circle reader service no. 907.

no doubt the 8514/A crowd has an advantage here: *Windows* comes with an 8514/A driver. During setup, you simply pick 8514/A from *Windows*' list of displays, and you're ready to roll at 1024 by 768. With 34010 boards you must copy a driver from disk, the same as with a super-VGA board.

Graphics coprocessor boards, like super-VGAs, come with a bundle of utilities for turning special features on and off. A number of them also come with special software to enhance performance with certain applications (*Windows* and *AutoCAD* are the most common), and installing the program may require a separate routine.

QUALITY As with any hardware, the longer the warranty on the board, the better. Remember, too, to try it out with your chosen application

before you buy to ensure that driver quality is up to snuff.

Multiscan Monitors

If you've ever seen the sorry results of hooking the wrong board to the right monitor, you'll appreciate the multiscan concept. Designed to sync up intelligently with signals from multiple graphics boards, the typical multiscan can adapt capably to both VGA and beyond-VGA resolutions.

Most multiscans can display a virtually unlimited number of resolutions within a certain range, but a new crop of entries has narrowed the choice to the two or three key resolutions—a clever cost-saving measure. Three other factors that commonly affect cost are dot pitch, scanning technique at 1024 by 768, and the ability to accept digital input (for example, from an EGA or

CGA board).

DOT PITCH Next to resolution, dot pitch is the most important factor in determining the apparent sharpness of an image. Dot pitch is the distance between the tiny phosphor dots on the screen's inner surface. All other things being equal, the smaller the dot pitch, the sharper the image.

The most common dot pitches are .31mm and .28mm. On a 14-inch monitor, a .31mm dot pitch is adequate for 800 by 600 resolution, but if you want to up the ante to 1024 by 768, you need to have .28mm dot pitch or better. On a 16-inch monitor running in 1024 by 768 mode, greater screen area renders .31mm dot pitch acceptable.

COMPATIBILITY Though you may plan to use a monitor at beyond-VGA resolution, some users also need the ability to mix and match boards and monitors at will. A number of the higher-priced monitors handle digital input, which means they work with VGA, EGA, CGA, IBM Monochrome, and—usually—Hercules Graphics boards.

All the multiscans listed run at VGA resolution, but three of the 16-inch units won't do 800 by 600, and four inexpensive 14-inch units lack 1024 by 768 capability. Even if both the board and monitor can display graphics at the same beyond-VGA resolutions, remember that certain pairings may produce inferior images, so try before you buy.

SCANNING MODE The flicker caused by interlaced scanning bothers some people more than it does others. Most experienced users agree, however, that the longer you use an interlacing monitor, the more eye fatigue you'll experience. At 640 by 480 or 800 by 600, all the multiscans listed use non-interlaced scanning, but the vast majority of 14-inch multiscans fall back to interlaced

scanning at 1024 by 768.

Unless you like squinting at small fonts, you should probably buy a 16-inch monitor if you need to work at that resolution fairly often. If you're willing to pony up for a monitor that size, pay the extra \$100 to \$200 for one that supports noninterlaced scanning and treat yourself to a flicker-free environment.

QUALITY You should always select a monitor by comparing the top contenders with your own eyes—side by side, if possible. Try switching between VGA and beyond-VGA modes. Some monitors will adjust automatically, while others will require manual adjustment to get the picture size right. Some won't align properly at all, indicating either a bad match between board and monitor or a defective unit.

Once, we thought OS/2 and Presentation Manager would lead us into a computing environment simpler, more productive, and more enjoyable than before. *Windows 3.0* has taken that role instead, and graphics hardware vendors are anxious to support it.

In this guide we've made every effort to provide you with cost-effective hardware solutions tailored to specific applications. But if you're committed to *Windows*, you may want to take a leap ahead. The near future of graphics lies with the big screen, at flicker-free resolutions of 1024 by 768 or sharper. Sure, a 16-inch monitor will cost less a year from now. But the better the hardware platform, the sooner you and your employees will enjoy the full benefit of the new environment. ☺

TJ Byers is a contributing editor and Eric Knorr the editor for PC World.

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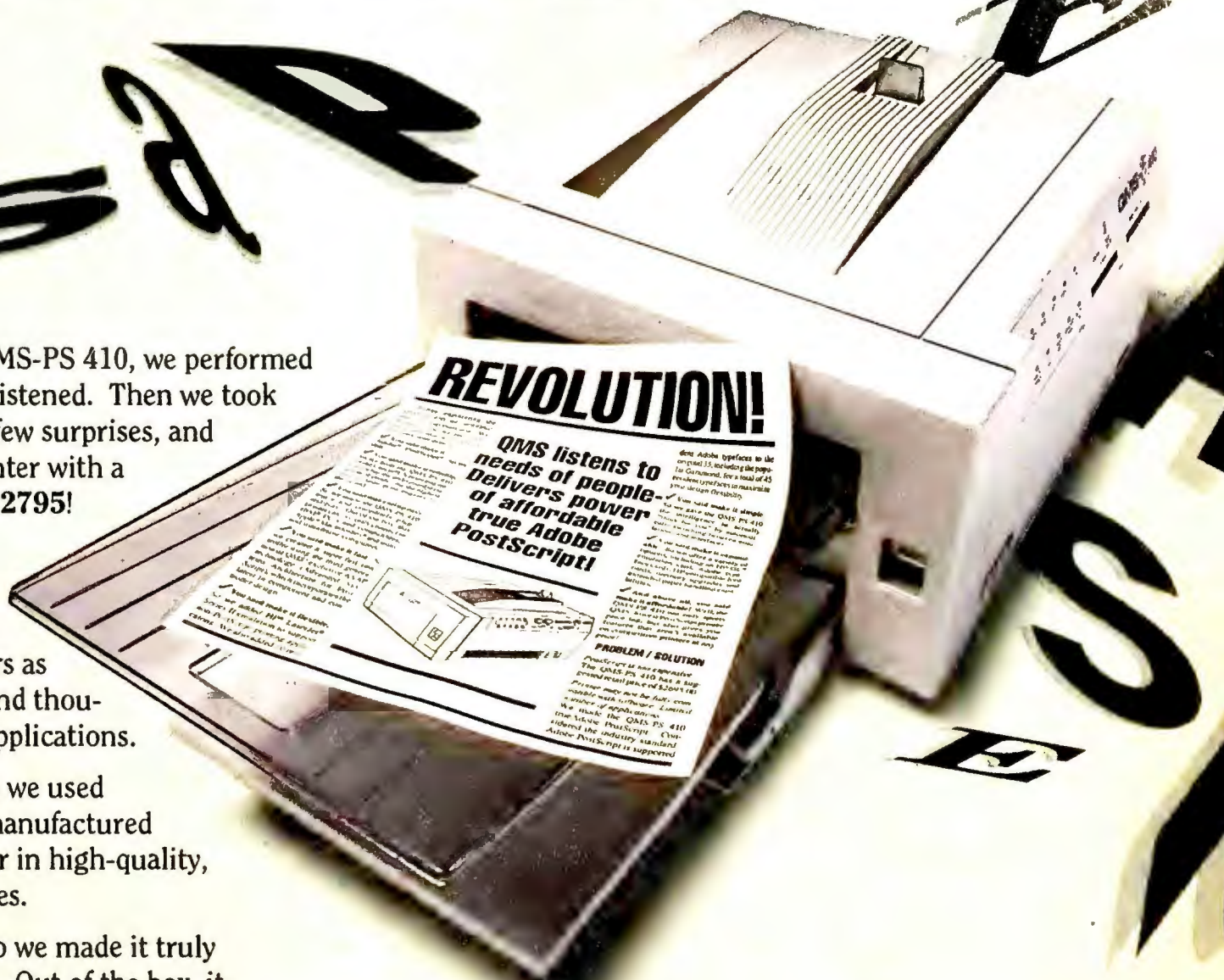
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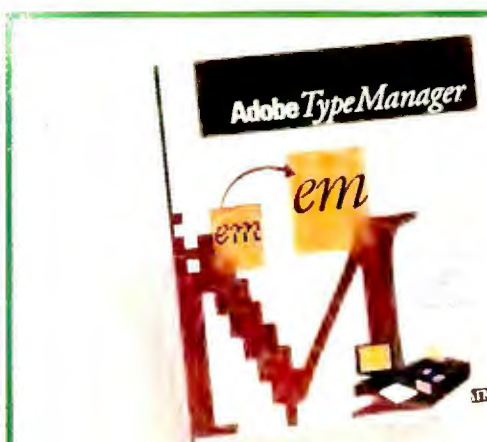


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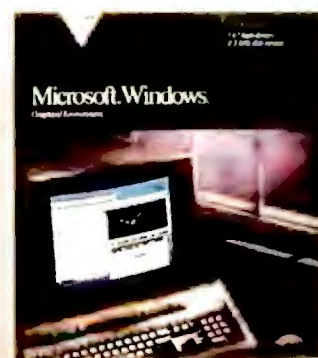
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6889 ☒ **MicroPhone II for Windows**—Telecom software that's "a joy to use," says *PC Computing*. With Watch Me mode to automate script creation, and portability with MicroPhone scripts on the Mac. \$215.

PC Globe ... NCP

- 5902 ☐ PC Globe 4.0. 39.
5900 ☐ PC USA 2.0. 39.

Personics ... NCP

- 4384 ☒ **Ultravision 2.0**. 79.
7475 ☒ **Macro Editor/Debugger 1.0**. 135.
7048 ☒ **Monarch 1.0 (Data Mgmt. Tool)**. 319.

PowerUp ... NCP

- 7860 ☒ **Calendar Creator Plus 3.0**. 45.
7858 ☒ **Express Publisher 2.0**. 89.

Precision Software ... NCP

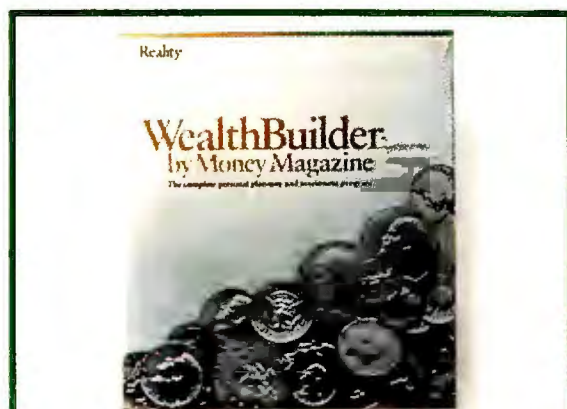
- 8102 ☒ **Superbase 2 1.2**. 219.
6600 ☒ **Superbase 4 for Windows 1.2**. 469.

Qualitas ... NCP

- 7539 ☐ **386MAX 5.0**. 75.
7967 ☐ **BlueMAX 1.0 (386 PS/2) (3½" only)**. 85.

Quarterdeck ... NCP

- 6422 ☐ **QRAM 1.0**. 49.
3221 ☐ **Expanded Memory Mgr. 386 5.1**. 59.
3220 ☐ **DESQView 2.3**. 79.
4586 ☐ **DESQView 386 5.1**. 129.



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6572 ☒ **WealthBuilder by Money Magazine 1.1**—Save & invest wisely. Set financial goals & achieve them. Plan for retirement, a child's education, a home. Optimize your portfolio & track all of your investments. \$145.

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- 7891 ☒ **WealthStarter 1.0**. \$49.
6572 ☒ **WealthBuilder 1.1**. 145.

Reference Software ... NCP

- 4396 ☒ **Grammatik IV 1.0**. 52.
7483 ☒ **Grammatik for Windows 1.0**. 52.

Revolution Software ... NCP

- 4480 ☒ **VGA Dimmer 2.01 (screen saver)**. 29.

RightSoft ... NCP

- 4155 ☒ **RightWriter 4.0**. 55.

Samna ... NCP

- 5799 ☒ **Ami Professional 1.2**. 309.

Sitka/TOPS ... NCP

- 6675 ☐ **TOPS Network Bundle 3.0**. 159.
3720 ☐ **Flashcard 2.1 (AppleTalk network card; 1 year warranty)**. 155.
6649 ☒ **Inbox (20 user) (electronic mail)**. 219.

Softlogic Solutions ... NCP

- 3542 ☐ **Software Carousel 4.0**. 55.

Software Publishing ... NCP

- 7769 ☒ **PFS:Preface 1.0 (with Viruscan)**. 49.
3499 ☐ **PFS:First Publisher 3.0 (with Deluxe Paint II)**. 99.
3478 ☐ **PFS:First Choice 3.02 (with Prodigy)**. 105.

- 3496 ☐ **Professional Write 2.2 (with Professional File)**. 179.

- 3495 ☒ **Professional Plan 1.01**. 69.

- 3482 ☐ **Harvard Graphics 2.3**. 359.

- 4766 ☒ **First Choice Network**. 299.

- 7507 ☒ **Professional Writer Network 2.0**. 349.

- 7513 ☒ **Professional File Network 2.0**. 379.

- 3483 ☒ **Harvard Graphics Network 2.0**. 599.

- 4342 ☒ **First Graphics 1.0**. 99.

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- 6889 ☒ **MicroPhone II for Windows**. 215.

Solution Systems ... NCP

- 7977 ☒ **Brief 3.0 (Programmer's Editor)**. 155.

Spinnaker ... NCP

- 7604 ☒ **PLUS for Windows 1.0**. 289.
4441 ☐ **Resume Kit 1.32**. 25.
4446 ☐ **Eight In One 2.0**. 39.

Systat ... NCP

- 7415 ☒ **Systat/SyGraph 5.0**. 649.

Symantec ... NCP

- 3152 ☒ **Norton Commander 3.0**. 105.
6397 ☒ **The Norton Backup 1.1**. 105.

- 3146 ☒ **The Norton Utilities 5.0**. 125.

- 3425 ☐ **Q&A 3.0**. 229.

- 3431 ☐ **Timeline 4.0**. 469.

Systems Compatibility ... NCP

- 6564 ☐ **Software Bridge 4.1**. 79.
6570 ☐ **Software Bridge LAN 4.1**. 155.

TIMESLIPS ... NCP

- 2987 ☐ **Timeslips III 4.0**. 195.
4277 ☐ **Timeslips III Network**. 399.
6994 ☐ **PercentEdge 1.0**. 69.

Timeworks ... NCP

- 6253 ☒ **Publish-It! 1.1**. 115.

Touchstone Software ... NCP

- 7420 ☒ **Check It 3.0**. 89.

Traveling Software ... NCP

- 5179 ☒ **LapLink III 3.0**. 95.

True BASIC ... NCP

- 3561 ☒ **True BASIC 2.1**. 52.

Vericomp ... NCP

- 6771 ☒ **Memory Master 1.1**. 45.



MECA ... NCP

4603 ☒ **Andrew Tobias' Tax Cut**—New power for handling your 1990 taxes. Import data from Quicken and/or TurboTax, read last year's Tax Cut data, and print your return—all with new versatility. \$49.

Volkswriter ... NCP

- 6246 ☐ **Volkswriter 4 1.02**. 109.

West Lake Data Corp. ... NCP

- 7577 ☐ **PC-FullBak+ 1.12**. 52.

- 7574 ☒ **PathMinder+ 1.0**. 79.

- 7575 ☒ **ValuePak (includes 4 programs)**. 69.

WordPerfect Corp. ... NCP

- 7781 ☒ **LetterPerfect 1.0**. 135.

- 3804 ☐ **WordPerfect 5.1**. 265.

- 6685 ☒ **DrawPerfect 1.1**. 279.

WordStar International ... NCP

- 6791 ☐ **WordStar Prof. 6.0**. 279.

- 7605 ☐ **WordStar 6.0 Network**. 345.

Xerox ... NCP

- 7796 ☒ **Ventura Publisher for Windows 3.0**. 569.

XTREE ... NCP

- 6161 ☒ **XTreePro Gold 1.4**. 85.

ZSoft ... NCP

- 7016 ☒ **PC Paintbrush IV Plus 1.0**. 119.

- 7014 ☒ **PC Paintbrush Plus for Windows 1.12**. 89.



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- 7769 ☒ **Preface (with Viruscan)**. \$49.

- 3499 ☐ **First Publisher (with Deluxe Paint II)**. 99.

- 3478 ☐ **First Choice (with Prodigy)**. 105.

- 3496 ☐ **Professional Write (w/Professional File)**. 179.

to do complex math?



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- 6030 ☐ Test Drive II: The Duel 32.
8081 ☐ Jack Nicklaus' Unlimited Golf & Course Design 39.
8079 ☒ Search for the King 39.

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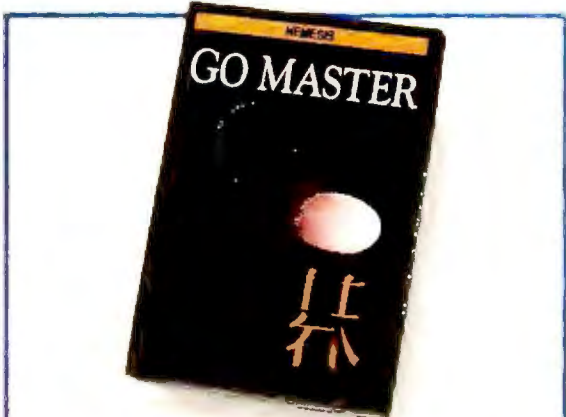
- 1464 ☐ The Word 4.3 (KJ or NIV) 159.

Broderbund ... CP

- 5701 ☒ Where/Time Carmen Sandiego? . . 32.
8068 ☒ Where in the World is Carmen Sandiego Deluxe Edition 52.
5851 ☒ SimCity 33.

Electronic Arts ... NCP

- 5698 ☒ Abrams Battletank 11.
8112 ☐ TV Sports Basketball 39.
6881 ☐ Populous 39.
8109 ☐ Harpoon 45.
5804 ☒ Deluxe Paint II (Enhanced) 89.



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7853 ☐ Word Torture - Spanish 29.

Lucas Film ... CP

- 8113 ☒ Pipe Dream 19.
7583 ☐ Indiana Jones & L.C. 35.
5803 ☐ Their Finest Hour (Battle of Britain) 42.

Microsoft ... NCP

- 7881 ☐ Entertainment Pk for Windows 1.0 29.
2858 ☐ Flight Simulator 4.0 39.

Microsoft Press (Books)

- 8127 Working with Word for Windows . . . 20.
8126 Running with DOS 4th Edition. . . . 20.
8129 Running Windows (2nd Edition) . . . 22.
8136 Running Microsoft Excel 22.

Parlor Software ... CP

- 3159 ☐ Bridge Parlor 2.3 49.

Penton Overseas ... NCP

- ☒ VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese). each 39.

Sierra On-Line ... CP

- 6023 ☒ Leisure Suit Larry III 39.
6796 ☒ Codename: Iceman. 39.
6972 ☒ Conquests of Camelot 39.
5106 ☒ Space Quest III 39.
7972 ☐ King's Quest V. 45.

Spectrum Holobyte ... NCP

- 3467 ☒ Tetris 22.
5993 ☒ Welltris. 22.
5817 ☒ Vette 25.
7602 ☒ Faces 32.

Spinnaker ... NCP

- 5580 ☐ Sargon IV (Chess Game) 32.

Software Toolworks ... NCP

- 6436 ☒ Hunt for Red October 20.
4659 ☒ Chessmaster 2100 (CP) 35.
4534 ☒ Mavis Beacon Typing. 35.
7372 ☐ World Atlas 42.
7879 ☒ U.S.A. Atlas 42.

Stone & Assoc. ... NCP

- 7564 ☒ Young Math (ages 5 to 8) 22.
3434 ☒ Kids Stuff (ages 2 to 6) 22.
3435 ☒ Letters, Numbers, Words (ages 2-6) 22.
3436 ☒ Memory Lane (ages 2 to 6) 22.
5231 ☒ Phonics Plus 22.
3439 ☒ 2nd Math (ages 7 to 16) 27.
3433 ☒ Algebra Plus Vol 1 (ages 13+) . . . 27.

Toyogo ... NCP

- 7676 ☒ Nemesis Go Master Deluxe 88.

True BASIC, Inc. ... NCP

- ☒ Kemeny/Kurtz Math Series. each 45.

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Manufacturer's standard limited warranty period for items shown is listed after each company name. Some products in their line may have different warranty periods.

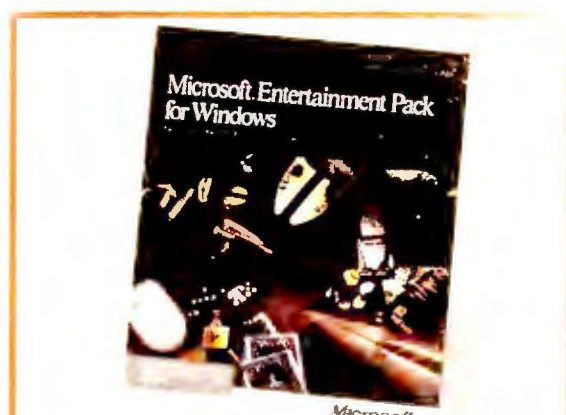
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6811 360SX (stand-by power source) . . . 219.
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7106 520ES (stand-by power source) . . . 329.

AST Research ... 2 years

- 1299 SixPakPlus 384k C/S/P 179.
8041 SixPak 286 0k. 105.
4107 RAMPage Plus 286 512k. 419.
4105 RAMPage Plus MC 512k 419.
6979 VGA Plus Video Card (256K expandable to 512K). 199.

Boca Research ... 5 years

- 7001 BOCARAM/AT PLUS (0-8 Meg) (LIM 4.0 extended) 125.
7061 BOCARAM/XT 0K (0-2 Meg, LIM 4.0) 99.
7135 TophAT (16-bit backfill 512K to 640K) 99.
6998 I/O Board for AT 59.
6999 I/O Board for Microchannel S/S/P . 109.
6995 SuperVGA (800 x 600, 16/8 bit) . . . 115.
7026 1024 VGA (16 bit non-interlaced) . . 149.



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8120 FlightStick w/Falcon & GameCard MCA 95.

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5787 HL-8e Laser Printer (HP2 comp.) 1399.

Canon ... 1 year

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7896 Sheet feeder for BJ-10e 75.

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7935 Gamecard III - Automatic 33.

8119 FlightStick w/Falcon & GameCard III 79.

8120 FlightStick w/Falcon & GameCard MCA 95.

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1604 2-Position switch box 25.

1605 3-Position switch box 35.

Cuesta Systems ... 1 year

1608 400 Watt DataSaver 429.

5130 600 Watt DataSaver 599.

Curtis ... lifetime

1704 Universal Printer Stand PS-1 18.



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7775 Equity LT-286e Laptop 1995.

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7391 Ultra 9600 Modem 899.

Hewlett-Packard ... 1 year

7976 DeskJet 500 (w/ink cartridge) 599.

6754 LaserJet III (w/toner) 1699.

6582 LaserJet IIP (w/toner) 1069.

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6421 2400B MNP Internal Modem 199.

4696 2400B Internal Modem 159.

2352 2400B Internal Modem 2 (for PS/2) 249.

5119 2400 Baud External Modem 179.

6420 2400EX MNP Modem 229.

7880 9600EX Modem 549.

2346 Inboard 386/PC w/1 Meg (w/free Ami) 519.

2348 Inboard 386/PC w/1 Meg Piggyback 349.

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4266 Above Board Plus 512k 369.

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4272 Above Board 2 Plus 512k 469.

5396 Above Board MC 32 0k 359.

7782 SatisFAXtion (fax board) 399.

7552 NetPort (3 year warranty) 489.

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7385 80287XL (16 MHz 80286 CPU's) 199.

4750 80387SX (16 MHz 80386SX CPU's) 309.

2371 80387 (16 MHz 80386 CPU's) 349.

2372 80387-20 (20 MHz 80386 CPU's) 399.

4121 80387-25 (25 MHz 80386 CPU's) 429.

2375 8087 (4.77 MHz 8088 CPU's) 89.

2374 8087-2 (8 MHz 8088 CPU's) 129.

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2582 Master Piece Plus 109.

7899 Expert Mouse serial 119. bus 129.

Key tronic ... 3 years

4518 101 Plus Keyboard 99.

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5800 3 button Thunder Joystick 29.

5802 Trackball 59.

7912 G/S+ (microchannel game card) 79.

5831 Game Card/Thunderstick Bundle 55.

7581 KI30 Joystick 29.

7862 TopTrack (Laptop Trackball) 79.

Logitech ... limited lifetime

5464 C9 Mouse for PS/2's 69.

7768 C9 Mouse with Windows 149.

5151 HiREZ Mouse (C9) 85.

6029 Trackman (Trackball) serial 85. bus 89.

4297 ScanMan Plus (hand scanner) 185.

4794 ScanMan Plus (MicroChannel) 219.

7975 ScanMan 256 319.

Magnavox ... 1 year

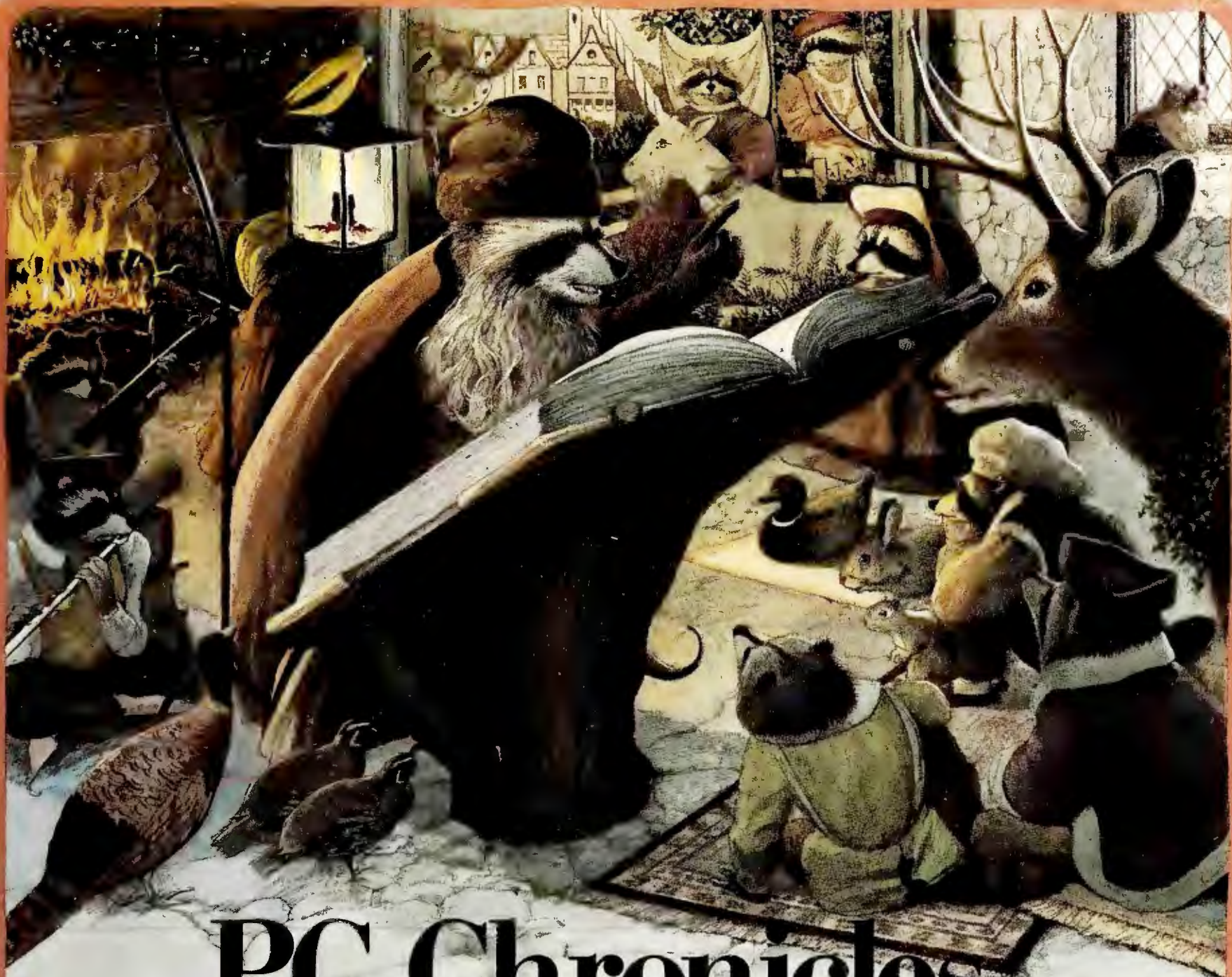
5990 CM9032 (13" VGA Monitor, .42 dot pitch) 299.

4762 9CM082 (13" VGA Monitor, .31 dot pitch) 349.

Micron Technology ... 2 years

7595 Intensify 2 Meg Expansion for HP LaserJet IIP or III 175.

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- 6832 Plotter in a Cartridge (for LJ II) 249.
- 6835 Headlines in a Cartridge (LJ II, IIP, IID) 209.
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- 3101 1200 Baud Internal Modem 65.
- 3100 1200 Baud External Modem (mini) . 77.
- 3103 2400 Baud Internal Modem 135.
- 3102 2400 Baud External Modem 179.
- 5286 2400 Baud Int. MNP Modem (Lev. 5) 175.
- 5285 2400 Baud Ext. MNP Modem (Lev. 5) 209.
- 4542 2400 Baud Internal Modem for PS/2 . 229.
- 8132 PM2400 Pocket Modem 99.
- 7934 PM9600SA 489.

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- 7086 MC600 Mobile Computer 2149.
- 7090 512K Flash EPROM 309.
- 7962 3 1/2" External Drive. 299.

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- 7127 Private Eye (virtual display) 499.

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- 6747 Safe 400S (Slimline) 399.



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- 7271 Inport 79. 6330 PS/2 79.

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- 7878 PC Mouse III 99.

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- 4799 Multisync 2A (VGA Monitor) 499.
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Orchid Technologies ... 4 years

- 7064 Peanut VGA (256k) 129.
- 7512 ProDesigner VGA II (1024 x 768) .. 299.
- 7888 ProDesigner/e (256k) 209.
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- 6779 25 Cartridges in One! (for LJ II, IIP, IID) 275.
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- 7634 2 Meg ... 219. 7633 4 Meg ... 369.
- 7158 Pacific Page (PostScript Cartridge for LaserJet IIP/III) 379.
- 6834 Pacific Page with free 2 Meg
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- 7632 Outline I. 209. 7631 Outlines II. 209.



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7271 Inport 79. 6330 PS/2..... 79.

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- 7913 Safe 650W 459.
- 7914 Safe 800W 599.
- 4560 Safe 1200W 739.

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- 4899 Nylon Laptop Carrying Case. 55.
- 7028 Foliopac 79.
- 6037 Premier Leather Carrying Case. . 199.

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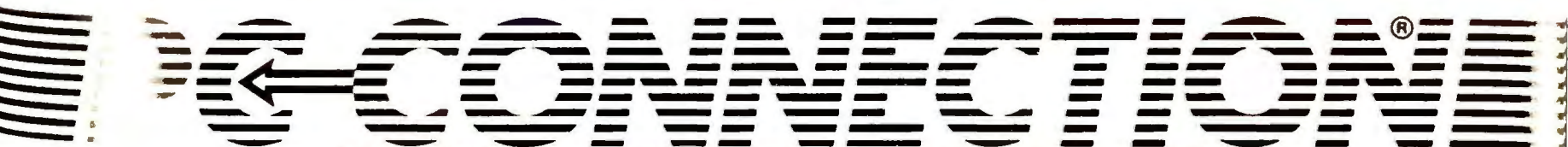
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4931	VRAM VGA 512k	379.

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5117	Bernoulli II Dual 44 Meg External	1969.
5113	44 Meg Cartridge Tripak (5 1/4")	249.
2500	PC2B Controller	229.
2503	PC4B Controller (Microchannel)	299.
7551	Bernoulli II Transportable 44 Meg	997.

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2917	40-60 Meg Internal Tape Drive	259.
2916	40-60M Ext. Tape Drive (w/power supply)	489.
5500	80-152M Int. Tape Drive	629.
5502	83-152M Ext. Tape Drive	799.
5190	DC2000 Pre-formatted Cartridges ea.	35.
6153	DC2120 Tape Cartridge (5 pack)	135.

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4950	360k Drive (for PC)	\$79.
4951	720k Drive (specify XT or AT, 3 1/2")	75.
4670	1.44 Meg Drive for PC/XT (3 1/2")	89.
4326	1.44 Meg Drive for AT	109.
6951	1.2 Meg Drive for AT	99.
6952	1.2 Meg Drive for PC/XT	99.

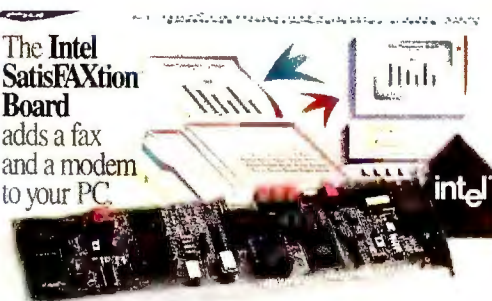
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The Intel SatisFAXtion Board adds a fax and a modem to your PC.



Intel ... 5 years

7782 SatisFAXtion—Send and receive faxes from within most applications using the print command. Built-in 2400 bps MNP modem standard. Includes coupons for free PC Tools and Fax-It software. \$399.



Practical Peripherals ... 5 years

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Pacific Data Products ... lifetime

7158 PacificPage Personal Edition 4.0—New and improved PostScript emulation for your HP LaserJet IIP, IID or III. Faster, superb font quality. Minimum 1.5M printer memory required. \$379.

DISKS

Maxell ... lifetime

2789	5 1/4" MD2-D 360k Disks (Qty. 10)	12.
2790	5 1/4" MD2-HD 1.2Mb Disks (Qty. 10)	19.
2792	3 1/2" DS/DD 720k Diskettes (Qty. 10)	14.
2793	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	27.

Sony ... lifetime

3291	5 1/4" DS/DD 360k Disks (Qty. 10)	10.
3292	5 1/4" DS/HD 1.2Mb Disks (Qty. 10)	19.
3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	13.
3298	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	22.
6659	QD 2000 Tape Cartridge	19.

PC Connection Exclusive!



Reflection Technology ... 1 year

7127 Private Eye—A large screen in a small box. A tiny virtual display which offers a full-size, 12" IBM CGA auxiliary screen to PCs & laptops. View privately in planes or meetings. Brighter than LCDs. \$499.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

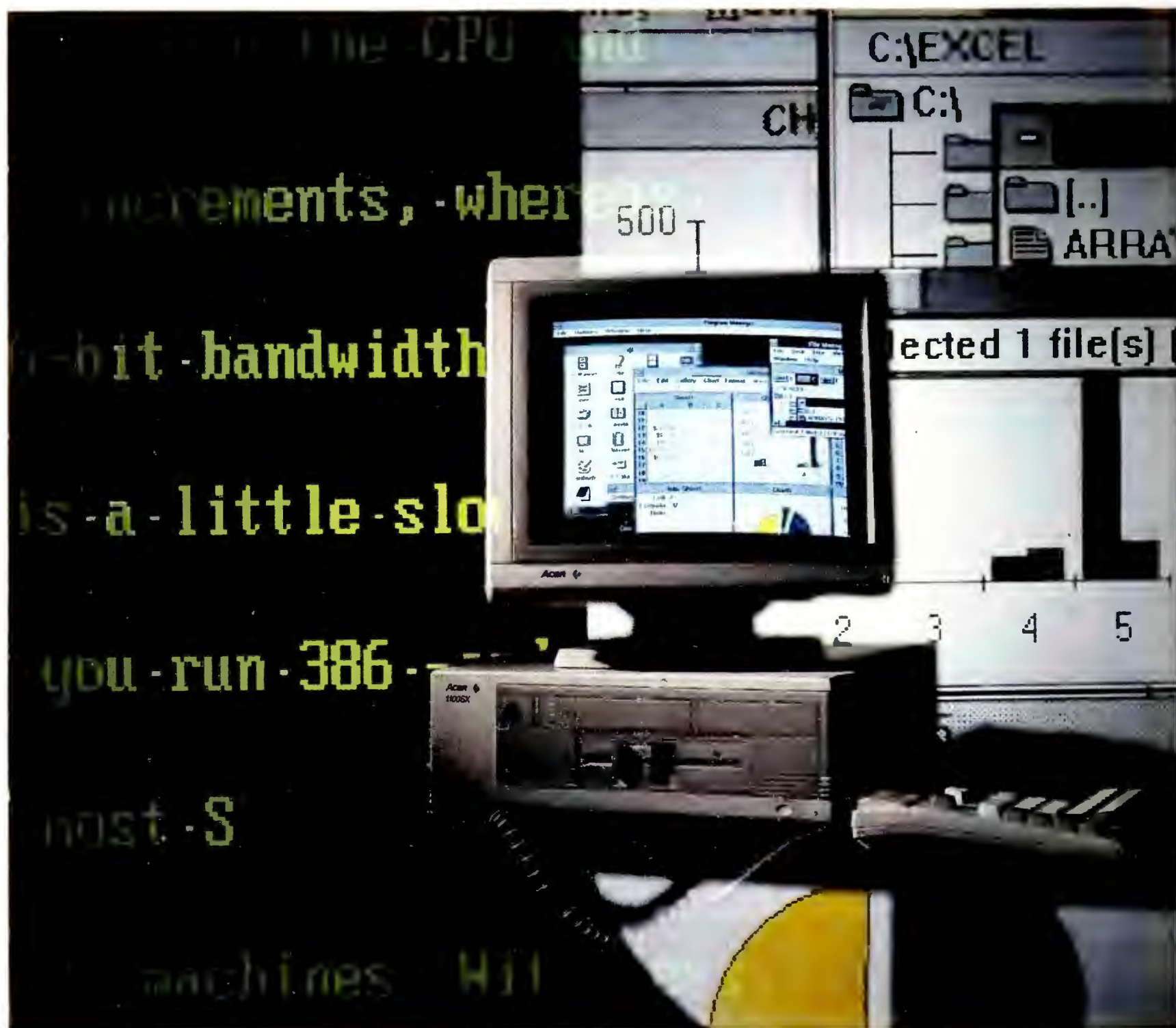
Hawaii:

- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

Alaska and outside Continental US:

- Call 603/446-7721 for information.

PC CONNECTION®



16-MHz SX Systems

A 16-MHz SX**is the ideal****bridge****between****character-****based and****graphical****worlds. We****show you****how to pick****the winners****from a****collection of****85 SX****mainstays.****Susan Lusty**

Think of the 16-MHz SX machine as part of the furniture. It's inexpensive enough to put in every cubicle, and if you're determined to take advantage of the best software, its 386-compatible processor is as essential as a comfortable chair. A cheaper 286 system may leave you uncomfortable, without full support for critical applications.

Buying less computer than an SX makes little sense, but you may desire more—which means shelling out for a full-fledged 386 or a 486. The average 25-MHz 386, for example, delivers 61 to 65 percent faster processing speed than the average SX, while the price typically increases \$2000 or \$3000. Many businesses will want to pay this premium only for CAD, LAN server, desktop publishing, and other taxing applications.

A compact chassis and entry-level pricing position the 16-MHz SX as the preferred light-duty office workstation. In this guide, you'll find 85 such systems, with vital statistics and buying information on each. Before you browse through the tables, though, let's take a look at a few key buying issues.

Standard Features Consistent with the theme of this issue, we've put together a standard configuration that makes sense for running *Windows*. The prices listed in the table are based on one parallel and one serial port, a floppy drive (with your choice of 3½- or 5¼-inch formats), a floppy/hard drive controller, an 80MB to 110MB hard disk, 4MB of memory on the motherboard, a VGA controller and color monitor, a key-

board, and DOS 3.3 or a later version. Systems sold through dealers will probably cost 20 to 30 percent less than the list price. If you want a monochrome monitor instead, you can slice about \$300 to \$400 off the price.

To speed throughput, most of these systems offer disk and memory caching. Disk caching keeps frequently used data in RAM to eliminate redundant disk accesses. Memory caching works similarly except that it keeps frequently used data in special high-speed static memory. Disk caching requires a software utility, while memory caching is built into the system hardware. If the system you choose doesn't include disk caching, you can buy a third-party utility for about \$70. Also, to speed calculations, all the SXs listed offer an optional 387SX math coprocessor.

CPU-Speed Memory All of the systems let you expand CPU-speed memory up to 2MB, on the motherboard or via a special high-speed slot. Most allow 8MB, and some as much as 16MB of high-speed RAM. (You can always expand SXs to 16MB by placing memory boards in standard 8-MHz expansion slots, but this eats up precious slots, and the expansion RAM runs slower.)

Headroom for at least 8MB is a good idea for *Windows*, especially with today's cheap RAM prices.

Expandability Most SXs have fewer slots available for expansion boards than standard 386s do. Even so, maximum flexibility demands at least four free slots after the unit is equipped in the standard configuration given above. Most of these should be 8/16-bit slots: Some boards, such as VGA adapters, can take advantage of 16-bit throughput.

Device Capacity An SX should have at least three drive bays, two of them externally accessible, so you can have a floppy drive, a hard drive, and a tape drive. Most 3½-inch drives will fit into a third-height bay, most 5¼-inch drives require a half-height bay, and many hard disks over 120MB typically need full-height bays.

Programs are hogging more and more disk megabytes these days: Together, *Windows 3.0*, a word processor, a desktop publishing package, and a spreadsheet can easily consume 25MB of hard disk space—not counting data files. Consequently, unless you can store files or share programs on a network, you'll probably need an 80MB hard disk—with 120MB an even safer choice.

Design and Construction Most of the machines reviewed have small footprints (16 by 16 inches), which can pay off on crowded desktops. However, some companies have resorted to tangled internal system designs in order to slim down, so make sure you can open the system unit easily to install boards and other add-ons. For example, some

16-MHz 386SX SYSTEMS

STANDARD FEATURES

	List price ¹	Disk caching software	Memory caching	Parallel ports (on motherboard*)	Serial ports (on motherboard*)	Dedi- cated mouse port	Built-in floppy con- troller	Built-in hard disk con- troller	Built-in VGA con- troller	CPU- speed RAM (MB)	8/16-bit slots: total/ free	8-bit slots: total/ free
ACER 1100SX	\$4120	y	n	1*	2*	y	y	y	y	8	4/4	0
ACMA 386SX	\$2195	n	n	1	2	n	n	n	n	8	6/4	2/1
ADVANCED DIGITAL CORP. POWERLITE 386SX	\$3772 ³	y	y	1*	1*	y	n	n	y	5	4/2	0
AMAX 386SX-16	\$2085	y	n	1*	2*	n	y	y	n	8	6/5	1/1
AMERICAN MITAC MPC 2386	\$3505	n	n	1*	2*	y	y	n	y	16/8	5/4	1/1
AMERICAN MITAC MPS 2386	\$3620	n	n	1*	1*	y	y	n	y	16/8	6/5	0
ARCHE RIVAL 386SX	\$4260	n	n	1	2	n	y ⁴	y	n	16/8	6/6	2/0
ARCHE TRIUMPH 386SX	\$4160	n	n	1*	2	n	y	y	y	16/8	3/3	2/1
AST PREMIUM/386SX-16	\$4895	y	y	1*	2*	y	y	y	n	2	6/5	1/1
AT&T 6386SX/EL	\$5900	y	y	1*	2*	y	y	y	y	8	3/3	1/1
AUSTIN 386SX WINSTATION	\$2658	n	n	1*	2*	n	y	y	n	8	6/5	1/1
CAF MASTER 386SX-16	\$2370	n	n	0	0	n	n	n	n	8	6/4	2/1
CLONE 386SX	\$2398	y	y	1	2	n	n	n	n	8	6/4	2/1
CLUB AMERICAN CV-316SX-B	\$2440	n	n	1	1	n	n	n	n	8	6/4	2/1
COMPAQ DESKPRO/386s	\$5197	y	y	1*	2*	y	y	y	y	13	4/4	0/0
COMPUADD 316s	\$2708	n	n	1*	2*	n	y	y	n	4	3/2	2
CORDATA CPC-8100	\$2547	n	n	1*	2*	n	y	y	y	8	6/6	2/2
CPT MODEL 316-SX	\$2399	n	n	1	2	n	n	n	n	5	5/4	3/2
CSR 386SX-16	\$3499	n	n	1	1	y	n	n	n	8	5/3	3/2
CSS LABS. PREFERRED 386SX	\$3747	n	n	0	0	n	n	n	n	8	8/5	0
DATA GENERAL DASHER/386-16C	\$4835	n	n	1*	2*	n	y	y	y	8	4/2	0
DELL SYSTEM 316SX	\$2699	n	n	1*	2*	n	y	y	y	8	3/3	0
DFI 386SX	\$4495	n	n	1	2	n	n	n	n	8	6/4	1/1
EASYDATA 386SX	\$2499	y	n	1*	2*	n	y	y	n	8	5/4	2/2
ELTECH 2160	\$2579	n	n	1	2	n	n	n	n	8	5/3	3/2
EPSON EQUITY 386SX PLUS	\$5270	n	n	1*	1*	y	y	y	y	14	3/3	1/1
EVEREX STEP 386is	\$4096	y	n	1	1	n	n	n	n	4	6/4	2/1
EVEREX TEMPO 386SX	\$4188	n	n	1	2	n	n	n	n	8	6/4	2/1
FALCO 386SX	\$3985	n	n	1*	2*	n	y	y	y	8	2/2	0
FIVESTAR MODEL 386SX	\$2495	y	y	1*	2*	n	y	y	y	8	4/4	0
FORTRON/SOURCE NET-SET SX	\$2400	y	n	1*	1*	y	y	y	n	8	3/2	0
GATEWAY 386SX	\$2245	n	n	1*	2*	y	y	y	n	8	6/4	2/2
GRID 386SX-MFP	\$4299	n	n	1*	1*	y	y	y	y	4	3/3	0
GRID 386isx	\$4599	n	n	1*	1*	n	y	y	y	16	6/6	0
HCI MAXAR 386SXL	\$3499	n	n	1*	2*	y	y	y	y	8	4/3	0
HERTZ 386SXe	\$2575	y	y	1	1	n	n	n	n	5	6/4	2/1
HEWLETT-PACKARD QS/16S	\$6082	y	n	1	1	y	n	n	n	8	6/4	1/1
HIQUALITY 386SX-16	\$2385	n	n	1	2	n	n	n	n	8	6/2	2/1
HYUNDAI SUPER-386	\$4285	n	n	1	1	n	y	y	n	8	4/3	2/2
IBM PS/2 MODEL 55 SX	\$6405 ⁷	y	n	1*	1*	y	y	n	y	4	3/3	0
INSIGHT 386SX-16	\$2049	n	n	1	2	n	n	n	n	8	6/4	2/1
LASER 386SX	\$3000	y	n	1*	2*	n	y	y	n	4	4/3	0

¹ Except as noted, price based on 4MB RAM, 1.2MB or 1.44MB floppy drive, 80MB to 110MB hard disk, one parallel and one serial port, VGA controller and color monitor, 101-key keyboard, and DOS 3.3 or later version.

² One year parts, two years labor.

Max. number of third-/half-/ full-height drives	Exter- nally accessible drives	Largest hard disk sold with machine	DESIGN				SERVICE AND SUPPORT							
			Switch- less setup	Com- pact foot- print	Front- panel on/off switch	Front- panel reset button	Warranty period (months)	Free on-site service (months)	Toll-free support number	Daily support hours	Weekend support	Electronic bulletin board	Fax	Reader service number
0/2/0	2	100MB	y	y	y	y	12	4	dealer	dealer	dealer	n	y	640
1/4/0	3	676MB	y	y	n	y	²	n	y	11	n	n	y	641
2/0/0	1	100MB	y	y	n	y	12	n	y	9	n	y	y	642
0/4/0	4	700MB	y	y	y	y	12	n	y	8.5	n	n	y	643
2/2/0	3	200MB	y	y	y	y	12	12	y	9	n	y	y	683
2/2/0	3	60MB	y	y	y	y	12	12	y	9	n	y	y	683
0/3/0	2	380MB	y	y	n	y	24	n	y	10	n	n	y	644
0/2/2	4	380MB	y	y	n	y	24	n	y	10	n	n	y	644
0/5/0	3	320MB	y	n	n	y	12	n	y	11	n	y	y	646
1/2/0	3	80MB	y	n	y	y	12	n	y	9	n	y	y	647
0/4/0	3	175MB	y	y	n	y	12	12	y	13	y	n	y	648
1/3/0	1	200MB	y	n	y	y	12	n	y	9	n	n	y	650
0/4/0	4	220MB	y	n ⁵	y	y	12	n	n	24	y	n	dealer	651
0/4/0	3	650MB	y	y	n	y	12	n	n	10	n	n	y	652
2/2/0	4	320MB	n	y	y	n	12	dealer	dealer	dealer	n	n	n	653
0/3/0	2	110MB	y	y	y	n	12	n	y	11	n	n	y	654
0/4/0	3	40MB	y	y	n	y	12	n	y	9	n	n	y	655
1/3/0	4	640MB	n	y	n	y	12	n	y	12	n	n	y	656
0/5/0	3	1.2GB	n	y	y	y	24	12	y	10	n	n	y	657
0/4/0	3	766MB	y	n	n	y	12	n	n	13	n	y	n	659
0/4/0	2	200MB	y	y	n	y	12	12	y	9	n	y	n	660
3/0/0	2	190MB	y	y	y	n	12	12	y	12	y	y	y	661
1/3/1	4	330MB	y	y	y	y	12	12	n	9	n	n	y	662
2/3/0	4	600MB	y	y	y	n	12	12	dealer	dealer	dealer	n	n	663
0/5/0	5	670MB	y	y	n	y	12	12	y	12	n	n	y	664
0/3/0	2	100MB	y	y	y	y	12	dealer	n	dealer	dealer	n	n	665
0/3/0 or 0/5/0	3 or 5	660MB	y	y	n	y	12	12	dealer	dealer	dealer	y	n	666
0/3/0 or 0/5/0	3 or 5	660MB	y	y	n	y	12	3	dealer	dealer	dealer	y	n	666
0/3/0	1	200MB	y	y	y	n	12	3	y	11	n	n	y	667
2/3/0	4	1.2GB	y	n ⁵	y	y	12	12	y	10	n	y	y	668
3/3/1	2	300MB	y	y	y	y	12	12	y	9.5	n	n	y	669
0/5/0	3	650MB	y	y	n	y	12	12	y	14	y	y	y	670
1/1/0	2	440MB	n	y	y	y	12	n	y	11	n	n	y	671
0/3/0	3	1GB	n	y	y	y	12	n	y	11	n	n	y	671
0/3/0	2	120MB	y	y	y	y	12	12	y	9	n	n	y	672
0/5/0	5	383MB	n	y	n	y	12	n	y	8	n	n	y	673
0/3/0	2	168MB	y	y	y	n	12	3	y	24 ⁶	y	y	n	674
0/5/0	3	350MB	y	n	y	y	12	n	y	10	y	y	y	675
1/2/0	2	100MB	y	y	y	y	18	n	dealer	dealer	dealer	dealer	dealer	676
0/2/0	2	60MB	y	y	y	n	12	dealer	dealer	dealer	n	n	n	677
1/3/0	3	1GB	y	y	y	y	12	12	y	13	y	n	y	678
0/3/0	2	80MB	y	y	n	y	12	6	y	10	n	y	y	679

² Does not include monitor or DOS.

⁴ \$100 extra for built-in floppy controller.

⁵ Case is a minitower.

⁶ 24-hour voice mail or pager to leave queries.

16-MHz 386SX SYSTEMS

STANDARD FEATURES

	List price ¹	Disk caching software	Memory caching	Parallel ports (on motherboard*)	Serial ports	Dedicated mouse port	Built-in floppy controller	Built-in hard disk controller	Built-in VGA controller	CPU-speed RAM (MB)	8/16-bit slots: total/	8-bit-slots: free
MICRO EXPRESS ME 386SX	\$2374	n	n	1	1	n	n	n	n	8	6/4	2/2
MICRO EXPRESS ME 386SX/SL	\$2324	n	n	1*	1*	n	y	y	y	4	3/3	2/2
MIS 386SX-16	\$1950	n	n	1	2	y	n	n	n	8	6/4	2/1
MISSION CYRUS DARIUS PROFESSIONAL	\$4120	y	y	1*	1*	y	y	y	y	8	2/2	0
MITSUBA MINI 386SX	\$2895	n	n	1	2	n	n	n	n	5	6/4	2/2
MITSUBISHI MP 386S	\$3695	y	n	1*	2*	n	y	n	n	8	6/4	0
MULTIMICRO 386SX-16	\$2750	n	n	1	1	n	n	n	n	8	5/3	3/2
NCR ELPCS386SX	\$5714	y	n	1*	2*	y	y	y	y	5	2/2	0
NCR PC386SX	\$5914	y	n	1*	2*	y	y	y	y	2	4/4	0
NEC POWERMATE SX PLUS	\$6068	y	n	1	1	y	y	n	y	10	5/4	0
NETWORK CONNECTION TRIUMPH SX	\$1695	n	n	1	2	n	n	n	n	8	6/3	2/2
OLIVETTI PCS 386SX	\$4790	n	n	1*	1*	y	y	y	y	8	3/3	1/1
OSICOM EXECUTIVE 386SX	\$3489	n	n	1*	2*	n	y	y	n	8	3/2	2/2
PACKARD BELL FORCE 386X	\$2599	n	n	1*	2*	y	y	y	n	8	3/2	1/1
PAN OVERSEAS POC 386SX	\$3747	n	n	1*	2*	n	y	y	n	5	5/4	1/1
PC BRAND 386SX-16	\$2186	y	n	1	2	n	n	n	n	8	6/4	2/1
PC CRAFT PCC 2700/16	\$3299	n	n	1	2	n	n	y	n	4	6/4	2/1
PC DESIGNS GV-386/SX	\$2998	y	y	1	2	n	n	n	n	4	3/2	2/1
PHILIPS MAGNAVOX MAXSTATION 386SX	\$2399	n	n	1*	2*	n	y	y	n	8	4/3	1/1
POLYWELL 386SX-16VB	\$2449	n	n	1	2	n	n	n	n	8	5/3	2/2
PROTEUS MODEL 386SX-16	\$2359	y	n	1*	2*	y	y	y	n	8	6/5	1/1
REPLY 386SX-16	\$5645	n	n	2*	2*	y	y	y	y	8	5/5	0
SAMSUNG SD 700	\$4200	y	n	1*	2*	y	y	y	n	8	5/4	0
SUN MOON STAR 386SX	\$2395	y	n	1	2	n	y	y	n	8	3/2	2/2
SYNTRIX 386SX-16	\$3395	n	n	1*	2*	n	y	y	n	8	2/1	4/4
TANDON SLIMLINE 386SX	\$3363	n	n	1*	2*	n	y	y	n	5	3/2	1/1
TANDY 4016 SX	\$4498	n	n	1*	1*	y	y	y	y	4	3/3	0
TANGENT 386SX-16	\$2195	n	n	0	0	n	n	n	n	8	5/3	2/2
TATUNG TCS8450S	\$2425	n	n	1*	2*	y	y	y	n	8	3/2	1/1
TELEVIDEO TELESX	\$3395	n	n	1*	2*	n	y	y	y	4	5/5	0
TENEX 386SX	\$2247	y	n	1	2	n	n	n	n	5	6/4	2/2
TEXAS INSTRUMENTS TI 386SX	\$6475	y	n	1*	1*	y	y	y	n	4	3/2	1/1
TOPLINE 386SX	\$2595	n	n	1	2	y	y	y	n	8	5/4	2/0
TUSSEY SWAN 386SX	\$2693	y	y	1*	2*	n	y	y	n	8	6/5	1/1
TWINHEAD SUPERSET 590-16	\$2839	y	n	1*	2*	n	y	y	y	5	4/4	0
ULTRA COMP 386SX	\$2395	y	n	1	2	n	n	y	n	8	5/3	3/2
UNISYS 500/16A	\$5109	y	n	1*	2*	n	y	n	n	8	4/3	1/1
USIT ATHENA 386SX-16	\$3150	y	n	1*	2*	y	y	y	y	4	3/3	0
WANG PC 350/16S	\$5635	n	n	1	2	n	y	y	n	8	4/4	2/1
WLT AT-316S-6/8	\$3143	n	n	1*	2*	n	y	y	n	8	5/4 or 7/6	1/1
WYSE WY-3016SX	\$4704	y	n	1	1	n	y	y	n	8	6/5	2/2
WYSE WY-3116SX	\$4704	y	n	1	2	n	y	y	n	12	4/3	2/2
ZENITH Z-386SX	\$5898	y	y	1*	2*	n	y	y	n	8	5/4	0

¹ 60MB hard disk.

² Prorated warranty.

³ Businesses only.

¹⁰ In-house labor 60 months, motherboard 24 months, VGA card 48 months, standard parts 12 months.

Max. number of third-/half-/ full-height drives	Exter- nally accessible drives	Largest hard disk sold with machine	DESIGN				SERVICE AND SUPPORT							
			Switch- less setup	Com- pact foot- print	Front- panel on/off switch	Front- panel reset button	Warranty period (months)	Free on-site service (months)	Toll-free support number	Daily support hours	Weekend support	Electronic bulletin board	Fax	Reader service number
0/5/0	3	750MB	y	y	y	y	15	n	y	10	n	n	n	680
0/3/0	2	200MB	y	y	y	y	15	n	y	10	n	n	n	680
0/5/0	3	1.2GB	y	y	y	y	12	n	y	9.5	y	n	y	681
0/3/0	1	200MB	y	n	n	y	12	n	n	n/a	n/a	n	y	682
0/3/1	3	330MB	n	y	n	y	12	n	dealer	dealer	dealer	dealer	y	684
1/2/0	2	100MB	n	y	y	y	12	dealer	y	10	n	y	y	685
0/4/0	4	677MB	y	y	y	y	12	12	n	9	n	y	y	686
0/2/0	1	100MB	y	y	y	n	12	12	dealer	dealer	dealer	n	n	687
0/3/0	2	100MB	y	y	y	n	12	12	dealer	dealer	dealer	n	n	687
0/3/0	2	140MB	n	y	y	n	12	dealer	dealer	dealer	dealer	y	y	688
1/1/1	3	1.2GB	y	y	n	y	12	n	dealer	12.5 ⁶	y ⁶	dealer	y	689
2/0/0	2	100MB	y	y	n	n	12	12	y	9.5	n	n	n	690
1/2/0	2	140MB	y	y	y	y	12	12	y	12	n	y	y	691
0/4/0	3	124MB	y	y	y	y	12	12	y	9	y	n	y	692
0/5/0	3	600MB	y	y	n	y	12	n	dealer	dealer	dealer	n	y	693
6/4/2	4	640MB	y	y	y	y	60 ⁸	3	y	16	n	n	y	694
0/3/1	3	768MB	y	y	y	y	12	4	y	9	n	y	y	695
0/4/0	4	350MB	y	y	n	y	12	12 ⁹	y	11	y ⁶	n	y	696
0/3/0	2	80MB	y	y	y	n	12	6	y	13	n	n	n	697
0/4/0	4	1GB	y	y	n	y	¹⁰	n	y	14	y	n	y	698
0/4/0	2	340MB	y	y	y	y	15	15	y	8	n	n	y	699
2/2/1	3	800MB	y	y	y	y	12	12	y	11	n	n	y	700
0	0	¹¹	y	y	y	y	12	n	y	10	n	y	y	701
0/4/0	2	200MB	y	y	y	y	36	6	y	9	n	y	y	702
0/3/0	0	660MB	y	y	n	n	12	n	y	12	n	n	y	703
3/0/0	2	200MB	y	n	y	n	12	n	y	24	y	n	y	704
0/3/1	3	440MB	n	y	y	y	12	n	n	9.5	y	y	n	705
1/3/0	4	105MB	y	n	n	y	12	n	y	11	y	n	y	706
0/4/0	2	100MB	y	y	n	y	12	4	y	10	y	n	y	707
2/3/0	3	80MB	n	y	y	n	12	12	n	10	n	n	y	708
2/2/0	3	676MB	y	y	n	y	12	n	y	9	y	n	y	709
0/3/0	2	110MB	y	y	n	n	12	n	y	9	n	y	n	710
2/3/0	3	330MB	y	y	n	y	12	n	dealer	dealer	dealer	n	y	711
0/4/0	3	200MB	y	y	n	y	12	12	y	12	n	y	y	712
2/2/0	3	200MB	n	y	y	y	12	12	y	10	n	n	y	713
0/5/0 or 0/3/1	3	1.2GB	n	n	n	y	12	n	y ¹²	9	n	n	y	714
0/3/0	1	320MB	y	y	y	y	12	n	y	24	y	y	n	715
1/1/1	2	300MB	y	y	y	y	24	n	y	10	n	n	n	716
0/3/0	2	200MB	n	y	y	n	12	n	y	19	n	n	y	717
0/3/0 or 0/5/0	2 or 3	321MB	y	y	n	y	36	36	y	12	n	n	y	718
0/4/0	3	110MB	y	y	y	y	12	n	y	10	n	y	y	719
0/3/0	3	110MB	y	y	n	y	12	n	y	10	n	y	y	719
2/1/0	2	80MB	y	y	y	n	12	dealer	dealer	dealer	dealer	dealer	dealer	720

¹¹ Company does not sell hard drives.

¹² Toll-free for out-of-state only.

For more information about all products in this table, circle reader service no. 902.

systems hide the coprocessor socket behind the power supply, forcing you to remove the motherboard.

Also look for niceties such as front-panel power and reset

buttons. A switchless setup procedure that employs menu-driven software is far more convenient than flipping DIP switches. Keyboard style tends to be a matter of person-

al preference, so there's no substitute for a hands-on test drive.

Warranty and Technical Support When systems are similar in price and function-

ality, look to service and support as the tie breaker. All the vendors listed provide at least 12 months of warranty, but to play it safe you may want to choose one of the systems that

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714/727-9357 (fax)

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512/454-1357 (fax)

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818/289-8752 (fax)

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916/373-0221 (fax)

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800/289-3776

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415/373-1168 (fax)

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605/232-2023 (fax)

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Fremont, CA 94538
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Hertz Computer Corp.

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Hewlett-Packard

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19310 Pruneridge Ave.
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HiQuality Systems, Inc.

740 N. Mary Ave.
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408/432-3300

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408/473-9200

IBM

1133 Westchester Ave.
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714/852-1225 (fax)

offers two to five years. Make sure you read the fine print; most warranties cover parts and labor, but some cover only parts—a difference that could end up costing you hundreds

of dollars.

Toll-free telephone tech support is another money saver, and some vendors also offer tech support via fax or modem. Watch out for 900

numbers, though; they can end up costing more than toll calls.

In today's SX market, selection is wider and prices are better than ever before. If

you're looking for a low-cost ticket into the future, you're looking at an SX. ☺

Susan Lusty is an assistant editor for PC World.

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714/256-5025 (fax)

PC Designs

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Swan Technologies

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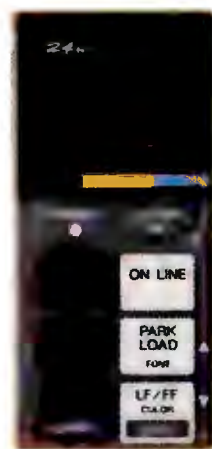
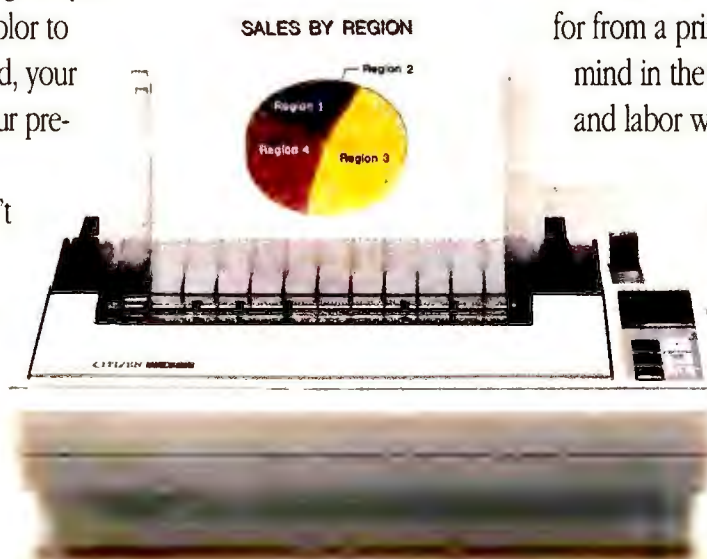
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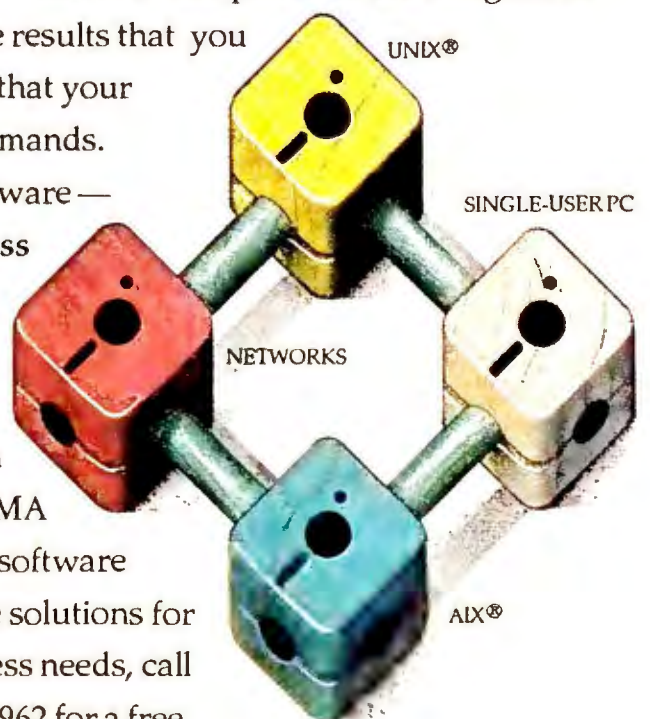


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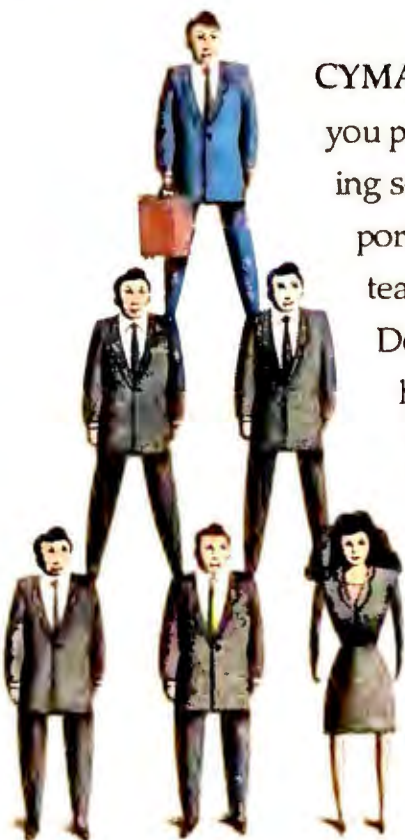
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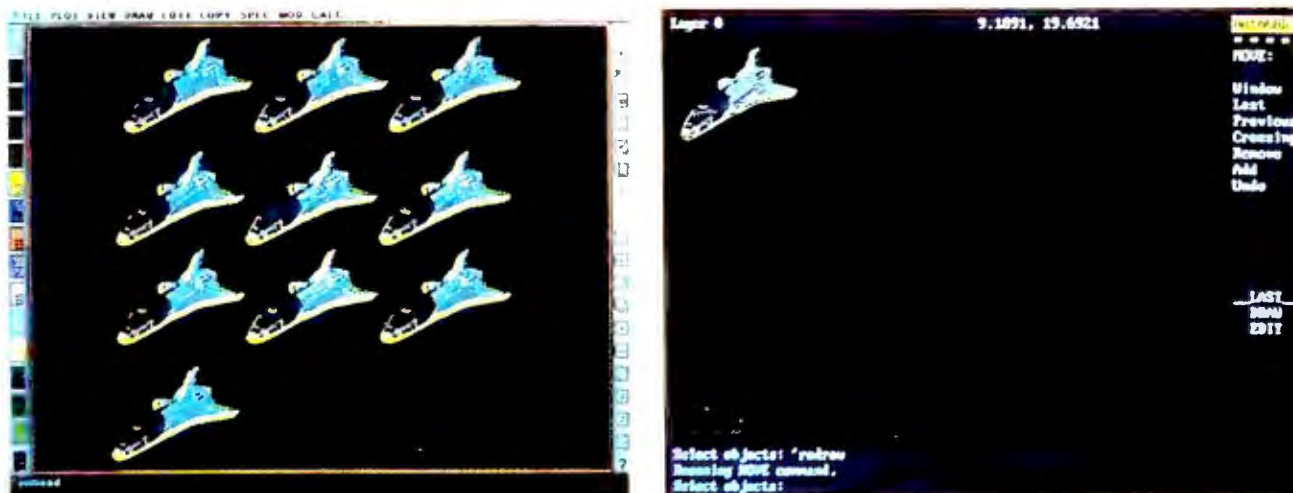


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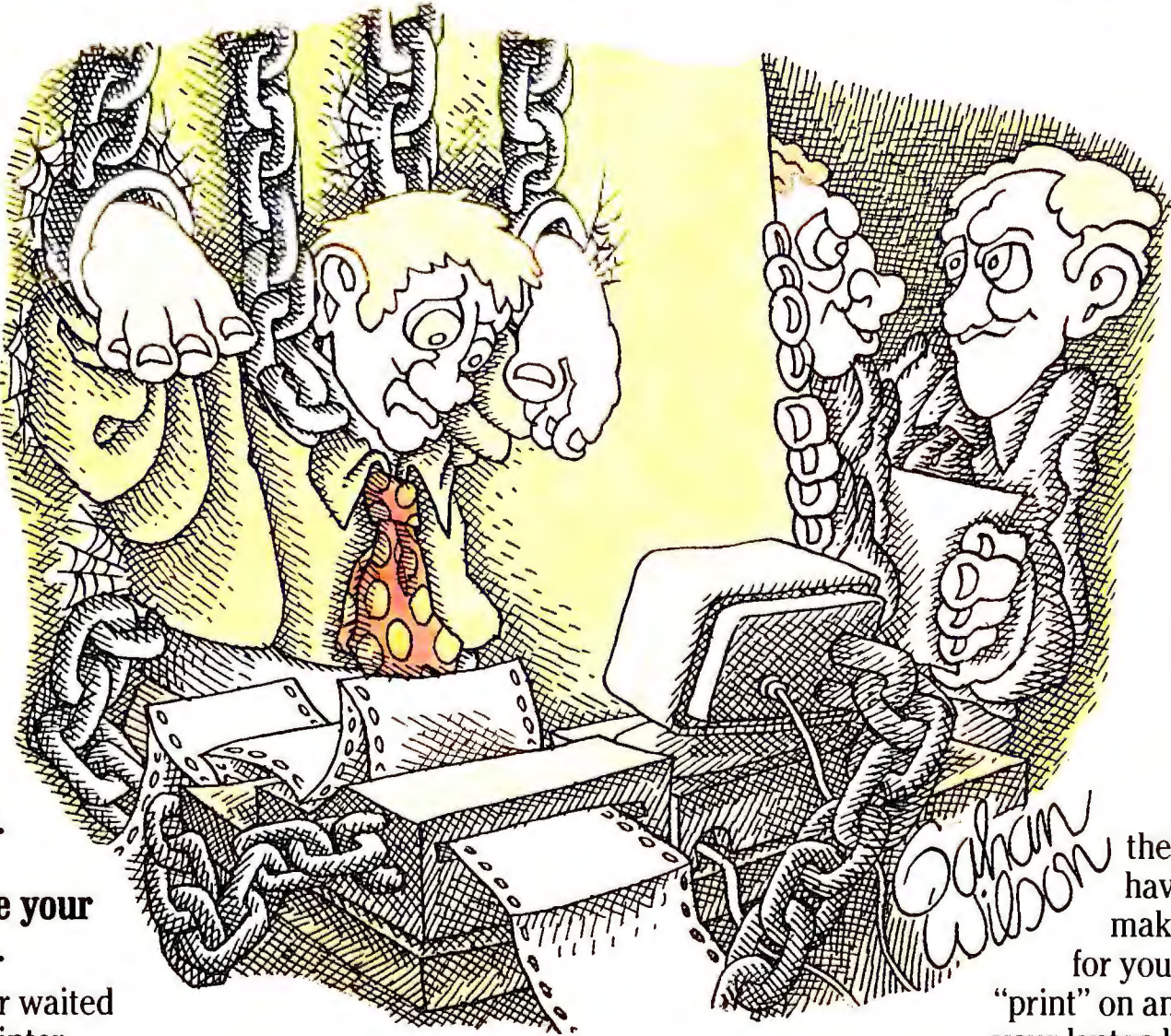
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Timing tests were done on an ALR Flex Cache 386 33 MHz machine with 4 MB RAM, DOS 3.3 and a standard VGA card. Drawings are shown after 74 seconds elapsed time.

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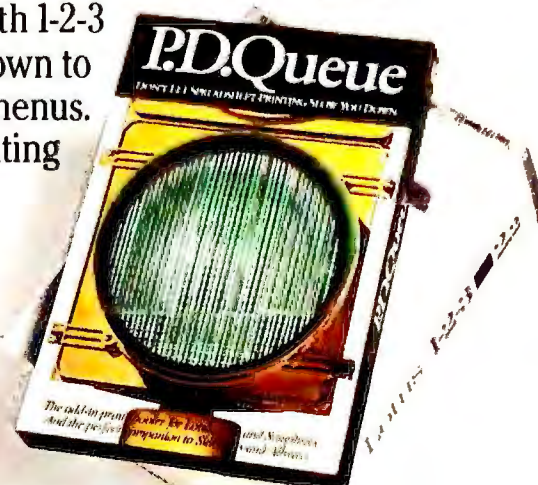
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Circle 60 on reader service card

LaserJet II Compatibles

Why buy more printer than you need? If you're looking for basic graphics and fast text printing, this guide to 31 LaserJet II clones can help you meet an officeful of printing requirements.

Considering the PostScript-like features of the LaserJet III, investing in a LaserJet II compatible seems silly. After all, buying a LaserJet III is like getting a microwave for the price of a toaster: You get scalable fonts, resolution enhancement, and slick effects like rotated and shadowed text all for a measly \$2395.

Unfortunately, most applications can't yet tap these special features, and people who need such finesse can get much more from a PostScript printer. Most of us will gladly settle for a toaster: a durable printer that handles simple graphics and cranks out text in a hurry—in other words, a LaserJet II. The problem is that HP doesn't sell it anymore. The solution? Try a LaserJet II clone.

This Buyers' Guide examines a host of laser printers that walk, talk, and print just like the LaserJet II. Thanks to longer duty cycles and faster engine speeds, many of the printers make more efficient LAN printers than the LaserJet III or the now-defunct II. Just remember that even the best imitations have limitations: While software written for the LaserJet II runs trouble-free on nearly all these printers, most can't use cartridges or other expansion products designed specifically for HP's unit.

Daniel Tynan and Cathy Smith

Romancing the Clones

Which printer should you choose as your work-group workhorse? If you shop carefully, you can find a laser that meets or beats the Series II and III in the key areas of price, speed, and durability. Here's what to look for:

Price The \$2395 Series III sells on the street for well under \$2000; you should pay a lot less for your laser or get a lot more printer in the bargain. But the price tag is only part of the story. For example, the Qume CrystalPrint costs almost 2 cents less per page than the PCPI LaserImage 1030—a difference that can add up to big savings over the life of the printer. Consider the cost and life expectancy of consumables and whether the print drum and toner cartridge come separately or as an integrated unit. Though in-

tegrated consumables are usually more expensive, they're also easier to install.

Speed Text-printing performance depends largely on engine speed. While the Series III clocks in at 8 ppm, the printers in this survey range from smaller 6-ppm machines to brawny 12-ppm units that can shoulder LAN-sized work loads.

Durability The III offers a monthly duty cycle of 16,000 pages and comes with a one-year warranty and HP's sterling reputation for reliability. Printers like IBM's LaserPrinter and Panasonic's KX-4450i offer even heftier duty cycles, and most are backed by solid one-year warranties. How can you gauge a printer's reliability before you buy? Check out the cost of the vendor's extended service contract. An expensive service

agreement may mean the manufacturer expects the printer to require extensive repair.

Fonts None of the printers in this guide can match the Series III's font-scaling talents—and as simple text printers, they don't have to. Still, look for a generous selection of resident typefaces (the PCPI and Kyocera printers come with 38 and 79, respectively), plus compatibility with HP and third-party downloadable soft fonts, for those times when your documents demand a high-quality look.

Expandability The Series III comes with 1MB of RAM; the printers here come with between 512K and 1.5MB—fine for simple text printing, but not enough for downloadable fonts or full-page graphics. None of the printers accepts HP memory boards, so

adding RAM may cost a little more—from \$295 to \$520 for a 1MB upgrade. And since few accept HP font cartridges and some don't work with PostScript emulators, you're also at the mercy of a vendor's proprietary options.

Paper Handling The III's paper capacity tops out at 200 sheets—far less than Kyocera's 1000-sheet options. Look for multiple trays, face-down output, and duplex printing options, as well as the ability to handle all the usual suspects—letter- and legal-sized paper, envelopes, labels, and transparencies.

Even in a graphical world, the vast majority of output will be documents and spreadsheets requiring a handful of fonts and minimal graphics. Unless you hunger for scalable fonts and flashy graphical effects, a fast, bread-and-butter



PIERRE-YVES GOAVEC

SERIES II COMPATIBLES: LASER POWER FOR YOUR LAN

Manufacturer	Printer	List price	STANDARD FEATURES							EMULATIONS	
			Standard RAM	Maximum RAM	Rated speed (ppm)	Monthly duty cycle (pages)	Cost of toner cartridge	Number of pages per cartridge	Estimated cost per page (cents) ¹	HPGL	EpsonFX
DATAPRODUCTS	LZR 650	\$1695	512K	4.5MB	6	3000	\$60	3000	2.8	y	y
	LZR 1230	\$3695	512K	2MB	12	25,000	\$31	5000	3	y	y
EPSON AMERICA	Epson EPL-6000	\$1399	512K	4.5MB	6	3000	\$29	1500	2.5	n	y ²
FACIT	Facit P6060	\$1599	512K	4.5MB	6	4000	\$24	1500	3.4	n	n
FUJITSU AMERICA	RX 7200	\$3995	640K	4.6MB	12	10,000	\$68	10,000	3.5	y ²	y
IBM	LaserPrinter	\$2395	512K	4MB	10	20,000	\$199 ³	10,000	2	n	n
KYOCERA ELECTRONICS	F800A	\$2295	512K	4.5MB	8	10,000	\$40.95	4000	3.22	n	y
	F1000A	\$2895	512K	1.5MB	10	10,000	\$36.95	3000	3.37	n	y
	F2000A	\$4695	1MB	5MB	10	10,000	\$36.95	3000	3.37	n	y
MANNESMANN TALLY	MT905	\$1499	512K	4.5MB	6	4000	\$45 ⁴	1500	3	n	y ²
	MT906	\$1695	512K	4.5MB	6	4000	\$45 ⁴	1500	3	n	y ²
OFFICE AUTOMATION SYSTEMS	LaserPro EXEC	\$1495	512K	4.5MB	6	3000	\$47	1500	⁵	n	y ²
	LaserPro LP 90/8	\$2350	1MB	5MB	8	5000	\$47	1500	⁵	y	y
OKIDATA	Okilaser 800	\$1795	512K	4.5MB	8	5000	\$33	2500	3.2	n	n
	Okilaser 820	\$2295	512K	4.5MB	8	5000	\$33	2500	3.2	n	n
OLIVETTI OFFICE USA	PG 306	\$1595	512K	4.5MB	6	3000	\$29	1500	2.5	n	y
PACKARD BELL	PB 9500	\$2195	1.5MB	4.5MB	6	4000	\$27.50	1500	⁵	n	y
PANASONIC COMMUNICATIONS & SYSTEMS	KX-4420 Laser Partner	\$1695	512K	4.5MB	8	3000	\$45	3000	2.9	n	n
	KX-4450i Laser Partner	\$2095	512K	4.5MB	11	20,000	\$45	5000	2.9	n	y
PCPI	LaserImage 1030-PP	\$2395	1MB	5MB	6	3000	\$32	1500	4.12 ⁶	y	y
	LaserImage 1030-ID	\$2795	1MB	5MB	6	3000	\$32	1500	4.12 ⁶	n	y
	LaserImage 1030-IS	\$2995	1MB	5MB	6	3000	\$32	1500	4.12 ⁶	n	y
	LaserImage 2020-PP	\$3495	1MB	5MB	8	10,000	\$84	6000	3.4	y	y
	LaserImage 2020-ID	\$3895	1MB	5MB	8	10,000	\$84	6000	3.4	n	y
	LaserImage 2020-IS	\$4095	1MB	5MB	8	10,000	\$84	6000	3.4	n	y
QUME	CrystalPrint Super Series II	\$1999	1.5MB	1.5MB	6	5000	\$125 ³	7500	2.3	y	y ²
SHARP ELECTRONICS	JX-9500	\$1795	512K	4.5MB	6	3000	\$57	3000	2.7	n	y
TANDY	Tandy LP 950	\$1599	512K	2MB	6	3000	\$64.95	3000	3.1	n	y
TEXAS INSTRUMENTS	MicroLaser	\$1799	512K	4.5MB	6	3000	\$60	3000	⁵	n	y
TOSHIBA AMERICA	PageLaser6	\$1549	512K ⁸	4.5MB	6	4000	\$49 ⁴	1500	3.1	n	n
UNISYS	AP9210	\$2395	512K	4MB	10	20,000	\$195 ³	10,000	2	y	n

¹ Vendor estimate, based on cost of toner, drum, and developer.

² Extra-cost option.

³ Integrated drum, toner, and developer package.

⁴ Package of two.

⁵ Information unavailable.

⁶ Includes cost of cleaning cartridges.

LaserJet clone may be all your office really needs—no matter how you slice it. ☺

Daniel Tynan is an associate editor and Cathy Smith the editorial assistant for PC World.

WHERE TO BUY

Dataproducts Corp.
6200 Canoga Ave.
Woodland Hills, CA 91367
800/624-8999,
415/358-1990,
818/887-4789 (fax)

Epson America
20770 Madrona Ave.
Torrance, CA 90503
800/289-3776

Facit, Inc.
400 Commercial St.

Manchester, NH 03108
800/733-2248,
603-647-2724 (fax)

Fujitsu America, Inc.

3055 Orchard Dr.
San Jose, CA 95134-2022
800/626-4686,
408/432-1318 (fax)

IBM Praprinter	PostScript option	FONT SUPPORT			PAPER HANDLING			PORTS				Reader service number
		Number of resident typefaces	Accepts HP font cartridges	Accepts down- loadable soft fonts	Maximum number of paper trays	Paper capacity (standard/ maximum)	Prints legal enve- lapes, labels, transparencies	Facedown output	Parallel/ serial	AppleTalk	Warranty	
y	n	16	n	y	2	250/500	y	y	y/y	n	1 year	601
n	n	8	n	y	3	250/750	y	y	y/y	n	1 year	602
n	y	6	y	y	1	150/150	y	y	y/y	n	2 years	605
y ²	y	6	y	y	1	150/150	y	y	y/y	n	1 year	606
y	n	8	n	y	2	250/500	y	y	y/y	n	90 days on-site	607
n	y	5	n	n	4	200/700	y	y	y/y	n	1 year	608
n	n	79	n	y	1	150/150	y	y	y/y	n	90 days	609
n	n	79	n	y	1	250/1000	y	y	y/y	n	90 days	610
n	n	79	n	y	2	250/1250	y	y	y/y	n	90 days	611
y ²	n	6	y	y	1	150/150	y	y	y/y	n	1 year 90 days on-site	612
y ²	y	6	n	y	2	150/400	y	y	y/y	y ²	1 year 90 days on-site	613
y ²	y	6	y	y	1	150/150	y	y	y/y	n	1 year	614
y	n	7	y	y	1	200/200	y	y	y/y	n	1 year	615
y	n	26	y	y	2	200/400	y	y	y/y	y ²	1 year	616
y	n	26	y	y	2	200/400	y	y	y/y	y ²	1 year	617
y	y	8	n	y	1	150/150	y	y	y/y ²	n	1 year on-site	618
y	n	6	y	y	1	150/150	y	y	y/y	y	1 year	619
n	n	22	n	y	1	250/250	y	y	y/y ²	n	1 year	620
y	n	28	n	y	2	500/500	y	y	y/y	n	1 year	621
y	y	38	n	n	2	250/400	y	y	y/y	n	90 days on-site	622
y	y	38	n	n	2	150/400	y	y	y/y	n	90 days on-site	623
y	y	38	n	n	2	150/400	y	y	y/y	n	90 days on-site	624
y	y	38	n	n	1	250/250	y ⁷	y	y/y	n	90 days on-site	625
y	y	38	n	n	1	250/250	y ⁷	y	y/y	n	90 days on-site	626
y	y	38	n	n	1	250/250	y ⁷	y	y/y	n	90 days on-site	627
y	y	10	n	y	1	100/100	y	n	y/y	y	1 year	628
y	n	3	n	n	2	250/500	y	y	y/n	n	1 year	629
y	n	24	n	y	2	250/250	y	y	y/y	n	1 year	631
n	y	3	n	y	2	250/500	y	y	y/y ²	y/y ²	1 year	632
y	n	8	y	y	2	150/150	y	y	y/y	n	1 year	633
y	y	6	n	y	2	200/500	y	y	y/y	n	1 year	634

⁷ Not legal-sized paper.

⁸ 1MB required for 300-dpi resolution.

For more information about all products in this table, circle reader service no. 901.

IBM

National Distribution
Division
101 Paragon Dr.
Montvale, NJ 07645
800/426-2468

Kyocera Electronics

100 Randolph Rd.
Samersset, NJ 08873
201/560-0060,
201/560-8380 (fax)

Mannesmann Tally

8301 S. 180th St.
Kent, WA 98032
800/843-1347,
206/251-5520 (fax)

Office Automation Systems

9940 Barnes Canyon
Rd.
San Diego, CA 92121
619/452-9400,
619/452-2427 (fax)

Okidata

Customer Information
Center
532 Fellowship Rd.
Mt. Laurel, NJ 08054
800/654-3282,
609/778-4184 (fax)



UPGRADES FOR THE '90S #10

The (Almost) Ultimate Floppy Upgrade

The 2.8MB floppy drive may well be standard in the next generation of personal computers. But if you want to skip a generation—and store *lots* of data—Q/Cor's 3½-inch floppy drive, the Stor/Mor, is a sure bet. The drive can pack a whopping 21.4MB on special high-capacity floppies, and it's darn fast—although not quite as fast as Q/Cor claims. The Stor/Mor can't read or write 1.44MB or 720K floppies, but the drive is compatible with programs ranging from *Norton Utilities* to *Fast-back* to *NetWare* and works in nearly any XT, AT, or compatible.

The Stor/Mor comes in both internal and external versions; the external unit examined here is pretty easy to install. You plug the controller into a free slot, connect it to the drive with a cable, and plug the drive's power supply into an AC outlet. Turn on your PC, copy a few utilities to



A Bernoulli alternative: the Stor/Mor holds 21MB on a floppy yet costs \$895.

the hard disk, reference a device driver in your CONFIG.SYS file, and that's about it. To format a 25MB floppy, you naturally use a supplied utility. You can even boot your PC from the Stor/Mor and partition its superfloppies as you would a hard disk. If you need floppy portability and hard disk storage, the Stor/Mor is one

of the best options around. List price: external \$895, internal \$795, 25MB floppy disk \$25. Q/Cor, One Meca Way, Norcross, GA 30093; 800/548-3420, 404/564-5528 (fax).
—Robert Luhn

Reader service no. 730

WHERE TO BUY

Olivetti Office USA
765 U.S. Hwy. 202 S
Bridgewater, NJ
08807
201/526-8200,
201/526-8405 (fax)

**Packard Bell
Electronics**
9425 Canoga Ave.
Chatsworth, CA 91311
818/773-4400

**Panasonic
Communications &
Systems Co.**
Two Panasonic Way
Secaucus, NJ 07094
800/742-8086,
201/348-7000

PCPI
10865 Rancho
Bernardo Rd.
San Diego, CA 92127
800/225-4098,
800/262-0522

California,
619/487-5809 (fax)

Qume Corp.
500 Yosemite Dr.
Milpitas, CA 95035
408/942-4000,
408/942-4052 (fax)

**Sharp Electronics
Corp.**
Sharp Plaza
Mahwah, NJ
07430-2135

201/529-9500

Tandy Corp.
1800 One Tandy
Center
Fort Worth, TX 76102
817/390-3011

**Texas Instruments
Information
Technology Group**
P.O. Box 202230
Austin, TX 78720
800/527-3500

**Toshiba America
Information
Systems**
Printer Products
Division
9740 Irvine Blvd.
Irvine, CA 92718
714/583-3000

Unisys Corp.
P.O. Box 500
Blue Bell, PA 19424
800/448-1424

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3. ☐ Ford 6. ☐ Japanese

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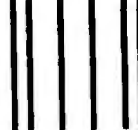
1. ☐ Recently purchased 3. ☐ 4-6 mos. 5. ☐ no plans
2. ☐ 1-3 mos. 4. ☐ 7-12 mos.

Are you:

1. ☐ under 25 3. ☐ 30-40 5. ☐ 51-60 7. ☐ 71 or older
2. ☐ 25-29 4. ☐ 41-50 6. ☐ 61-70

Is your Household Income:

1. ☐ under \$25,000 4. ☐ \$50,000-\$75,000
2. ☐ \$25,000-\$34,900 5. ☐ greater than \$75,000
3. ☐ \$35,000-\$49,900



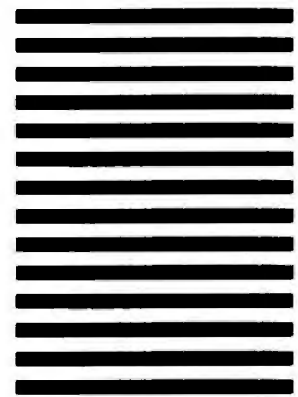
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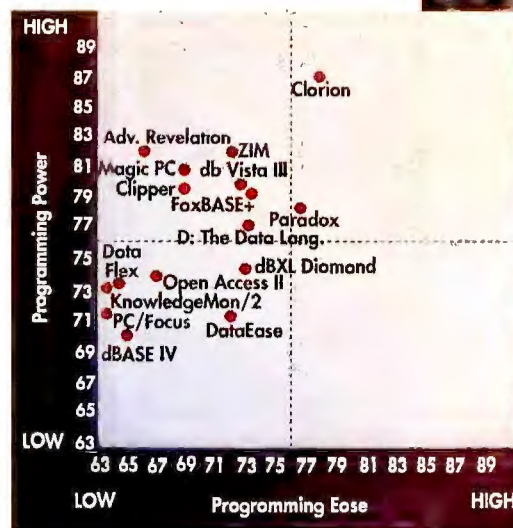
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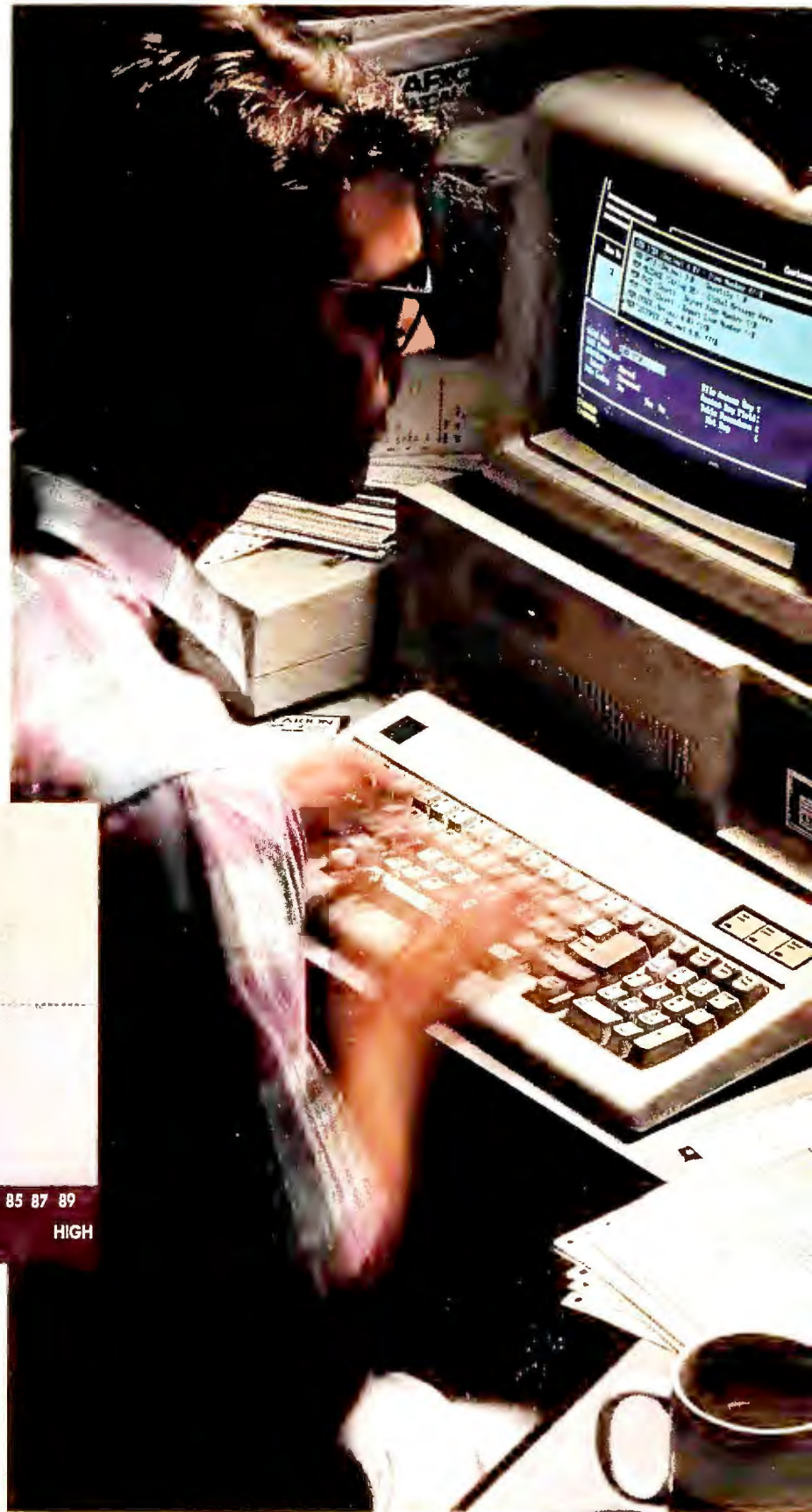
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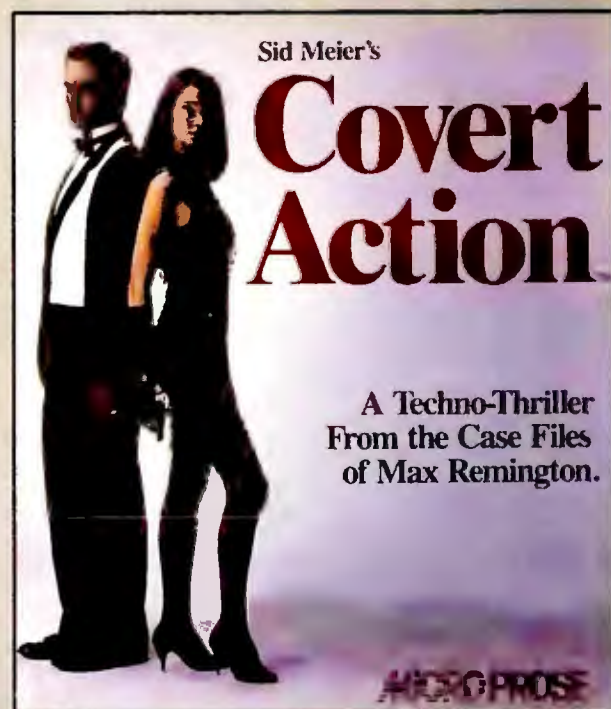
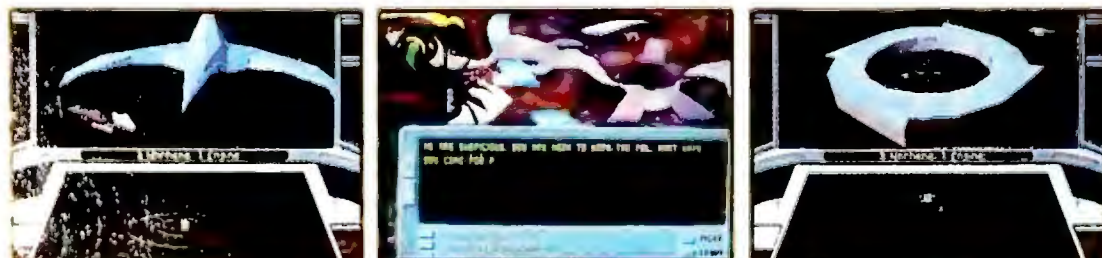
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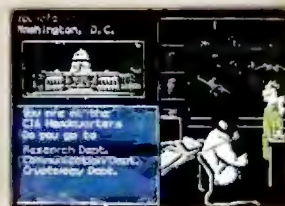
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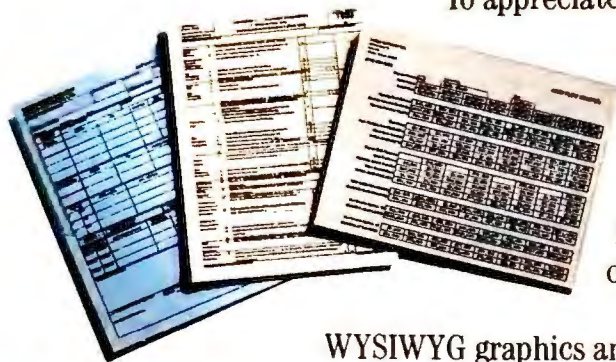
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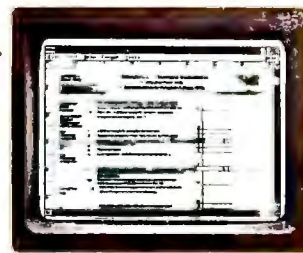
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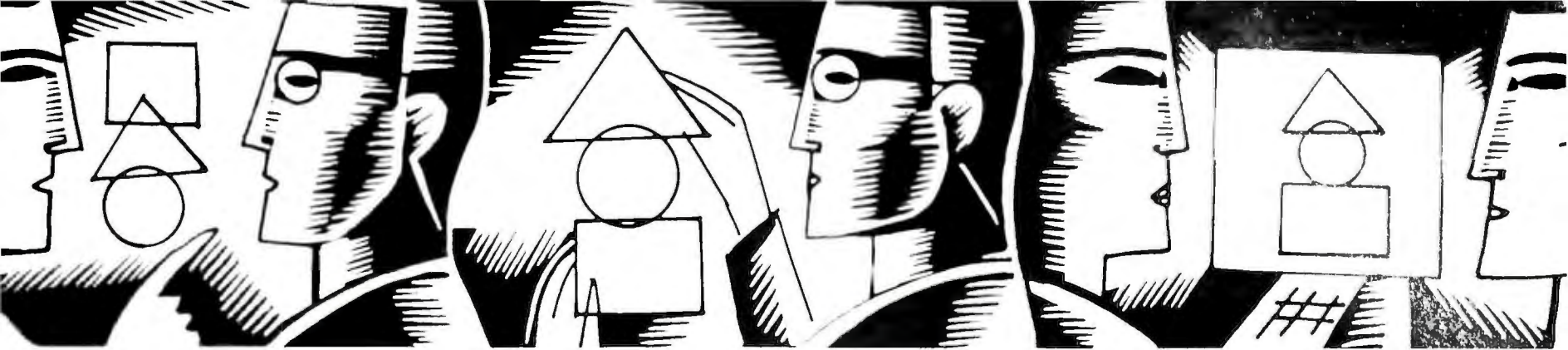
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Edited by Tom Swan

Let Your Fingers Do the Flying

Good typists who are held back by a slow keyboard will appreciate a program I wrote, KBSETUP.C (see LISTING 1). It reprograms a keyboard's repeat delay and speed to really let your fingers fly. By lengthening or shortening the delay from when you press down on a key to when it starts to repeat and by adjusting the repeat rate, KBSETUP lets you fine-tune your keyboard to match your typing skills.

Enter the command **kbsetup m** to display a menu of choices. At the DOS prompt, enter **kbsetup** again, with two

parameters. The first should be a letter from A to D, representing the delay you want; the second a value from 0 to 31 representing the desired speed. For example, **kbsetup a 0** gives you the shortest

delay and fastest speed, while **kbsetup d 31** produces the longest and slowest.

Executing the program without parameters sets the keyboard rates to the *(continues)*

```
/* kbsetup.c by Michael O'Connor */

#include <ctype.h>
#include <dos.h>
#include <stdio.h>
#include <stdlib.h>

#define ISIN(l,h,v) ((l<=v)&&(v<=h))

int kbdelay = 0; /* Default typematic delay */
int kbrepeat = 0; /* Default repeat rate */

void usage(void)
{
    puts("ERROR: Type KBSETUP M for menu\n");
    exit(1);
}

void menu(void)
{
    clrscr();
    puts("\n\t\tKBSETUP MENU:\n\n");
    "\t keyboard DELAY time == delay in msec\n"
    "\t\t\t\t\tA\t\t\t\t\t==\t\t\t\t\t250\n"
    "\t\t\t\t\tB\t\t\t\t\t==\t\t\t\t\t500\n"
    "\t\t\t\t\tC\t\t\t\t\t==\t\t\t\t\t750\n"
    "\t\t\t\t\tD\t\t\t\t\t==\t\t\t\t\t1000\n"
    "\t keyboard REPEAT rate == characters per second\n"
    "0 == 30.0\t\t 8 == 15.0\t\t 16 == 7.5\t\t 24 == 3.7\n"
    "1 == 26.7\t\t 9 == 13.3\t\t 17 == 6.7\t\t 25 == 3.3\n"
    "2 == 24.0\t\t 10 == 12.0\t\t 18 == 6.0\t\t 26 == 3.0\n"
    "3 == 21.8\t\t 11 == 10.9\t\t 19 == 5.5\t\t 27 == 2.7\n"
    "4 == 20.0\t\t 12 == 10.0\t\t 20 == 5.0\t\t 28 == 2.5\n"
    "5 == 18.5\t\t 13 == 9.2\t\t 21 == 4.6\t\t 29 == 2.3\n"
    "6 == 17.1\t\t 14 == 8.6\t\t 22 == 4.3\t\t 30 == 2.1\n"
    "7 == 16.0\t\t 15 == 8.0\t\t 23 == 4.0\t\t 31 == 2.0\n"
    "Syntax: kbsetup <A...D> <0...31>\n"
    "Default settings: A 0 (short delay, fast repeat)";
    exit(1);
}

(continues)
```

LISTING 1: Compile KBSETUP.C with Borland's Turbo C to create KBSETUP.EXE. Execute the program using the command KBSETUP M to display a menu of parameters for adjusting your keyboard's key-repeat delay and speed.


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Circle 133 on reader service card


```

void main(int argc, char *argv[])
{
    int i;

    if (toupper(argv[1][0]) == 'M') menu();
    else for (i = 1; i < argc; i++)
        if (isdigit(*argv[i])) {
            kbrepeat = atoi(argv[i]);
            if (!ISIN(0, 31, kbrepeat)) usage();
        } else {
            argv[i][0] = toupper(argv[i][0]);
            if (!ISIN('A', 'D', argv[i][0])) usage();
            kbdelay = argv[i][0] - 'A';
        }

    _AX = 0x0305;
    _BH = kbdelay;
    _BL = kbrepeat;
    geninterrupt(0x16);
}

```

LISTING 1 (continued)

default values A 0. Entering unrecognized parameters displays an error message reminding you of how to view the program's options.

Michael D. O'Connor

Damascus, Maryland

Editor's note: Use Turbo C to compile KBSETUP.C, creating KBSETUP.EXE. Copy that file to a directory listed in your PATH statement. After running KBSETUP with parameters as described above, load a favorite program and experiment with the new settings in a familiar environment. You may have to run KBSETUP several times to find the parameters that work best for you.

The program works by setting register AX to 0305hex, BH to the delay value, and BL to the typematic rate. Then geninterrupt() calls the ROM BIOS keyboard service (interrupt 16hex), executing function 0305hex, which sets the delay value and the typematic rate. IBM introduced this function in the PCjr, and most ATs support it. It's also available in all PS/2s. But if your ROM BIOS is dated earlier than 11/16/85 or if you have an XT, a PC, or a similar clone, then KBSETUP probably won't work on your system.

1-2-3 Version Detector

Our company uses versions 2.01 and 2.2 of 1-2-3, and it's important that our files be compatible. I wanted to create a macro that would use 2.2-specific commands when available and alternative instructions when run in 2.01, but that meant the macro had to tell one version of the program from the other.

I combed my manuals but couldn't find an @VERSION function that determined which 1-2-3 version was running. Not to be beaten, I created my own solution. Assuming the worksheet is named VERSION.WK1, place the file-link expression +<<version.wk1>>A1 into cell A1.

Version 2.2 evaluates this expression as 0 (and not, oddly enough, as a circular reference), but in version 2.01 it results in an ERR. This makes possible the sample macro (see FIGURE 1), which determines whether cell A1 contains an

```

(IF (@ISERR(A1))) {BRANCH ver_201}
{BRANCH ver_22}

```

FIGURE 1: This sample macro uses a file-link expression in A1 to check which version of 1-2-3 is running.

error. If so, it branches to a macro called ver_201. Otherwise, version 2.2 is active, and the ver_22 submacro runs.

Chuck Indelicato

College Point, New York

Editor's note: Before running this macro, enter the text in FIGURE 1 in two cells, one on top of the other. In two cells that are not adjacent to those cells or each other, enter version 2.01 and version 2.2. Use /Range Name Create to name these three macros \t, ver_201, and ver_22, respectively.

To run the macro, go to an unoccupied cell and type <Alt>-T. The version of 1-2-3 you're using will appear in the cell as a label.

Adding Point-and-Shoot to Windows 3.0

In Windows 3.0's File Manager, you can launch an application by selecting a data file if you've told Windows to associate the file's extension with a particular application. (You set associations in WIN.INI's [Extensions] section.) However, if an application handles files with any number of different extensions, as Notepad does, this method is impractical. To get around this weakness, I use the Recorder accessory and the Clipboard to design macros that pass any file name to a program.

Here's how you can create a macro that launches Windows' Notepad and loads the currently highlighted file. First, start Recorder from the Windows Program Manager's Accessories group window, then open the File Manager, going to a directory that contains a text file. Select that file to highlight its name. Return to Recorder and choose Record from the Macro menu. Give the macro a name—<List Files> for example—and set the Shortcut Key to an appropriate combination; <Ctrl>-<Alt>-E, for example.

You now need to copy the selected file name into the Clipboard by preparing (continues)

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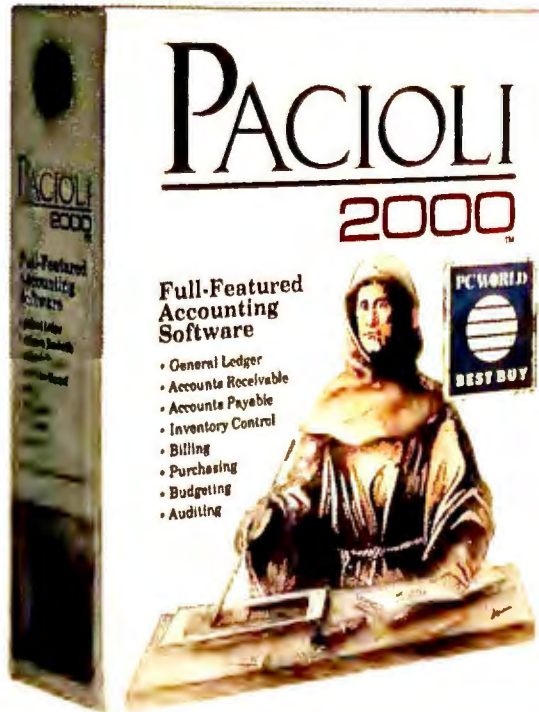
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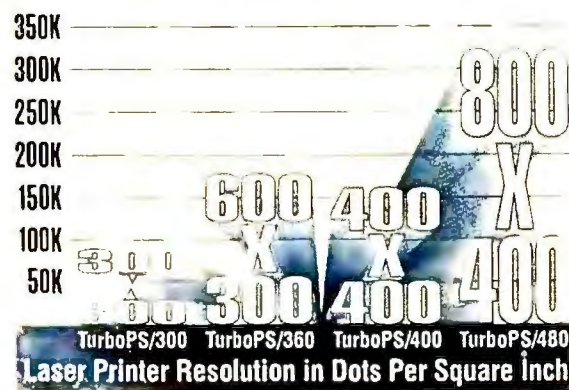
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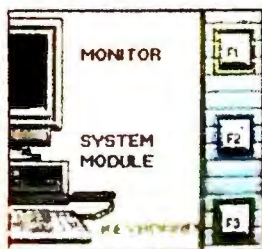
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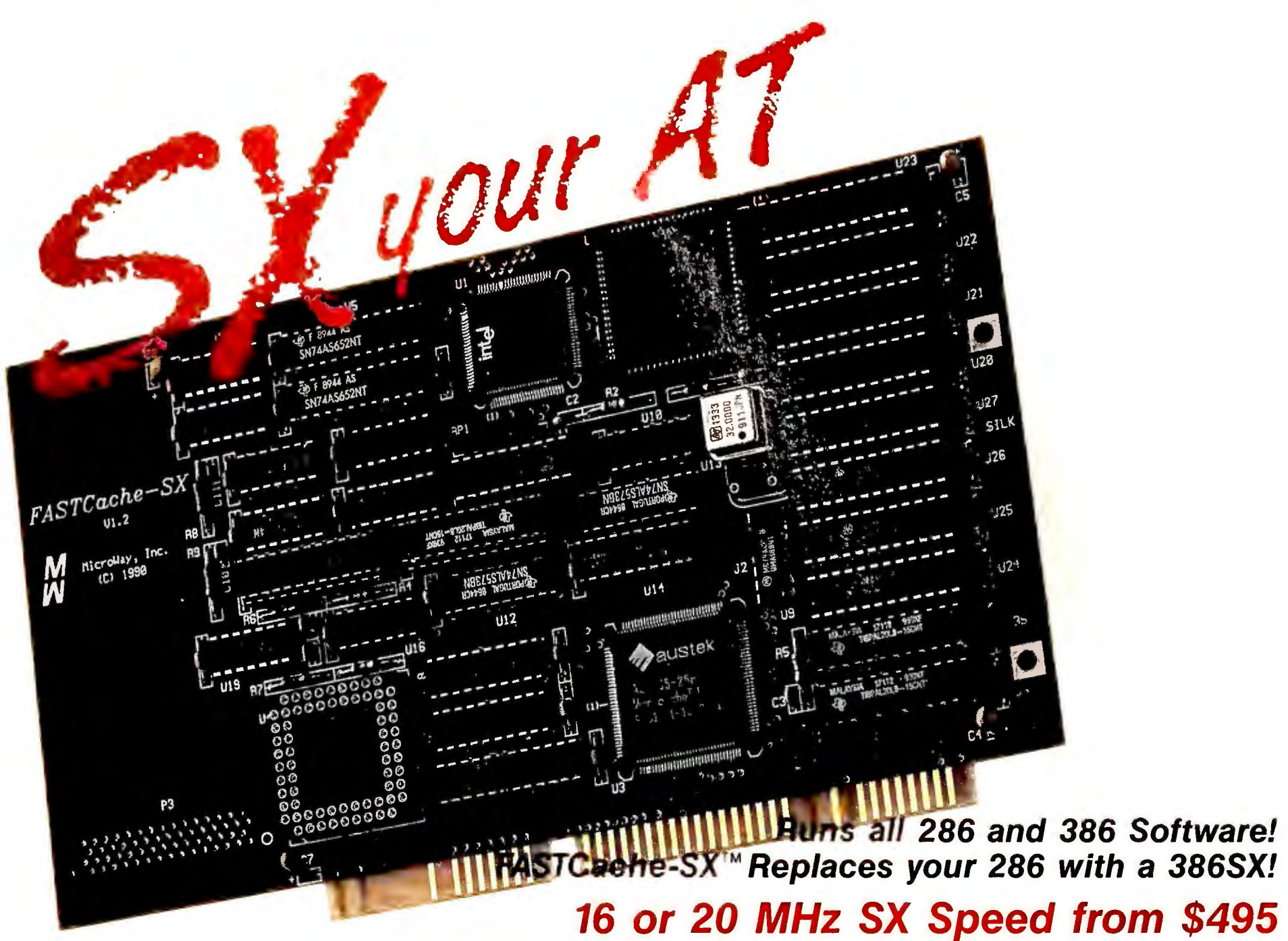
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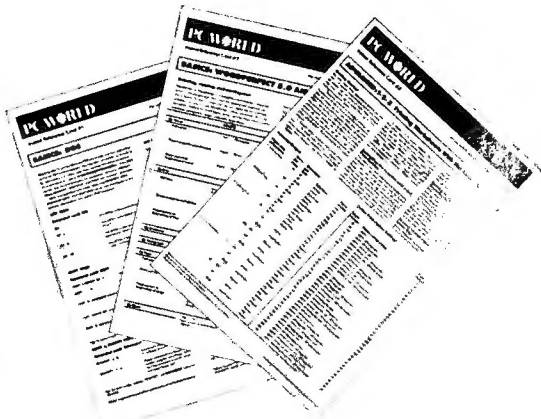
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and then aborting a print job. Press **<Alt>-F** and **p** to execute the File Manager's Print command. You should see the highlighted name of your file in the input box. Press **<Ctrl>-<Insert>** to transfer that name to the Clipboard. Then, press **<Tab>** twice, followed by **<Enter>** to cancel printing.

The next step is to press **<Alt>-F** to open the File menu. Press **r** to run a program, and then type **notepad** (or the name of another program you want to launch), followed by a space. Press **<Shift>-<Insert>** to copy the file name from the Clipboard to the Run command's input box. Press **<Enter>** to execute the Run command.

Before doing anything else, you must save the macro. Press **<Ctrl>-<Break>** to call up the Recorder's dialog box, and select *Save macro OK*. You can then quit Notepad by pressing **<Alt>-FX**.

To use Notepad to edit a file, open the File Manager, highlight the file name, and press **<Ctrl>-<Alt>-E**. If you want to pass file names to other programs, you can prepare similar macros, assigning them to various key combinations.

David L. Chu

Summit, New Jersey

Editor's note: I find Mr. Chu's technique handy for editing files that lack extensions, such as the README text files on program disks.

After creating the macro, be sure to save it in a Recorder data file. To do that, open Recorder if it's displayed as an icon, and select *Save from the File menu* (press **<Alt>-FS**). Enter a file name with no extension—**macros**, for example—and press **<Enter>**. These steps save all current macros in **MACROS.REC**.

To reload those same macros the next time you run Windows, you can start the Recorder utility and open the **MACROS.REC** file (or whatever you named it). Or you can modify **WIN.INI** to do that automatically. Again using Notepad to edit **WIN.INI**, insert **macros.rec** into the 'load' command under the [windows] section header, so that

the command reads something like **'load=nwpopup.exe macros.rec'**.

Finally, although you can use Mr. Chu's macro to run DOS programs, you'll need to slightly modify the process described above. After executing the File Manager's Run command, return to the Recorder by holding down **<Alt>** and pressing **<Tab>** repeatedly until 'Recorder' appears at the top of the display or until the Recorder window or icon is selected. Release the **<Alt>** key, and press **<Ctrl>-<Break>** to call up the Recorder's dialog box. Save the macro in the usual way, and then quit your DOS application.

Printing the Unprintable

Hewlett-Packard DeskJet printers provide near-laser-quality printing at a much lower cost. But there are drawbacks. For one, the DeskJet prohibits you from printing close to the edge of the paper, so text files with 80-column lines don't always print correctly. Two files, **DRAFT.CTL** (see **FIGURE 2**) and **DRAFT.BAT** (see **LISTING 2**), solve this problem.

DRAFT.CTL contains the DeskJet control codes that adjust the printer margins to allow full pages of text to print. By changing the vertical and horizontal motion indexes, the file also leaves enough room at the left margin for loose-leaf binder holes.

DRAFT.BAT sends the codes in **DRAFT.CTL** to the printer, then calls the DOS PRINT utility to print up to nine files. Be sure that you specify **DRAFT.CTL**'s correct drive and path name in place of 'c:\path' in the TYPE command.

The batch program is especially well (continues)

```
Ec(s1QEc&a5Ec&l7.27cEc&k11.25H
```

FIGURE 2: **DRAFT.CTL** contains the DeskJet printer control codes that **DRAFT.BAT** (see **LISTING 2**) sends.

BASICS: WINDOWS 3.0

STARTING WINDOWS 3.0

What to do: By default, Windows 3.0 runs in its most appropriate mode, based on your hardware setup. You may, however, want to start it in another mode. On a 386 computer, for example, real mode is used to run a program designed for Windows 2.xx. Use these commands at the DOS prompt to load Windows 3.0 in the desired mode:

Command	Mode	CPU required
WIN	Automatic selection	8088 or better
WIN/E	Enhanced	80386 or better
WIN/S	Standard	80286 or better
WIN/R	Real	8088 or better

WINDOW OPERATIONS

What to do: These steps work with any window. **Note:** <Alt>-<Space> opens the Control menu for a running application; <Alt>-<Minus> opens it for the current document or program group window. Menu names and options you select with the mouse are shown in italics; "double left" means click the left mouse button twice. The control menu box referred to is the little gray box in the top left corner of every Windows application window.

WINDOW OPERATIONS (continued)

Put full-screen DOS program in window (Enhanced mode only)	none	<Alt>-<Enter>
Make DOS program full screen (Enhanced mode only)	Control menu box/Left, Settings/Left, Full Screen/Left, OK/Left	<Alt>-<Enter>

Tip: When running DOS applications in a window, clicking the left mouse button will turn on the text selection mode. The word *Select* will appear in the title bar, and you won't be able to operate the program. To return to normal operation, click the right mouse button or press <Esc>.

PROGRAM MANAGER OPERATIONS

What to do: Normally, when you first run Windows, Program Manager appears full screen, with the Main window center screen. From there you can load applications, add new ones to Program Manager, and create new program groups. Although Windows 3.0 is designed to be used with a mouse, many of the following keyboard shortcuts can save you time.

WINDOW OPERATIONS (continued)

Action	Point at/Click	Keyboard command
Select application window or icon	Window or icon/Left	Hold <Alt>, <Tab> until highlighted
Switch back to last active application	Window or icon/Left	<Alt>-<Tab>
Select group window or icon	Window or icon/Left	Hold <Ctrl>, <Tab> until highlighted
Size a window	Border or corner/ Hold left, drag border outline/Release	<Alt><Space>S or <Alt><Minus>S, choose border with cursor keys, size window with cursor keys, <Enter>; repeat for each border
Move a window	Window title bar/ Hold left, drag outline/Release	<Alt><Space>M or <Alt><Minus>M, use cursor keys to move, <Enter>
Minimize window to icon	Minimize button/Left	<Alt><Space>N or <Alt><Minus>N
Restore application or group icon to window	Icon/Double left	Select icon, <Enter> if group icon
Maximize application or group icon to full-screen window	Icon/Left, Maximize/Left	Select icon, <Alt><Space>X or <Alt><Minus>X
Maximize window to full screen	Maximize button/Left	<Alt><Space>X or <Alt><Minus>X
Close current document window	Control menu box/ Double left	<Ctrl>-<F4>
Close current application window	Control menu box/ Double left	<Alt>-<F4>
Display Task List and switch to another program	Control menu box/Left, Switch to/Left, select desired program, Switch to/Left	<Ctrl>-<Esc>, select desired program, <Enter>

PROGRAM MANAGER OPERATIONS (continued)

Action	Point at/Click	Keyboard commands
Select and open program group window	Program group icon/ Double left	<Ctrl>-<Tab> to group icon, <Enter>
Select a program icon	Program icon/Left	Cursor keys
Run a program	Program icon/Double left	Select program icon, <Enter>
Move program to new group	Program icon/Hold left, drag to new group/Release	Select program icon, <Alt>FM, <Cursor Down> to select group, <Enter>
Add new program to selected program group	File/Left, New/Left, OK/Left, type description, <Tab>, type path and file name, OK/Left	<Alt>FN<Enter>, type description, <Tab>, type path and file name, <Enter>
Create new program group	File/Left, New/Left, Program Group/Left, OK/Left, type description, <Tab>, type file name, OK/Left	<Alt>FNG<Enter>, type description, <Tab>, type file name (no extension), <Enter>
Change printer	Control Panel icon/ Double left, Printers icon/Double left, select printer/Left, Active/Left, OK/Left, control menu box/Double left	Cursor to Control Panel icon, <Enter><Alt>SP, cursor to printer, <Tab>, cursor to Active, <Enter> <Alt>-<F4>
Exit Windows and save current desktop	Control menu box/Double left, Save changes/Left, OK/Left	<Alt>-<F4><Alt>S <Enter>

Notes: You can combine mouse and keyboard procedures. For example, select a program icon with the mouse, and press <Enter> to run it. Once you've saved the desktop you want, make sure the Save Changes box is not checked when you exit Windows.

Tip: If you're trying to add 1-2-3 to a program group, for example, and can't remember where 123.EXE is, select the Browse button and sift through the directories to find the right executable file (EXE, COM, or BAT).

ADVANCED: WINDOWS 3.0

FILE MANAGER OPERATIONS

What to do: File Manager displays a directory tree of the current drive, with directories shown as folders. Those with a plus sign contain subdirectories.

Action	Point at/Click	Keyboard commands
Change disk drives	Drive icon/Left	<Ctrl>-drive letter
Select directory	Directory name/Left	Cursor or letter keys
Expand a branch	Directory folder/Left	Select directory, <Plus>
Show all directories	Tree/Left, Expand All/Left	<Ctrl>-<*>
Collapse a branch	Directory folder/Left	Select parent directory, <Minus>
Display directory's files in a window	Directory name/Double left	Select directory, <Enter>
Select a file	File name/Left	Cursor or letter keys
Select adjacent files	First file name/Left, hold down <Shift>, last file name/Left	Select first file name, <Shift>-<Cursor Down>

CREATING PIF FILES

What to do: PIF files control how DOS programs run in Windows, from memory to window size. This example shows the PIF editor in Windows' Enhanced mode. To create a PIF file, double-click the PIF Editor icon in the Accessories group, and fill in the displayed form. Save the PIF file, and add it to a group window as you would any new program.

FILE MANAGER OPERATIONS (continued)

Select nonadjacent files	First file name/Left, hold <Ctrl>, select more files using left button	<Shift>-<F8>, cursor to desired files, <Space> to select
Select all files in window	File/Left, Select All/Left	<Ctrl>-</>
Deselect all files in window	File/Left, Deselect All/Left	<Ctrl>-<\>
Delete selected files or directories	File/Left, Delete/Left, Delete/Left, Yes/Left	<Delete><Enter>, <Enter> to confirm
Copy selected file(s)	File/Left, Copy/Left, Type destination file name, Copy/Left	<F8>, type destination file name, <Enter>
Move selected file(s)	File/Left, Move/Left, type destination directory, Move/Left	<F7>, type destination directory, <Enter>
Rename selected file or directory	File/Left, Rename/Left, type new file name, Rename/Left	<Alt>FN, type new file name, <Enter>
Run program	Program file/Double left	Select program file, <Enter>
Associate data file extension with program	Select file, File/Left, Associate/Left, type program path and name, OK/Left	Select file, <Alt>FA, type program path and name, <Enter>
Find a file or directory	File/Left, Search/Left, type name (may include ? and *), Search Entire Disk/Left, OK/Left	<Alt>FH, type name (may include ? and *), <Alt>E<Enter>

Tips: You can move selected files or directories elsewhere on the same drive simply by dragging the appropriate icons from one File Manager directory window to another. To make copies on the same drive, hold down <Ctrl> while dragging. If you drag them into a directory window of a different drive, the files are copied. To move files to a different drive, hold down <Alt> while dragging. To speed deletions, select Confirmation from the Options menu, and uncheck 'Confirm on Delete'.

CREATING PIF FILES (continued)

1. Type the program's drive, subdirectory, and executable file.
2. Type the name you want to appear below the program's icon.
3. Type the parameters you'd issue when running the program from DOS. Type a question mark if you want Windows to prompt for a parameter when the program is run.
4. Type the drive and directory the program should log on to when it runs, such as a document or worksheet directory. **Note:** The program's directory must be in the system's PATH statement.
5. Enter the minimum memory requirement, and the maximum you want to allocate (up to 640K). If you enter -1 in either box, the application gets all available conventional RAM.
6. Select whether the program will run full screen or in a window. **Note:** If the program uses a mouse, pick Full Screen.
7. Select Exclusive if you want the program to monopolize the PC; other programs will be suspended. Choose Background if the program should be active when placed in the background.
8. Check this box to return automatically to Windows when you exit the program. If you don't, you'll have to type <Alt> <Space>C to shut the program's window.
9. Click this button to display the Advanced Options screen, where you can more precisely allocate memory and processor time, among other options. For most users, however, the default settings will suffice.

If you use a lot of DOS programs, you may want to explore the Advanced Options screen—CPU-intensive programs like spreadsheets may need a higher value than word processors and similar programs. Under Multitasking Options, you can dictate how much relative processing time a program gets. Memory Options let you dole out or restrict expanded (EMS) and extended (XMS) memory use. Under 'Other Options', you can reserve keys for your program that Windows would normally use—such as <Alt>-<Tab>.



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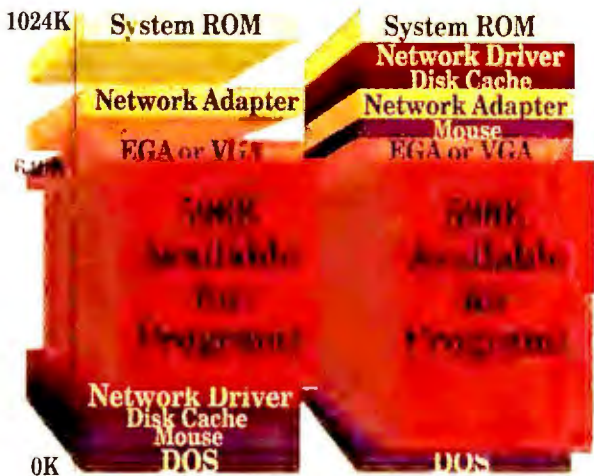
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```
@echo off
type c:\path\draft.ctl >prn
print %1 %2 %3 %4 %5 %6 %7 %8 %9
```

LISTING 2: DRAFT.BAT prepares a DeskJet for printing 80-column text, then uses PRINT.COM to print up to nine files.

suited for printing README files. Pages will break at perforations, there will be room for hole punches, and printing is done in draft mode, which conserves ink.

Jon D. Morrow
Chicago, Illinois

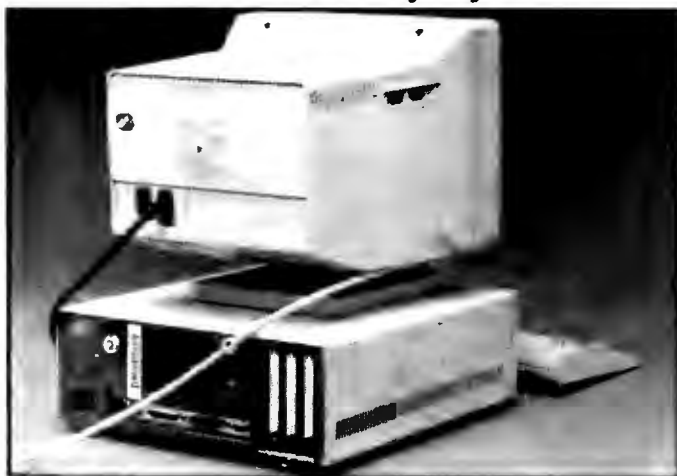
Editor's note: When entering DRAFT.CTL, you must insert an Escape code in the four places ^Ec appears. Some editors, such as Microsoft Word, let you enter an Escape character by holding down <Alt> while you type <27> on the numeric keypad.

If your editor doesn't allow inserting Escape codes, use @ signs instead; then, at the DOS prompt, enter edlin draft.ctl to load the file into the DOS EDLIN utility. Type !r@, press <Ctrl>-Z<Ctrl>-V, type <[, and press <Enter> to change the four @'s to Escape codes. Then press e<Enter> to save your changes to disk and quit EDLIN. Also, make sure that DRAFT.BAT and the DOS PRINT.COM utility are in a directory listed in the current DOS path before running DRAFT.

Tom Swan is a contributing editor for PC World and the author of several books, including Mastering Turbo Debugger (Howard W. Sams and Co., Carmel, Indiana, 1990).

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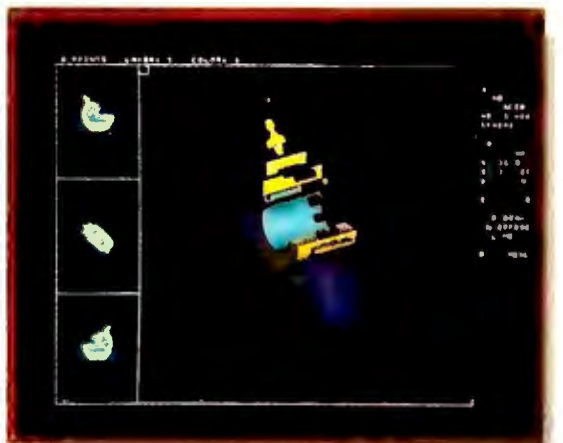
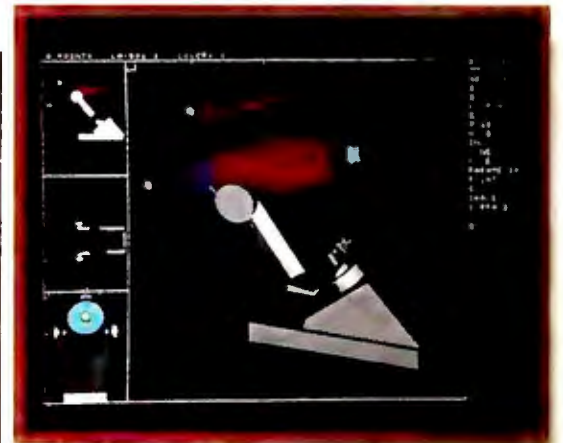
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HOW DO I GET ONE?

DesignCAD 3-D and DesignCAD 2D are available from most retail computer stores, or you may order directly from us. If you have questions about which program to purchase please give us a call. All you need to run DesignCAD 3-D is an IBM PC or compatible computer with 640 K RAM memory and a hard disk. Both products support most graphics cards, printers, plotters and digitizers. Free Information and a demo disk are available by faxing (918) 825-6359 or telephoning:

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DEVELOPER'S TOOLBOX

Batch File Thrills

Tom Swan

Has the thrill of completing your first batch file program melted like a snow cone in June? If so, you're not alone. Like thrill seekers looking for that ultimate roller coaster ride, most batch file programmers are disappointed to discover that batch commands have serious limitations and that the kicks just get harder to find. For example, there are no WHILE or REPEAT loop-the-loops available to batch programs as there are in C and Pascal. File, string, and display functions are as plentiful as honest wheels of fortune in a shore-town amusement park. And I'd sooner guess weights for a buck on the beach than use a batch program to detect expanded memory.

Then I tried a new version of *The Builder* from Hyperkinetix. The product is a combination compiler and text editor that can convert BAT files into EXE or COM executable programs. If you prefer writing batch files to using more complete languages like C and Pascal but have cursed DOS's meager set of standard batch commands, *The Builder* is your ticket to adventure.

Using *The Builder* is as easy as crashing bumper cars. Just load or enter a BAT file into the built-in editor, press a key, and wait a few seconds as the program converts your batch commands to an intermediate format and then compiles the text. The result is an OBJ file similar to that produced by most high-level languages. This is then linked to create the final EXE or COM program. The entire process is automated, but you can execute the steps individually if necessary—if, for example, you wanted to use another linker instead of *The Builder*'s.

The product's extensions to standard batch commands are what make *The Builder* truly exciting. The intermedi-

ate language to which the program converts BAT files includes CASE, REPEAT, and WHILE control structures. (You can also use the language to write new programs.) There are functions that determine the current drive and detect whether a subdirectory exists—key features for writing goofproof application installers, one of the most difficult chores to accomplish with plain batch commands.

Other functions in *The Builder*'s library include keyboard handlers for getting responses from program users, file and string operations, display controls, and menu commands for creating pop-up and pulldown menus. A complete set of functions tells you how much expanded RAM is available.

While the forms of these and other commands differ significantly from standard batch commands, if you can write moderately complex batch programs you'll have no trouble mastering *The Builder*'s intermediate language. To help you learn the twists and turns

quickly, the product comes with several helpful examples, including a menu program that you can use as a template.

When it comes to thrills, I usually try to get mine with both feet on solid ground. But I'll ride with *The Builder* anytime. While writing batch programs, I don't even scream much anymore.

Let's talk it over. My MCI Mail handle is TSWAN; my CompuServe ID is 73627,3241. ☺

WHERE TO BUY

The Builder

Hyperkinetix, Inc.

666 Baker #405

Casta Mesa, CA 92626

800/873-9993, 714/979-2813 (fax)

LIST PRICE: \$149.95

REQUIREMENTS: 384K, DOS 2.1 or later version

TECHNICAL SUPPORT: unlimited free support for registered users, additional support plans available; toll-free number, M-F 9-5

OTHER SUPPORT: company BBS,

CompuServe

Reader service no. 817

```

File Edit Compile Window F1=Help
Compile (F9)
Run
** The Bu
** Copyri hyperkinetix, inc.
** Sample Builder file: MENU.BLD

' Clear the screen and draw three boxes to create a shadow box effect.
' Then fill the box with the text for the menu.

:menutop
cls
Double Box 1,1,80,24 bright red on cyan
Single box 4,5,70,20 black on black
Single box 3,4,70,20 red on white
say @ 5,26 "<reverse><red> hyperkinetix, inc. "
say @ 6,26 "<reverse><red> The Builder - Sample "
say @ 8,14 "<reverse><red> Select a demo to run: "
say @ 10,20 "<reverse><red> 1. <bright blue> Run the SAY demo. "
say @ 11,20 "<reverse><red> 2. <bright blue> Run the SAYHILIT demo. "
say @ 12,20 "<reverse><red> 3. <bright blue> Run the SAYBLINK demo. "
say @ 13,20 "<reverse><red> 4. <bright blue> Run the SAYREURS demo. "
say @ 14,20 "<reverse><red> 5. <bright blue> Run the SAYUNDER demo. "

* * E:\BUILDER\EXAMPLES\MENU.BLD $3 +26 Ins

```

The Builder compiles standard BAT files to EXE or COM programs, and it also lets you write programs in an intermediate language, used by the menu program shown here.



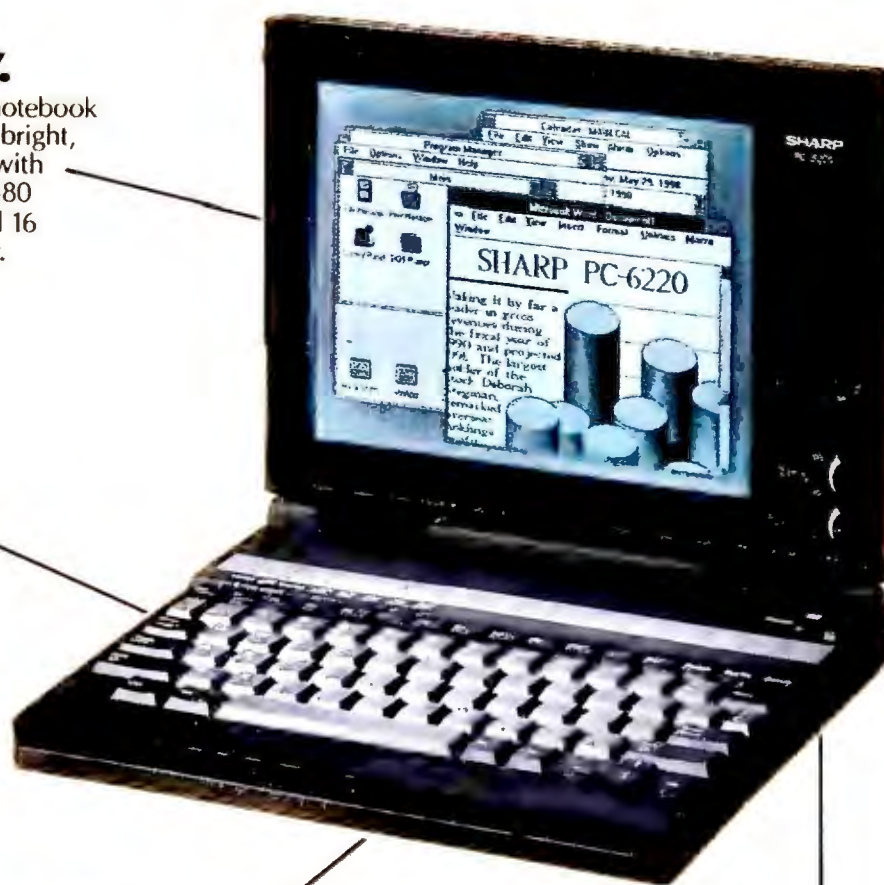
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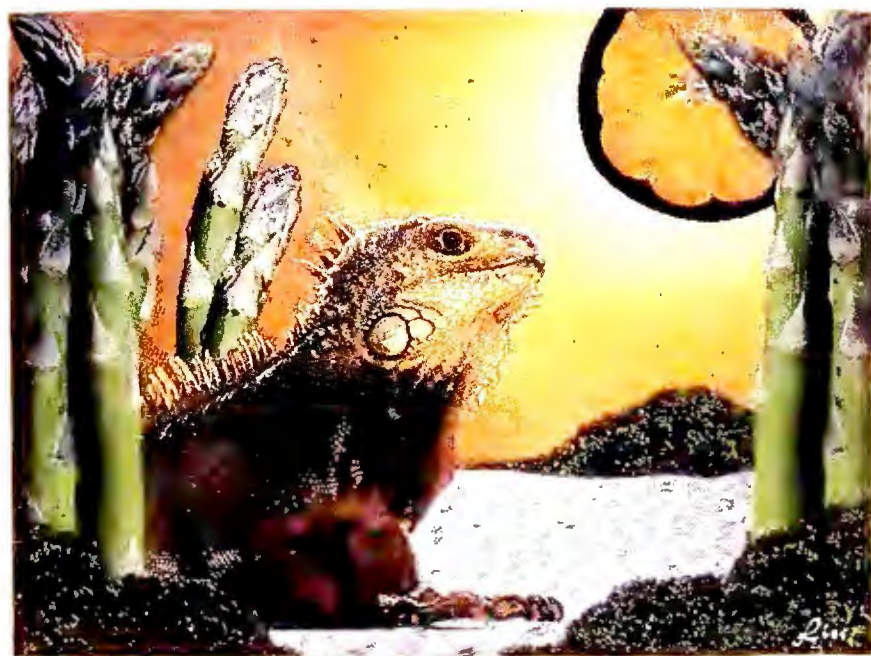
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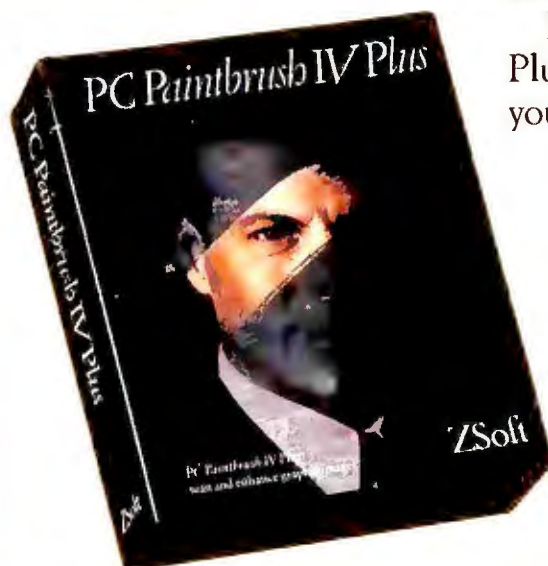
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■ Laptops	276
■ Memory Boards	276
■ Peripherals	276-278
■ Plotters	278
■ Security	278
■ Tandy Peripherals	278
■ Tape Back-Ups	278

■ Languages	287
■ Laser Logos & Signatures	287
■ Mailing Programs	287-288
■ Maintenance Management	288
■ Manufacturing	288
■ Medical	288
■ Music	288
■ Networking	288
■ Productivity	288
■ Project Management	288
■ Public Domain/Shareware	289-290
■ Real Estate	290
■ Security	290
■ Statistics	290
■ Surveys	291
■ Taxes	291
■ Time Management	291
■ Utilities	291
■ Windows	291

MISCELLANEOUS

■ Accessories	279
■ Bar Coding	279-280
■ Business Opportunities	280-281
■ Catalogs	281
■ Computer Insurance	281
■ Data/Disk Conversion	281
■ Disk Copy Service	282
■ Disks	282
■ Supplies	282

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ADVERTISING RATES&INFORMATION

SOFTWARE

■ Accounting	282-283
■ Business Applications	283-284
■ Church Applications	284
■ Construction	284
■ Data Base	284
■ Data Entry	284-285
■ Educational	285
■ Engineering	285
■ Entertainment/Games	285-286
■ Financial	286
■ Flow Charting	286
■ Genealogy	286-287
■ Graphics	286
■ Health	287
■ Home Use	287
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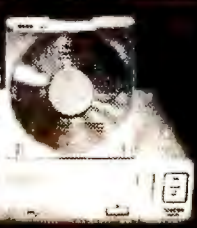
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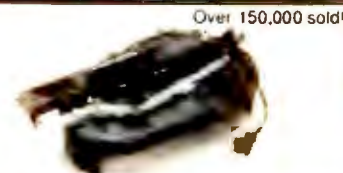
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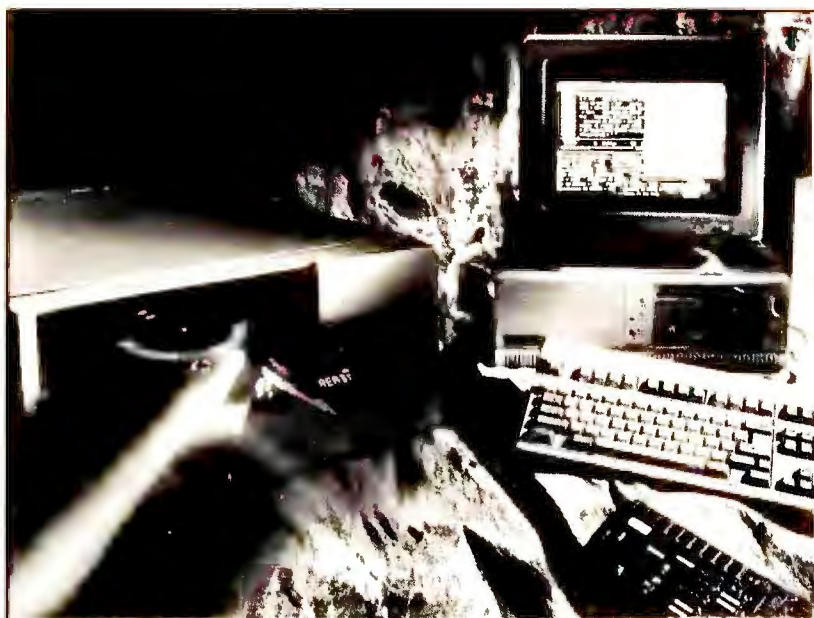
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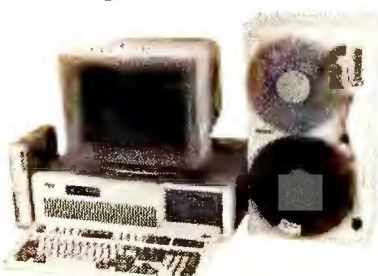
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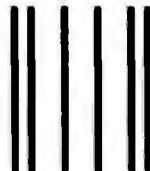
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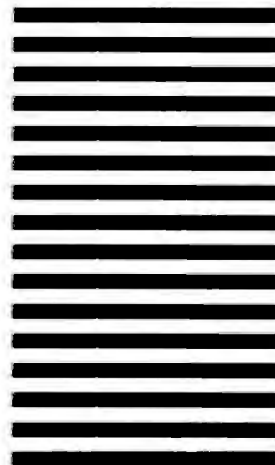
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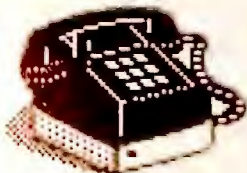
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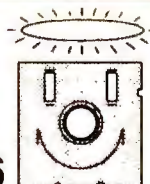
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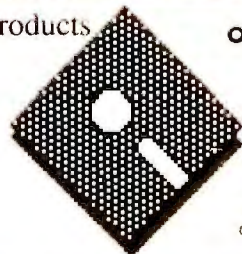
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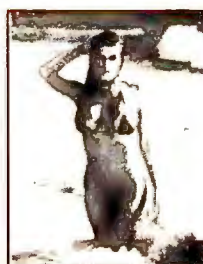
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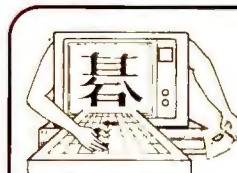
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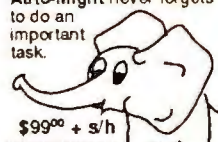
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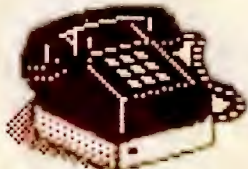
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Advertiser Index A to Z

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circle the appropriate
number on the reader
service card.

Reader Service Number	Page Number
11 Acco, Int'l.	133
306 American Small Business	268
— Anthro Corp.	74
— Arlington Computer Products	314-315
6 Artisoft, Inc.	14
— Ashton Tate	38-39, 138
10 ASP Computer Products	72
302 ATI Technologies, Inc.	139
— Bell Atlantic Corp.	263
1 Blackship Computer	28
— Broderbund Software	153
86 Brown Wagh Publishing	83
87 Brown Wagh Publishing	85
215 Buffalo Products	81
37 Buick Motor Division	245
24 Bulldog Computer Products ..	312
17 Caere Corp.	8-9
50 Canon USA	42-43
52 Central Point Software	75
58 Central Point Software	37
29 Charles Schwab & Co.	152
— Check Free	173
44 Chipsoft, Inc.	267
91 Citizen America Corp.	236
36 Clarion Software	247
38 CMS Enhancements	172
— Compaq Computer Corp ..	114-115
26 Compulynk	305
33 Compuserve	141
213 Computer Direct	313
200 Computer Discount Warehouse	298-299
48 Corel Systems	58
57 Cougar Mountain Software ..	250
— Curtis Manufacturing	5, 7
54 CYMA	237
208 Dac Software, Inc.	155
94 Dac Software, Inc.	137
— Damark, Int'l.	304
277 Datastorm Technologies, Inc.	100
66 Dauphin Technology	246
74 Dell Computer Corp.	C5-8
318 Dell Computer Corp.	56-57
51 Digital Research, Inc.	90
219 Disk Technician Gold	165
— Epson	34-35
64 ERGO	134-135
73 Everex	48-49
93 Evolution Computing	238
77 Falco Data Products	78

Reader Service Number	Page Number
100 Fast Micro	143-147
70 Fifth Generation Systems ...	45,47
84 Finalsoft	40
153 Formworx Corp.	22
76 Fortron/Source	154
60 Funk Software	239
148 Funk Software	116
63 Galaticom, Inc.	30-31
— Gateway 2000	17-20
133 GE Information Services	253
98 GE Rents	104
110 Great American Software	187
122 Group 1 Software	106
79 Haventree Software	60
104 Hayes Microcomputer Products.	101
— Hewlett Packard ...	12-13, 130-131
— IBM	88-89, 112
115 InfoWorld	292
109 Intel Corp.	67, 69
121 Int'l. Tele-video Marketing ...	300
— Intuit	169
— ISC	308-309
97 JetForm Corp. (formerly Indigo Software)....	249
41 Kenosha Computer	318
— LA Trade	311
126 Lexpertise	50
2 Logitech, Inc.	76-77
— Lotus Development Corp.	52-53, 129
162 Magee Enterprises	74
169 Manzanita Software	36
— Maxell	183
195 Micro Professionals	301
168 Microbiz Corp.	321
160 Microprose Software	248
— Microsoft	61-63, 102-103
155 Microview Corp.	6
191 Microway	259
172 MIS Computer Systems	73
130 Murata Business Systems ..	24-25
7 M-USA	255
193 Nantucket Corp.	258
187 NEC Home Electronics ...	C2-P1
182 NEC Home Electronics	23
— NEC Information Systems ...	199
159 NewGen	
158 Systems Corp.	256
163 NSI Computer Products ..	302-303
197 Okidata	70-71
192 Olivetti	257
— Pacific Data Products	125
231 Panasonic	121-123
233 Patton \$ Patton Software	46
198 PC Brand	170-171
— PC Connection	220-227
230 PC SIG	68
144 Peachtree Software	166
203 Peter Norton Computing	174
204 Pinnacle Micro, Inc.	29
211 Power Up! Software Corp. ...	252
224 Printers Plus	304
201 Project DSI	320

Reader Service Number	Page Number
202 QMS, Inc.	219
— Quarterdeck Office Systems ..	265
229 Reasonable Solutions	310
282 Reference Software	119
239 Rose Electronics	184
338 Samna Corp.	200
31 Secure-It	266
273 Sharp	270
— Sitka Corp.	54
73 Softlogic Solutions	64
— Software Publishing	188
269 Sony Magnetic Products	33
258 SourceMate	4
270 Suncom Technologies	44
250 Systems Plus	264
178 Telemart	316-317
263 Texas Instruments	55
259 Tiger Software	93-97, 107-111
287 Timeworks	151
260 Timeworks	10
257 Toshiba	126-127
288 Touchstone Software	32
— United Computer Express ...	319
289 Unitex	306-307
325 Western Telematic	26
— Wordperfect Corp.	51
290 Zenith Data Systems	98
206 ZSoft Corp.	271

Advertiser Index by Product Category

Get more information—
circle the appropriate
number on the reader
service card.

Reader Service Number	Page Number
HARDWARE	
Boards/Cards/Chips	
302 ATI Technologies, Inc.	139
191 Microway	259
Communications	
63 Galaticomm, Inc.	30-31
104 Hayes Microcomputer Products	101
130 Murata Business Systems ..	24-25
Computers	
1 Blackship Computer	28
— Compaq Computer Corp ..	114-115
26 Compulynk	305
66 Dauphin Technology	246
74 Dell Computer Corp.	C5-8
318 Dell Computer Corp.	56-57
— Epson	34-35

Reader Service Number	Page Number
64 ERGO	134-135
73 Everex	48-49
77 Falco Data Products	78
100 Fast Micro	143-147
76 Fortron/Source	154
— Gateway 2000	17-20
98 GE Rents	104
— IBM	88-89
109 Intel Corp.	67, 69
121 Int'l. Tele-video Marketing	300
168 Microbiz Corp.	321
172 MIS Computer Systems	73
182 NEC Home Electronics	23
192 Olivetti	257
198 PC Brand	170-171
273 Sharp	270
257 Toshiba	126-127
289 Unitex	306-307
290 Zenith Data Systems	98
Connectivity	
10 ASP Computer Products	72
239 Rose Electronics	184
Desktop Publishing	
— Pacific Data Products	125
Input Devices	
270 Suncom Technologies	44
Local Area Network	
6 Artisoft, Inc.	14
215 Buffalo Products	81
239 Rose Electronics	184
Monitors/Display	
187 NEC Home Electronics ...	C2-P1
Music	
86 Brown Wagh Publishing	83
Other	
204 Pinnacle Micro, Inc.	29
325 Western Telematic	26
Power Protection	
11 Acco, Int'l.	133
224 Printers Plus	304
Printers/Plotters	
50 Canon USA	42-43
91 Citizen America Corp.	236
— Hewlett Packard ...	12-13, 130-131
— NEC Information Systems ...	199
159 NewGen	
158 Systems Corp.	256
197 Okidata	70-71
231 Panasonic	121-123
224 Printers Plus	304
202 QMS, Inc.	219
263 Texas Instruments	55
Scanners/Digitizers	
2 Logitech, Inc.	76-77
Storage Devices	
38 CMS Enhancements	172
— Maxell	183
204 Pinnacle Micro, Inc.	29
SOFTWARE	
Accounting Financial	
29 Charles Schwab & Co.	152
44 Chipsoft, Inc.	267

Reader Service Number	Page Number
57 Cougar Mountain Software ..	250
54 CYMA	237
94 Dac Software, Inc.	137
208 Dac Software, Inc.	155
110 Great American Software	187
— Intuit	169
169 Manzanita Software	36
7 M-USA	255
144 Peachtree Software	166
258 SourceMate	4
250 Systems Plus	264
287 Timeworks	151
CAD/CAM	
306 American Small Business	268
93 Evolution Computing	238
Communications	
— Bell Atlantic Corp.	263
277 Datastorm Technologies, Inc.	100
63 Galacticomm, Inc.	30-31
155 Microview Corp.	6
Database Management	
— Ashton Tate	38-39
36 Clarion Software	247
122 Group 1 Software	106
193 Nantucket Corp.	258
Desktop Publishing	
48 Corel Systems	58
153 Formworx Corp.	22
97 JetForm Corp. (formerly Indigo Software)	249
211 Power Up! Software Corp.	252
260 Timeworks	10
206 ZSoft Corp.	271
Entertainment	
— Broderbund Software	153
160 Microprose Software	248
Graphics	
— Ashton Tate	138
— Software Publishing	188
Integrated Software	
288 Touchstone Software	32
Local Area Network	
— Sitka Corp.	54
Management	
— Bell Atlantic Corp.	263
Operating Systems	
51 Digital Research, Inc.	90
Optical Character Recognition	
17 Caere Corp.	8-9
Other	
— Quarterdeck Office Systems ..	265
Project Management	
79 Haventree Software	60
233 Patton \$ Patton Software	46
Shareware	
230 PC SIG	68
Spreadsheet/Template/Forms	
— Lotus Development Corp.	52-53
— Microsoft	61-63
Utilities	
58 Central Point Software	37

Reader Service Number	Page Number
52 Central Point Software	75
219 Disk Technician Gold	165
70 Fifth Generation Systems ...	45,47
84 Finalsoft	40
148 Funk Software	116
60 Funk Software	239
— Lotus Development Corp.	129
162 Magee Enterprises	74
203 Peter Norton Computing	174
23 Softlogic Solutions	64
259 Tiger Software	93-97, 107-111
288 Touchstone Software	32
Windows	
97 JetForm Corp. (formerly Indigo Software)	249
155 Microview Corp.	6
338 Samna Corp.	200
206 ZSoft Corp.	271
Word Processing/Aids	
87 Brown Wagh Publishing	85
126 Lexpertise	50
— Microsoft	102-103
282 Reference Software	119
338 Samna Corp.	200
— Wordperfect Corp.	51
MISCELLANEOUS	
Computer Accessories	
— Anthro Corp.	74
— Curtis Manufacturing	5, 7
Mail Order	
— Arlington Computer Products	314-315
24 Bulldog Computer Products ..	312
26 Compulynk	305
213 Computer Direct	313
200 Computer Discount Warehouse	298-299
— Damark, Int'l.	304
100 Fast Micro	143-147
121 Int'l. Tele-video Marketing	300
— ISC	308-309
41 Kenosha Computer	318
— LA Trade	311
195 Micro Professionals	301
168 Microbiz Corp.	321
163 NSI Computer Products ..	302-303
— PC Connection	220-227
224 Printers Plus	304
201 Project DSI	320
229 Reasonable Solutions	310
178 Telemart	316-317
259 Tiger Software	93-97, 107-111
— United Computer Express ...	319
On-Line Services	
— Check Free	173
33 Compuserve	141
133 GE Information Services	253
Other	
37 Buick Motor Division	245
115 InfoWorld	292
Security	
31 Secure-It	266

Reader Service Number	Page Number
Supplies	
— IBM	112
269 Sony Magnetic Products	33

Products Featured in Editorial

Get more information—circle the appropriate number on the reader service card.

Reader Service Number	Page Number
Add-On Board	
820 ChargeCard, All Computers....	59
732 Expanz, InfoChip Systems	182
728 FastCache-SX, MicroWay....	207
818 Hardcard II XL 50MB and 105MB; Plus Development	113
821 HiCard, RYBS Electronics....	59
734 Series III Professional Printer Controller, LaserMaster	167
Backup Software	
759 Back-It 4, Gazelle Systems....	120
Communications	
768 Mirror III 2.0, SoftKlone	142
Computer System	
640 Acer 1100SX, Acer America....	229
641 ACMA 386SX, ACMA Computers	229
642 Advanced Digital Powerlite 386SX, Advanced Digital	229
643 Amax 386SX-16, Amax Engineering.....	229
683 American Mitac MPC 2386, MPS 2386; American Mitac.....	229
644 Arche Rival 386SX, Triumph 386SX; Arche Technologies ...	229
646 AST Premium/386SX-16, AST Research	229
647 AT&T 6386SX/EL, AT&T	229
648 Austin 386SX Winstation, Austin Computer Systems	229
650 CAF Master 386SX-16, CAF Technology.....	229
651 Clone 386SX, Clone Technologies.....	229
652 Club American CV-316SX-B, Club American Technologies.....	229
653 Compaq Deskpro/386s, Compaq Computer.....	229
810 Compaq LTE 386s/20, Compaq Computer.....	99
775 Compaq SLT 386s/20, Compaq Computer.....	190
805 Compaq 386/25e, Compaq Computer.....	159
654 CompuAdd 316s, CompuAdd ..	229
655 Cordata CPC-8100, Cordata Technologies.....	229
656 CPT Model 316-SX, CPT.....	229

Reader Service Number	Page Number
657 CSR 386SX-16, CSR.	229
659 CSS Labs. Preferred 386SX, CSS Laboratories	229
660 Data General Dasher/386-16C, Data General	229
748 Dauphin 3000SX, Dauphin Technology.....	124
776 Dell 316LT, Dell Computer....	193
661 Dell System 316SX, Dell Computer.....	229
746 Dell System 425TE, 433TE; Dell Computer.....	128
662 DFI 386SX, DFI	229
663 EasyData 386SX, EasyData....	229
664 Eltech 2160, Eltech Research	229
777 Epson Equity LT-386SX, Epson America	195
665 Epson Equity 386SX Plus, Epson America	229
666 Everex Step 386is, Tempo 386SX; Everex Systems.....	229
667 Falco 386SX, Falco Data Products.....	229
668 Fivestar Model 386SX, Fivestar Computers.....	229
669 Fortron/Source Net-Set SX, Fortron/Source	229
670 Gateway 386SX, Gateway 2000	229
778 Grid 1450SX, Grid Systems	195
671 Grid 386is, 386SX-MFP; Grid Systems	229
740 GridCase 1550SX, Grid Systems	118
672 HCI Maxar 386SXL, Hyosung Computer & Information Systems	229
673 Hertz 386SXE, Hertz Computer.....	229
674 Hewlett-Packard QS/16S, Hewlett-Packard	229
675 HiQuality 386SX-16, HiQuality Systems	229
676 Hyundai Super-386, Hyundai Electronics America	229
677 IBM PS/2 Model 55 SX, IBM.	229
806 IBM PS/2 Model 70-A21, IBM	159
754 Infinity Desktop Computer, Falco Data Products	124
678 Insight 386SX-16, Insight Computers.....	229
679 Laser 386SX, Laser Computer.....	229
680 Micro Express ME 386SX, 386SX/SL; Micro Express	229
681 MIS 386SX-16, MIS Computer Systems	229
682 Mission Cyrus Darius Professional, Mission Cyrus.....	229
684 Mitsuba Mini 386SX, Mitsuba ..	229
685 Mitsubishi MP 386S, Mitsubishi Electronics America	229
686 MultiMicro 386SX-16, MultiMicro.....	229
687 NCR ELPC386SX, PC386SX; NCR.....	229
688 NEC PowerMate SX Plus, NEC Technologies.....	229
807 NEC PowerMate 386/25S, NEC Technologies.....	160

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INFORMATION FROM ADVERTISERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350										

CATALOG SECTION

401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460
461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580
581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600

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PRODUCTS FEATURED IN EDITORIAL

601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620
621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680
681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760
761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860
861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900

PRODUCT CATEGORY INFORMATION

For information on an entire category of products or all of the products mentioned in an article, circle the appropriate number below.

Editorial Features (See Article for Number)

901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920
921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940
941	942	943	944	945	946	947	948	949	950										

Advertised Products

Computers	951	Network Products	957
Data Management (PIMs)	952	Operating Environments	958
Desktop Pub./Graphic Software	953	Printers	959
Financial/Accounting	954	Scanners	960
Memory Boards	955	Video Boards	961
Monitors	956	Word Processing	962

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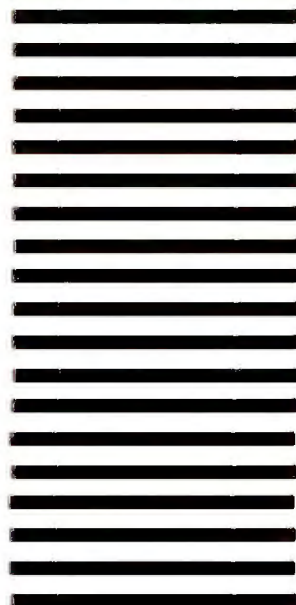
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350										

CATALOG SECTION

401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460
461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580
581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600

PRODUCTS FEATURED IN EDITORIAL

601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620
621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680
681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760
761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860
861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900

PRODUCT CATEGORY INFORMATION

For information on an entire category of products or all of the products mentioned in an article, circle the appropriate number below.

Editorial Features (See Article for Number)

901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920
921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940
941	942	943	944	945	946	947	948	949	950										

Advertised Products

Computers	951	Network Products	957
Data Management (PIMs)	952	Operating Environments	958
Desktop Pub /Graphic Software	953	Printers	959
Financial/Accounting	954	Scanners	960
Memory Boards	955	Video Boards	961
Monitors	956	Word Processing	962

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Reader Service Number	Page Number	Reader Service Number	Page Number	Reader Service Number	Page Number	Reader Service Number	Page Number
779	NEC ProSpeed 386SX, NEC Technologies. 195	718	WLT AT-316S-6/8, WLT Systems 229	878	ThinkSync Trio CM-4210, IOcomm 209	863	TVGA 8916, Trident Microsystems 209
742	NEC UltraLite 286V, NEC Technologies. 117	719	Wyse WY-3016SX, WY-3116SX; Wyse Technology 229	896	TM 5156H, T.W. Casper 209	855	Ultimate VGA, VGA Solution; Micro-Labs 209
689	Network Connection Triumph SX, The Network Connection 229	781	Zenith SupersPort SX, Zenith Data Systems 198	887	Ultra 1200, 1400, 1600; Princeton Graphic Systems 209	846	VGA400, VGA500, VGA600, VGA700; Cardinal Technologies. 209
690	Olivetti PCS 386SX, Olivetti Office USA 229	720	Zenith Z-386SX, Zenith Data Systems 229	886	VGAM/1024, PC Craft 209	851	VGA Level 16+, VGA Super 16; Leading Technology 209
691	Osicom Executive 386SX, Osicom Technologies. 229	Desktop Publishing Utility		Display Adapter		840	VGA Wizard, VGA Wizard Deluxe; Ahead Systems 209
692	Packard Bell Force 386/33, Force 386X; Packard Bell Electronics 132, 229	784	Express Publisher, Power Up Software 46	827	Advanced Graphics 1024, Compaq Computer 209	844	VGA Wonder+, ATI Technologies. 209
693	Pan Overseas POC 386SX, Pan Overseas Computer 229	786	JetDesk, Koch Software Industries 46	828	AGA 1024, Desktop Computing 209	850	Video Seven VGA 1024i, Video Seven V-RAM VGA; Headland Technology. 209
694	PC Brand 386SX-16, PC Brand 229	787	LaserTwin, Metro Software. 46	842	AST-VGA Plus, AST Research 209	848	Viewpoint VGA, Viewpoint VRAM; Everex Systems. 209
695	PC Craft PCC 2700/16, PC Craft 229	789	SuperFonts 25/1, Metro Software 46	843	ATD VGA, ATD Televideo 209	825	XJi, Artist Graphics 209
696	PC Designs GV-386/SX, PC Designs 229	Development Tool		837	Cobra Plus, Vermont Microsystems 209	Font	
697	Philips Magnavox MaxStation 386SX, Philips Consumer Electronics. 229	764	BASIC Professional Development System 7.1, Microsoft 142	831	8514/A, IBM 209	788	LJ Fonts, Weaver Graphics. 46
698	Polywell 386SX-16VB, Polywell Computers 229	Disk Drive		838	8514/A, 8514/A Combo; Western Digital Imaging. 209	790	MSDfonts, Mephistopheles Systems 46
699	Proteus Model 386SX-16, Proteus Technology 229	731	Disctec RHD 20, Disk Technologies. 195	826	8514/ULTRA, 8514/ULTRA+ VGA, 8514/Vantage, 8514/Vantage+ VGA; ATI Technologies 209	791	Publisher's Powerpak, Atech Software 46
700	Reply 386SX-16, Reply 229	726	Practidisk ED, Practical Computer Technologies. 198	861	ErgoVGA, PowerGraph VGA, PowerView VGA, VGA 800/16; STB Systems 209	Graphics	
701	Samsung SD 700, Samsung Information Systems America 229	730	Stor/Mor, Q/Cor 244	858	EXCELSIOR, Prism Imaging Systems 209	753	Presentation Team 2.0, Digital Research 120
702	Sun Moon Star 386SX, Sun Moon Star 229	Display		836	EX1280, VX1024; Vectrix. 209	Information Management	
703	Syntrex 386SX-16, Syntrex ... 229	869	AcerView 33, AcerView 35, 7015; Acer America 209	854	Extended VGA Card, Micro Express 209	752	GrandView 2.0, Symantec. 132
704	Tandon Slimline 386SX, Tandon 229	872	Advanced Graphics Color, Compaq Computer 209	829	Hercules Graphics Station, Hercules Computer Technology. 209	Input Device	
743	Tandy 1500 HD, Tandy 117	889	AlphaScan, Sampo Corp. of America 209	830	IGC 10, Hewlett-Packard 209	733	Switchboard, Datadesk Int'l. ... 179
705	Tandy 4016 SX, Tandy 229	898	CM-140UV, Xtron Computer Equipment 209	841	Impression Card, Amax Engineering. 209	LAN Application	
808	Tandy 4025 LX, Tandy 163	891	CM-1440, CM-1450; Seiko Instruments USA 209	852	MaxVGA/16, MaxVGA 1024; MaxLogic. 209	822	LANSpace, LANSystems. 59
706	Tangent 386SX-16, Tangent Computers 229	893	CM-1495G, CM-1496X, CM-1498X; Tatung Co. of America 209	832	MG-104, MG-108, PG-1024; Matrox Electronic Systems ... 209	LAN Package	
707	Tatung TCS8450S, Tatung Company of America. 229	868	CM-61428S, CM-61728, CM-8426; Aamazing Technologies. 209	833	MultiSync Graphics Engine, NEC Technologies. 209	747	Little Big LAN, The \$25 Network; Information Modes 136
708	Televideo TeleSX, Televideo Systems 229	881	Diamond Scan 14, Diamond Scan 16L, FA3435ATK; Mitsubishi Electronics America 209	834	#9GX Levels 1,2,3, Number Nine Computer 209	Language	
709	Tenex 386SX, Tenex Computer Express 229	874	ECM 1310, Electrohome Ltd. 209	862	OmniVGA, OmniVGA/HR, VGA/AD; Tatung Co. of America ... 209	817	The Builder, Hyperkinetix 269
710	Texas Instruments TI 386SX, Texas Instruments 229	877	8514, 8515; IBM 209	865	Paradise VGA Plus 16, Paradise VGA 1024; Western Digital Imaging 209	Miscellaneous	
711	Topline 386SX, Topline Technologies. 229	882	Flexscan 8060H, 8060S, 9070U; Nanao USA 209	857	PBS VGA, Packard Bell Electronics. 209	727	83D87, Cyrix. 204
780	Toshiba T3100SX, Toshiba America Information Systems 197	875	1450 Plus, 1460 Plus, 1610 Plus; GoldStar Technologies. 209	864	P800, P1024, 1024AM; ViewSonic. 209	Modem	
809	Toshiba T8500 Model 25, Toshiba America Information Systems 164	876	14MVX, Hitachi/NSA 209	853	Premier VGA, Metheus. 209	745	9600EX, Intel PCEO. 140
811	TravelMate 3000, Texas Instruments. 99	879	1428S, Leading Technology ... 209	856	ProDesigner/E, ProDesigner II; Orchid Technology. 209	744	PM9600SA V32/V42bis, Practical Peripherals. 140
712	Tussey Swan 386SX, Swan Technologies. 229	870	Impression AX414E, Amax Engineering. 209	859	SigmaVGA Legend, Sigma Designs 209	Operating System/ Environment	
713	Twinhead Superset 590-16, Twinhead 229	884	Model 8510, Packard Bell Electronics. 209	860	Sota VGA 16+, Sota Technology. 209	815	Desqview, Quarterdeck Office Systems 322
714	Ultra Comp 386SX, Ultra-Comp 229	894	Multi Vision 795, Super Vision 790; Taxan U.S.A. 209	847	SpeedStar VGA, Diamond Computer Systems 209	827	Microsoft Windows 3.0, Microsoft 59
715	Unisys 500/16A, Unisys. 229	892	Multiscan CPD-1302, CPD-1304; Sony Corp. of America 209	867	Super RVGA II, Zymos 209	Other Peripheral	
716	USIT Athena 386SX-16, US Integrated Technologies (USIT) 229	883	MultiSync 2A, 3D, 4D; NEC Technologies. 209	845	Super VGA by Boca, Boca Research 209	767	Bernoulli Dual, Portable, Transportable; Iomega 142
717	Wang PC 350/16S, Wang Laboratories 229	885	PanaSync C1381, C1391; Panasonic Communications & Systems. ... 209	849	SuperVGA 6300, 6400; Genoa Systems 209	755	Dycam Model 1, Dycam 128
		888	RE1520, RE1515; Relisys. 209	835	340i, Sota Technology 209	Printer	
		880	6CM320, 7CM320; Magnavox. ... 209			634	AP9210, Unisys. 241
		871	SmartScan II, Amdek. 209			795	Apple LaserWriter IINTX, Apple Computer 178
		895	SuperSync 2A+, 3A, 5A; TVM Professional Monitor 209			741	Canon BJ-10e, Canon U.S.A. ... 118
		890	SyncMaster 1, 2, 3; Samsung Electronics America 209			628	CrystalPrint Super Series II, Qume 241

Reader Service Number	Page Number
629 JX-9500, Sharp Electronics ...	241
620 KX-4420 Laser Partner, Panasonic Communications & Systems ...	241
621 KX-4450i Laser Partner, Panasonic Communications & Systems ...	241
796 Kyocera Q-8010, Kyocera Electronics	179
623 LaserImage 1030-ID, PCPI ...	241
624 LaserImage 1030-IS, PCPI ...	241
622 LaserImage 1030-PP, PCPI ...	241
626 LaserImage 2020-ID, PCPI ...	241
627 LaserImage 2020-IS, PCPI ...	241
625 LaserImage 2020-PP, PCPI ...	241
608 LaserPrinter, IBM	241
614 LaserPro EXEC, Office Automation Systems	241
615 LaserPro LP 90/8, Office Automation Systems	241
601 LZR 650, Dataproducts	241
602 LZR 1230, Dataproducts	241
632 MicroLaser, Texas Instruments	241
612 MT905, Mannesmann Tally ...	241
613 MT906, Mannesmann Tally ...	241
797 NewGen TurboPS/480, NewGen Systems	179
616 OkiLaser 800, Okidata	241
617 OkiLaser 820, Okidata	241
633 PageLaser6, Toshiba America Information Systems	241
619 PB 9500, Packard Bell Electronics	241
618 PG 306, Olivetti Office USA ...	241
799 QMS-PS 820 Turbo, QMS ...	181
800 Qume CrystalPrint Express, Qume	182
607 RX 7200, Fujitsu America ...	241
631 Tandy LP 950, Tandy	241
801 Texas Instruments OmniLaser 2115, Texas Instruments	182
Printer Accessory	
725 PostScript Cartridge, Adobe Systems	193
Scanner	
749 Howtek Personal Color Scanner, Howtek	136
750 UMAX UC300, UMAX Technologies	136
Spreadsheet	
813 Quattro Pro 2.0, Borland Int'l ..	91
Tax	
766 Sylvia Porter's RapidTax, DacEasy	142
Utility	
757 ImPort for Windows, Zenographics	140
824 Popdrop, Bloc Publishing	59
825 QEMM-386, Quarterdeck Office Systems	59, 213
816 SuperKey, Borland Int'l	322
826 386-To-The-Max 5, Qualitas	59
Word Processing	
763 Ami 1.2, Samna	142
812 Microsoft Word 5.5, Microsoft	105
765 Microsoft Word for Windows 1.1, Microsoft	142



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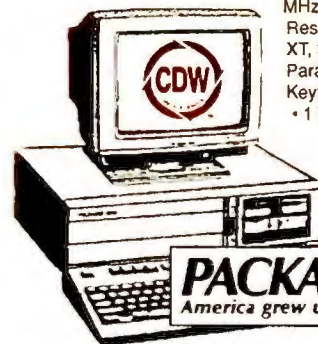
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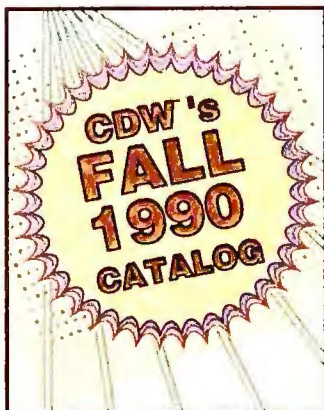
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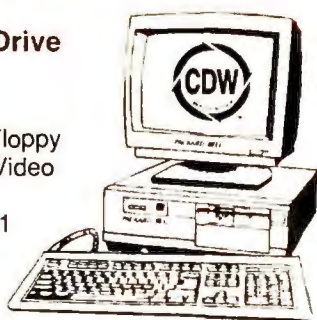


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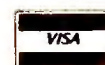
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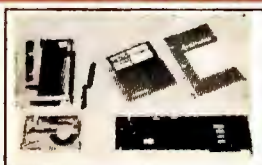
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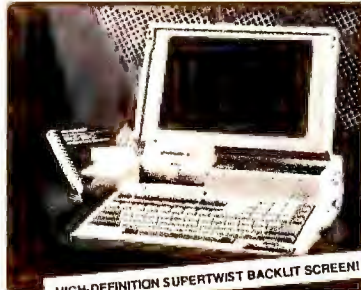
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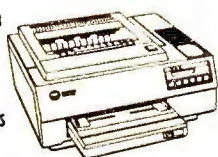
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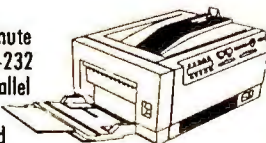
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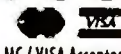
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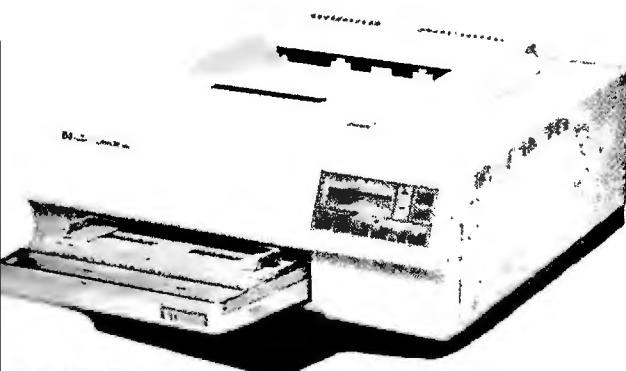


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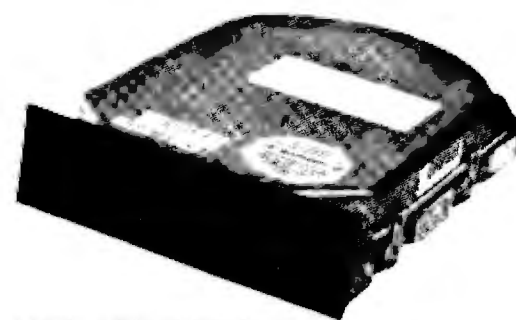
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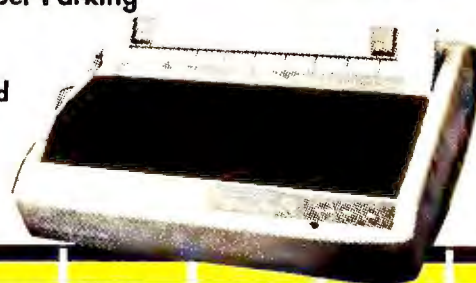
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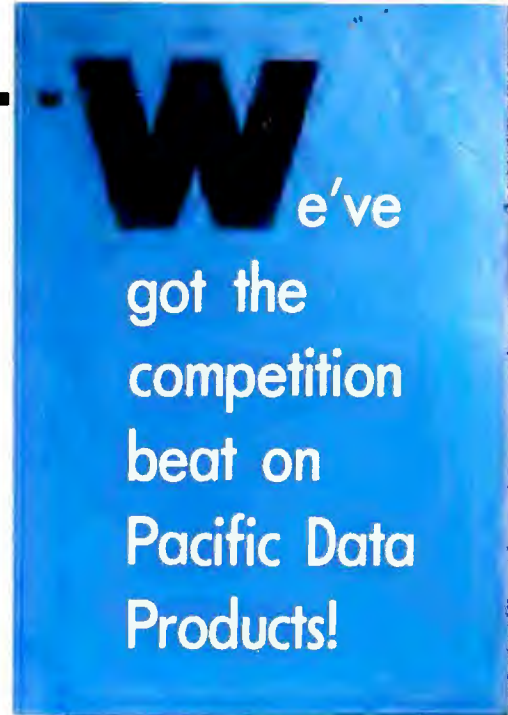
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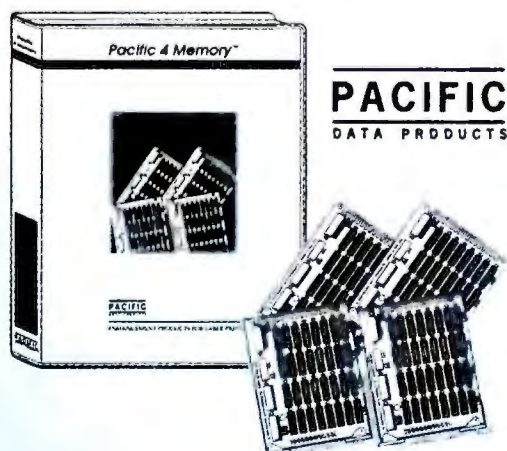
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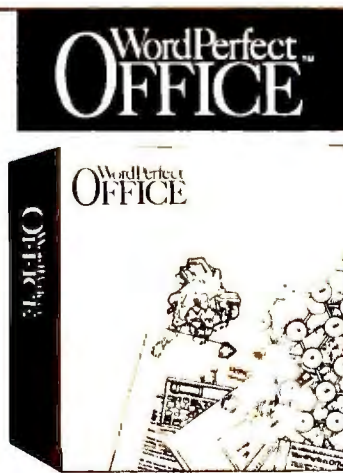
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TAKING IT HOME

The practical guide to home/office computing

Building your own integrated software

Lawrence J. Magid

Trying to do the same job at home as at the office, with fewer resources, may send you into the arms of low-cost integrated packages like *Microsoft Works*.

Typically, these programs offer scaled-down versions of the most-often-used applications—perfect if you have less memory, storage, and CPU power at your disposal, and perhaps less demanding computing needs at home as well. Integration provides a consistent interface for ease of use and easy data transfer among modules.

But that strength can be a weakness. Just because you like an integrated program's word processor doesn't mean that you're going to like its spreadsheet. In any case, you still may need to swap home files in and out of your jumbo apps at the office on a daily basis and deal with constantly changing commands.

Rather than having to buy an integrated sampler, what if you could configure your own integrated package? You could put together the two or three full-featured apps that you use all the time at the office—without the panoply of printer drivers and help and sample files that clog up your office hard disk.

Windows 3.0 does the trick on my beefed-up 386 home desktop, but I can't

afford its RAM and disk overhead on my laptop, where I happen to do a lot of home computing. Fortunately, there are a couple of other options.

If you're using a 286 or even an XT, *Desqview* from Quarterdeck Office Systems lets you create an integrated environment using off-the-shelf DOS applications. The program uses only about 150K of RAM, most of which can be tucked into extended or expanded memory. You can run multiple programs in the remainder, cutting and pasting between them.

It isn't *Windows*: *Desqview* can't



TIM CARROLL

transfer live spreadsheet ranges, and it can't make your spreadsheet look and feel like your word processor. But its built-in macro language lets you create the same keyboard commands for your programs at work and at home. For example, as a longtime *WordPerfect* user, I've assigned <F10> as the Save key for all my programs.

If you don't need to run more than one program at a time or are short on memory, you can still achieve a high degree of interprogram integration with a stand-alone macro utility like Borland's *SuperKey*. It gives you the same macro capability as *Desqview*, but

without the clipboard for data transfer.

And it still lets you write macros to move data between programs. For example, I use *WordPerfect* to create E-mail instead of using the editor in my communications program. Just about any communications program can save incoming text as an ASCII file, and all word processing programs speak ASCII. The trick is making the process seamless.

I use *WordPerfect* to write an article or letter, and then run a macro that automatically saves it as a text file in a specified directory under the name SEND.TXT. Since I always save to the same file name, I've programmed the macro to overwrite the previous version of SEND.TXT. Then I use a communications program macro with the same keystrokes to automatically transmit SEND.TXT. I achieve the same result as with a *Windows* or *Desqview* clipboard, and although I prefer the macros native to my applications, *SuperKey* can always fill in.

The concept applies to just about any combination of programs as long as they can agree on some common file format for data exchange. Integrated programs are fine, but there is nothing to prevent you from building your own macros to integrate the applications that you like most under your own personal user interface. ☛

Lawrence J. Magid is a nationally syndicated computer columnist.

Desqview \$129.95; Quarterdeck Office Systems; 213/392-9851, 213/314-3214 (fax)

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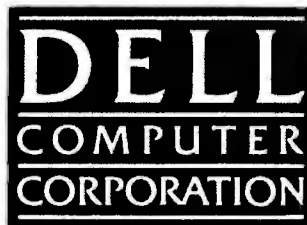
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2. Are you interested in computer products for:

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Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
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_____	3-6 months		

4. What do you plan to use computer products for?

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2. Are you interested in computer products for:

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