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THE NEW DELL SYSTEM 316
16 MHz 386SX

STANDARD FEATURES:

- Intel 80386SX microprocessor running at 16 MHz.
- Choice of 1 MB or 2 MB of RAM* expandable to 16 MB (8 MB on the system board).
- Page mode interleaved memory architecture.
- VGA systems include a high performance 16-bit video adapter.
- LIM 4.0 support for memory over 1 MB.
- Socket for 16 MHz Intel 80387SX math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Integrated high performance hard disk interface and diskette controller on system board. (ESDI based systems include a hard disk controller.)
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots.

OPTIONS:

- 16 MHz Intel 80387SX math coprocessor.
- 1 MB or 4 MB RAM upgrade kit.
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- Graphics Performance Display GPD-16C, GPD-19C.

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150 MB-18 ms ESDI	$4,099	$4,298	$4,599	$4,798
322 MB-18 ms ESDI	$5,099	$5,298	$5,599	$5,798

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- Advanced Intel 82385 Cache Memory Controller with 32 KB of high speed static RAM cache.
- Page mode interleaved memory architecture.
- VGA systems include a high performance 16-bit video adapter.
- Socket for 25 MHz Intel 80387 or 25 MHz WEITEK 3167 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard disk drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots.

OPTIONS:
- 25 MHz Intel 80387 math coprocessor.
- 25 MHz WEITEK 3167 math coprocessor.
- 1 MB or 4 MB RAM upgrade kit.
- 2 MB or 8 MB memory expansion board kit.
- Graphics Performance Accelerator GPX-1024.
- Graphics Performance Display GPD-16C, GPD-19C.

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THE DELL SYSTEM 310
20 MHz 386.

The best combination of performance and value available in its class.

STANDARD FEATURES:
- Intel 80386 microprocessor running at 20 MHz.
- Choice of 1 MB or 4 MB of RAM* expandable to 16 MB using a dedicated high speed 32-bit memory slot.
- Advanced Intel 82385 Cache Memory Controller with 32 KB of high speed static RAM cache.
- Page mode interleaved memory architecture.
- VGA systems include a high performance 16-bit video adapter.
- Socket for 20 MHz Intel 80387 or 20 MHz WEITEK 3167 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard disk drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots.

OPTIONS:
- 20 MHz Intel 80387 math coprocessor.
- 20 MHz WEITEK 3167 math coprocessor.
- 1 MB or 4 MB RAM upgrade kit.
- 2 MB or 8 MB memory expansion board kit.
- Graphics Performance Accelerator GPX-1024.
- Graphics Performance Display GPD-16C, GPD-19C.

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Hard Disk Drive	TTL Mono 1 MB RAM	TTL Mono 2 MB RAM	VGA Color Plus 1 MB RAM	VGA Color Plus 2 MB RAM
40 MB-29 ms IDE	$3,699	$3,898	$4,199	$4,398
90 MB-18 ms ESDI	$4,199	$4,398	$4,699	$4,898
150 MB-18 ms ESDI	$4,699	$4,898	$5,199	$5,398
322 MB-18 ms ESDI	$5,499	$5,698	$5,999	$6,198

THE DELL SYSTEM 220
20 MHz 286.

It's fast as most 386 computers. But at less than half the price. The footprint is small, too.

STANDARD FEATURES:
- 80286 microprocessor running at 20 MHz.
- 1MB of RAM* expandable to 16MB (8 MB on system board).
- Page mode interleaved memory architecture.
- LIM 4.0 support for memory over 1 MB.
- Integrated diskette and VGA video controller on system board.
- Socket for Intel 80287 math coprocessor.
- One 3.5" 1.44 MB diskette drive.
- Integrated high performance hard disk interface on system board.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports (integrated on system board).
- 3 full-sized industry standard expansion slots available.

OPTIONS:
- External 5.25" 1.2 MB diskette drive.
- 3.5" 1.44 MB diskette drive.
- Intel 80287 math coprocessor.
- 1 MB or 4 MB RAM upgrade kit.

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System 220 — With Monitor

Hard Disk Drives	VGA Mono 1 MB RAM	VGA Mono 2 MB RAM	VGA Color Plus 1 MB RAM	VGA Color Plus 2 MB RAM
40 MB-29 ms IDE	$2,999	$3,198	$3,299	$3,498
100 MB-25 ms IDE	$3,599	$3,798	$3,899	$4,098

THE DELL SYSTEM 200
12.5 MHz 286.

This full-featured 286 computer runs at 12.5 MHz, and is completely Microsoft MS-DOS and MS OS/2 compatible.

STANDARD FEATURES:
- 80286 microprocessor running at 12.5 MHz.
- 640 KB of RAM expandable to 16 MB (4.6 MB on system board).
- Socket for Intel 80287 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard disk drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 6 industry standard expansion slots.

OPTIONS:
- Intel 80287 math coprocessor.
- 512 KB RAM upgrade kit.
- 2 MB RAM upgrade kit.

Extended Service Plan pricing starts at $166

System 200 — With Monitor & Adapter

Hard Disk Drive	VGA Mono	VGA Color Plus
40 MB-40 ms	$2,499	$2,799
40 MB-28 ms	$2,699	$2,999
90 MB-18 ms ESDI	$3,199	$3,499
150 MB-18 ms ESDI	$3,699	$3,999
322 MB-18 ms ESDI	$4,499	$4,799

Performance enhancements (Systems 325, 310, 316 and 220) Within the first megabyte of memory, 384 KB of memory is reserved for use by the system to enhance performance.

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THE $3500 DELL 386SX SYSTEM COMES WITH SELF-DIAGNOSTIC SOFTWARE, TOLL-FREE TECHNICAL SUPPORT, 30-DAY MONEY-BACK GUARANTEE AND NEXT-DAY, DESKSIDE SERVICE.

Right away, it's easy to see what makes the new Dell System 316 different from the Compaq^ 386s.

While they both utilize Intel's new 386SX™ chip, the System 316 is a full featured system designed to give you uncompromising 386SX/16 MHz performance.

But for a price that's somewhere in the neighborhood of a 286-based system.

Now, cynics might be inclined to think we achieved this at the expense of expandability.

Obviously these people own the 4-slot Compaq.

The System 316 has a total of seven open slots. Leaving you enough room to add modems or network cards, fax boards, high-performance graphics cards or tape backups. Not to mention all the bells and whistles that'll be coming out next year. And the year after that.

And the year after that.

Point is, the Dell System 316 was designed for the long haul.

Not as a passing fad.

IT'S YOUR CALL.

If the System 316 is beginning to sound like the perfect business computer, it's because it is.

How perfect though is entirely up to you. Because every 316 is custom configured. To give users exactly what they need.

For example, the System 316 comes standard with your choice of 1 MB or 2 MB of RAM. If you'd like more, we can add as much as 8MB to the system board. Okay, we can add another 8MB by installing a memory expansion board.

What about storage? We can set your 316 up with a 40, 100, 150 or 322 MB hard drive. And a 40 or 150 MB tape drive.

Tell us, what type of monitor do you prefer? VGA mono with paperwhite screen, or VGA Color Plus for high resolution colors displayed on a larger screen? Or perhaps you'd like even larger monitors, capable of displaying 1024 by 768 pixel resolution? You've got your choice. You've got your choice of operating systems, too. The 316 can run MS-DOS,® OS/2, or UNIX® systems. Making it extremely versatile, as well as extremely powerful.

Once you've told us what you want, we'll make sure what you want works, by burning-in the system unit.

And even though each and every 316 we build is individually configured, they're all guaranteed dependable just the same.

DON'T GET STUCK IN THE MIDDLE.

Have you noticed how most computer retailers seem to know far too much about sales techniques and far too little about computer technology?

Ask even the simplest of questions and the answer will undoubtedly involve the highest margin item in the store. And heaven forbid you should ever have to go back there for service.

Well, when you buy from us,

you never set foot in a store.

Because we've eliminated it. Along with the retailer.

Instead, you talk directly with a computer expert.

Someone who can help you configure a system that not only meets your needs, but meets them for about 35% less than you'd pay a retailer.

WE COME WHEN WE'RE CALLED.

One of the things that very clearly sets a Dell system apart from other computers is not just how they're sold but how they're supported.

Overkill was one description used in a PC Week article.

Perhaps.

But then, we think you'll agree, when something goes wrong, you want as much help as possible, right?

Which is why every Dell system comes with self-diagnostic software and a toll-free technical support line. We're able to solve 90% of all problems right over the phone.

The other 10% receive next-day, deskside service. Thanks to our new alliance with Xerox Corporation.

And you get all this help for a full year—whenever you need it—at no extra charge.△

You've probably guessed by now, one of the things that drives us most is customer satisfaction.

So we'd like to give you the ultimate guarantee: Try a System 316 in your office for a month. Run your toughest applications. Put it through its paces, at your pace. If you're not completely satisfied, send it back anytime within 30 days. And we'll refund your money.

No questions asked.

THE $4900 COMPAQ 386S COMES WITH A GUY IN A SUIT.

MAYBE YOU SHOULDN'T BUY ONE AFTER ALL.

No matter how many reasons we give you to buy a Dell system, sometimes it makes more sense to lease one instead.

Whether you need a single computer, or an entire office full, a leasing plan is just like 100% financing. So you don't tie up working capital. Or credit lines. Of course, there can also be tax advantages as well.

And just as we can custom configure your computers, we can see to it you get a custom designed lease plan to fit the exact needs of your business.†

Maybe that explains why over half the companies in the Fortune 500 now own or lease Dell computer systems. And why, in two separate PC Week polls, 1400 corporate volume buyers rated Dell number one in overall customer satisfaction.

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The Right Connections

ROBERT CARDIN

Network consultant and reviewer Robert Lauriston

For one who makes his living installing and troubleshooting networks, Robert Lauriston has some curious ideas. "Networks aren't for everybody," he says. "Don't install a network because you think you'll save money. Install one because you need it. You might think that you're going to save money, but in the long run your support needs increase exponentially."

Lauriston, a San Francisco–based consultant who specializes in *WordPerfect* and network setups, had more than his share of support headaches during the preparation of this month's roundup of high-powered network operating systems ("Seven Top LANs: A Hard Look at Ease of Use"). "We installed, uninstalled, and occasionally reinstalled seven systems, one after the other. It was an interesting experience, but I don't recommend it for everyone."

Because *PC World*'s test network is right in the heart of the editorial department, most of our staffers got to know Lauriston during the month he spent holed up in the lab. Lauriston himself got to know the seven contenders in our roundup very well indeed.

"At one level," he reports, "these operating systems all do the same things—they let you share files and resources and run applications. Beyond that, there is a huge range of features, approaches, and capabilities. Good interface design is perhaps the most important measure of a LAN operating system. A well-designed interface can make complicated tasks seem a lot less difficult."

Novell's *NetWare* earned our Best Buy recommendation, and Banyan's *Vines* scored points for its prowess in dealing with multiserver networks. NSTL's tests and our reviewer's hands-on experience suggest that the next revision of 3Com's OS/2-based *3+Open* may give both products a serious run for their money. "More and more," Lauriston concludes, "high-end networks are competing with minis and mainframes. And they're competing strongly, too, on price, performance, training, and support."

Also in this issue: For our roundup of top-flight 386s ("25-MHz Speedsters—A Buyer's Market"), we've assembled the most complete suite of NSTL system tests ever. If you've got a big computing job, these systems have all the muscle you'll need. Or do they? The *next* generation of 386 systems is nearly one-third faster, and they're ready to hit the streets. Senior Editor Eric Knorr and News Editor Mike Hogan ("Preview: Zenith, AST, and Everex Hit 33") have put together an inside look at three hot new 33-MHz systems with impressive pedigrees and price tags. ●

Ed Bott

Ed Bott
Managing Editor

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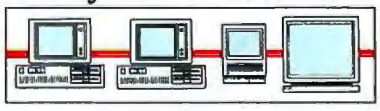

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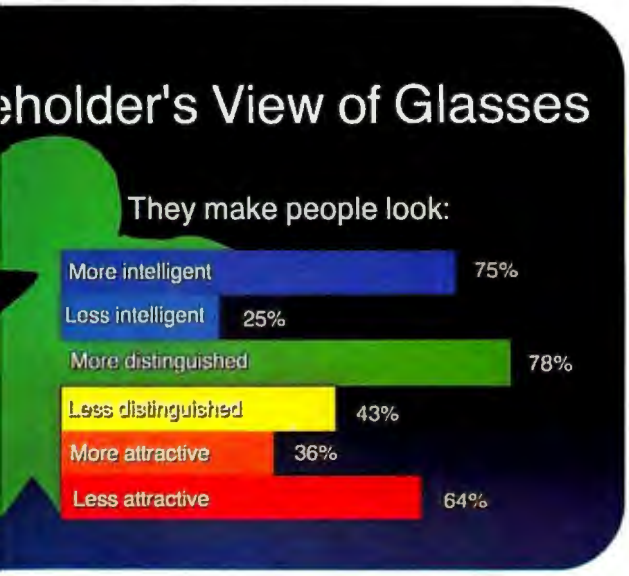

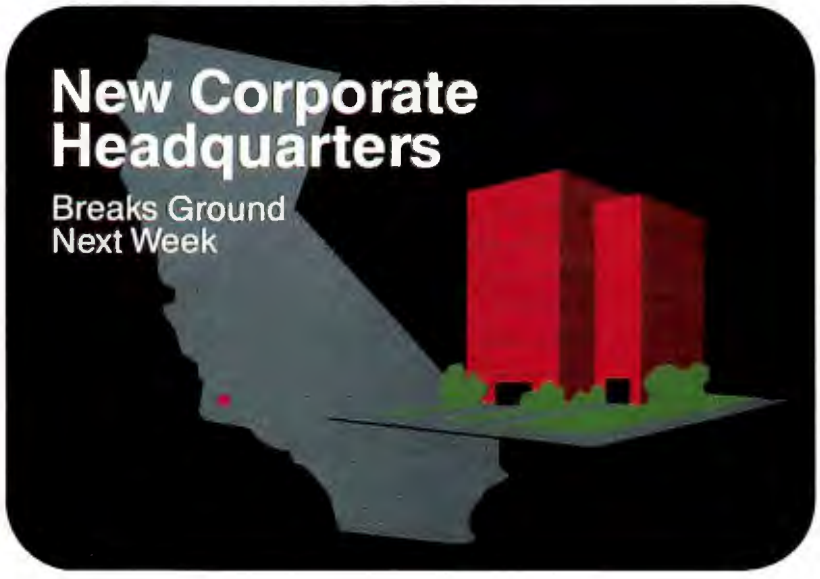

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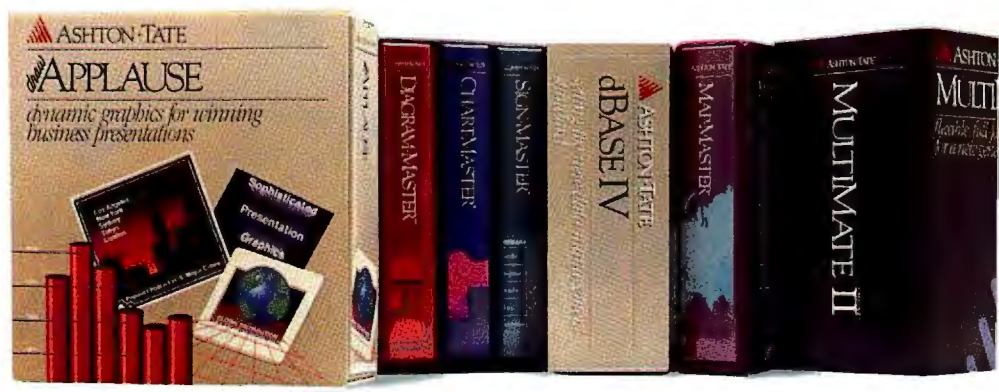

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Two-Inch Drive Debuts

Standard-Busting Media Chosen for Zenith's Sub-7-Pound Portable

Zenith Data Systems will build a 2-inch disk drive into a light new laptop scheduled to ship this summer. Seeking to develop a computer that weighs less than 7 pounds and can run for 3 hours on a single battery charge, Zenith will switch from the traditional 3½-inch floppy drive, which takes up approximately 24 cubic inches and accounts for about 2½ pounds (with batteries). The new drive, made by Sony and used in its Mavica camera, measures about 7½ cubic inches and weighs 6 ounces. Because it consumes half the power of 3½-inch units, the drive requires only a half-pound of batteries. Zenith decided against RAM cards, which are being considered by competitors, because of the relatively high cost of adding incremental storage using DRAMs rather than magnetic media. Zenith won't ship software on the 720K disks; DOS will be in firmware on the laptop. Programs and data can be transferred to the PC-compatible disks from an external 3½-inch add-on or a desktop via a bundled serial-cable transfer system. Zenith vice president of product marketing Andy Czernek doesn't see the new media becoming another industry standard, but he does anticipate its use in rival laptops because the drive won't raise prices.

System Prices Fall

Bargains to Be Found, Especially for 80286 Machines

PC price cutting has become epidemic as the computer industry heads into the summer doldrums and 80386-based systems begin to become the standard. Intel Corporation, which sells 80 percent of all IBM-compatible CPUs, expects to start shipping more of the 32-bit chips than 80286s over the next few months as 286 prices slide downward to make room for 33-MHz 80386s and a rash of cheap 80386SX-based systems. Some of Compaq's new small-footprint Deskpro 286e models are $1500 cheaper than comparably configured versions of its Deskpro 286. IBM also cut $500 to $945 off PS/2 Model 50Z and 70-E61 prices and has discontinued its cheapest Models 30 and 50. Other manufacturers have taken even more drastic steps, reports International Data Corporation analyst Bruce Stephen. "We are probably seeing what we should have seen last year, but it was derailed by high DRAM prices." Stephen also notes that intense price jockeying has hit the SX market. Compaq, which lopped $200 off its Deskpro 386S price tag in February, slashed another $300 to $800 in April. Prices on SX models will be further buffeted by lowball newcomers like Dell Computer's $2949 system, predicts StoreBoard, Inc., president JoeAnn Stahel. Street prices, she adds, indicate still more discounting at the retail level—the Deskpro 286 recently sold for $2185, about $500 below list—and these don't reflect the recent softening in memory prices.

Novell Unveils NetWare 386

Broadening Links to Other Nets, Workstations

Novell has launched a major upgrade of its network operating system designed to facilitate open network standards and interoperability. Exploiting the 80386's speed and greater memory addressability, *NetWare 386* version 3.0 runs under multiple network protocols and provides connectivity to a variety of machines (including DOS, OS/2, Macintosh, and UNIX workstations) more effectively than earlier *NetWare* versions designed for the 80286. Available in the second half of the year, Novell's new flagship runs three times faster in about the same amount of system memory and supports files of up to 4 gigabytes and server storage of up to 32 terabytes. In addition to the usual filing and printing services, *NetWare 386* will offer a SQL-compatible Btrieve relational data base, *MHS*-based E-mail, and other communications services, with plans for gateways to IBM SNADS and X.400 nets. Novell also will improve *NetWare SNA* gateways to large systems and wide area networks. Moreover, *NetWare 386* promises greater ease of installation and use. Its DOS-oriented programming platform provides for more flexible and streamlined system configuration, and it speeds porting of *NetWare* applications to other network operating systems. Promoting open systems, Novell publishes all *NetWare* application program interfaces, licenses source code to third parties, and offers a broad range of application tools. Novell recently merged with Excelan, a licensee of Microsoft's *LAN Manager*. It plans to support *LAN Manager*'s Server Message Block protocols, plus crucial IBM OS/2 Extended Edition net interfaces.

Color Laptops Coming

New Display Technologies May Bring Color to Laptops by Year-End

Several portables vendors—most notably Zenith, Sharp, Toshiba, and Mitsubishi—demonstrated color LCD prototypes at Spring COMDEX, presaging the introduction of color-equipped laptops as early as year-end. The technology is sufficiently mature to make even VGA color displays viable, but vendors are proceeding cautiously because they aren't sure which users will pay the necessary premium. They are focusing on top-of-the-line 80386-based machines and two types of color LCD. One is exemplified by the 14-inch double-supertwist display shown by Sharp Electronics. This technology, also exhibited by Mitsubishi Electronics and Toshiba America, is called "passive matrix" because its transistors are shared by groups of pixels. Cheaper and easier to produce than active-matrix designs—each of whose pixels is driven separately—this display should appear in an AC-powered Sharp luggable by year's end. National Marketing Manager Steve Sedeker estimates that this kind of color adds from $900 to $1200 to the price of a portable. By contrast, Zenith demonstrated a battery operated 6½-inch display using Hitachi's 640 by 200 active-matrix color panel. Active-matrix panels cost more but produce more saturated colors. One vendor, who asked not to be identified, figures they'll add a $2000 price premium. That's the reason for the COMDEX demos, explains Tom Sherrard, PC marketing director for Toshiba, which also has an 11-inch active-matrix design. "Our assumption is that the market is not willing to pay what they cost now."

Businessland to Sell Next

Largest Corporate Reseller Will Market UNIX Workstation

In one of the industry's most unusual pairings, Businessland has agreed to distribute the avant-garde UNIX workstation offered by Next, the high-profile start-up run by Apple founder Steve Jobs. The ink was barely dry on Businessland's divorce from Compaq (see *Top of the News, PCW,* May 1989) when the high-end reseller announced plans to offer the Next machine to corporations. Sold for $6500 on campus and $10,000 at Businessland, the sleek black Next cube includes a Motorola 68030 processor, 8MB of memory, a 256MB optical disk, a development environment, and several applications, such as Sybase's SQL data base server. More important, Lotus, Aldus, and other leading PC developers plan to port business productivity software to the Next machine, while Novell creates a Next version of *NetWare.* Negotiations with Jobs preceded the loss of Businessland's $150 million Compaq distribution agreement, reports spokesperson Beverley Bird. But Chairman David Norman made a point of predicting that Businessland would sell as many Next computers this year as it did Compaq systems last year. That would make Businessland Next's largest customer. It also would boost mainstream use of UNIX systems, which generally have been devoted to technical tasks or multiuser applications. Bird adds that Businessland's IBM and Apple sales are up in the wake of the Compaq loss, and so are earnings estimates.

Amstrad Attacks Business

British Supplier Aims All-for-One-Price Strategy at Corporate Market

This summer Amstrad, Inc., will begin selling two business PCs that follow the all-for-one-price strategy that made parent Amstrad, plc., one of the top business PC suppliers in Europe in only three years. For the past two years, the Irving, Texas, subsidiary of the $1.5 billion-a-year London company has been marketing the under-$1000 PC1512 and a slightly pricier PC1640 to home-office users and small businesses, selling through mass merchants and a few third-tier resellers. But at Spring COMDEX, it began pushing for midsize to large business customers in earnest with low-price, all-in-one bundles intended to be sold through upscale specialty resellers. The PC2286 and PC2386 will ship with extras like hard and floppy drive controllers and a 16-bit VGA adapter built into the motherboard, up to 4MB of base memory standard, a mouse, and the appropriate version of *Windows.* The PC2286 with 1MB of memory will start at $2000; the 20-MHz PC2386 with 4MB and a 64K cache will sell for $6000. All prices include a choice of monitors and 1:1 interleave hard drives. Amstrad would like to jump right into Fortune 1000 companies, says President Vernon Moore, but figures that, as in Europe, it will have to swim upstream from the home office to larger businesses. In order to overcome corporate skepticism, it will offer a one-year on-site service policy at no extra cost. International Data Corporation reports that Amstrad sold about 100,000 units in the United States last year. ●

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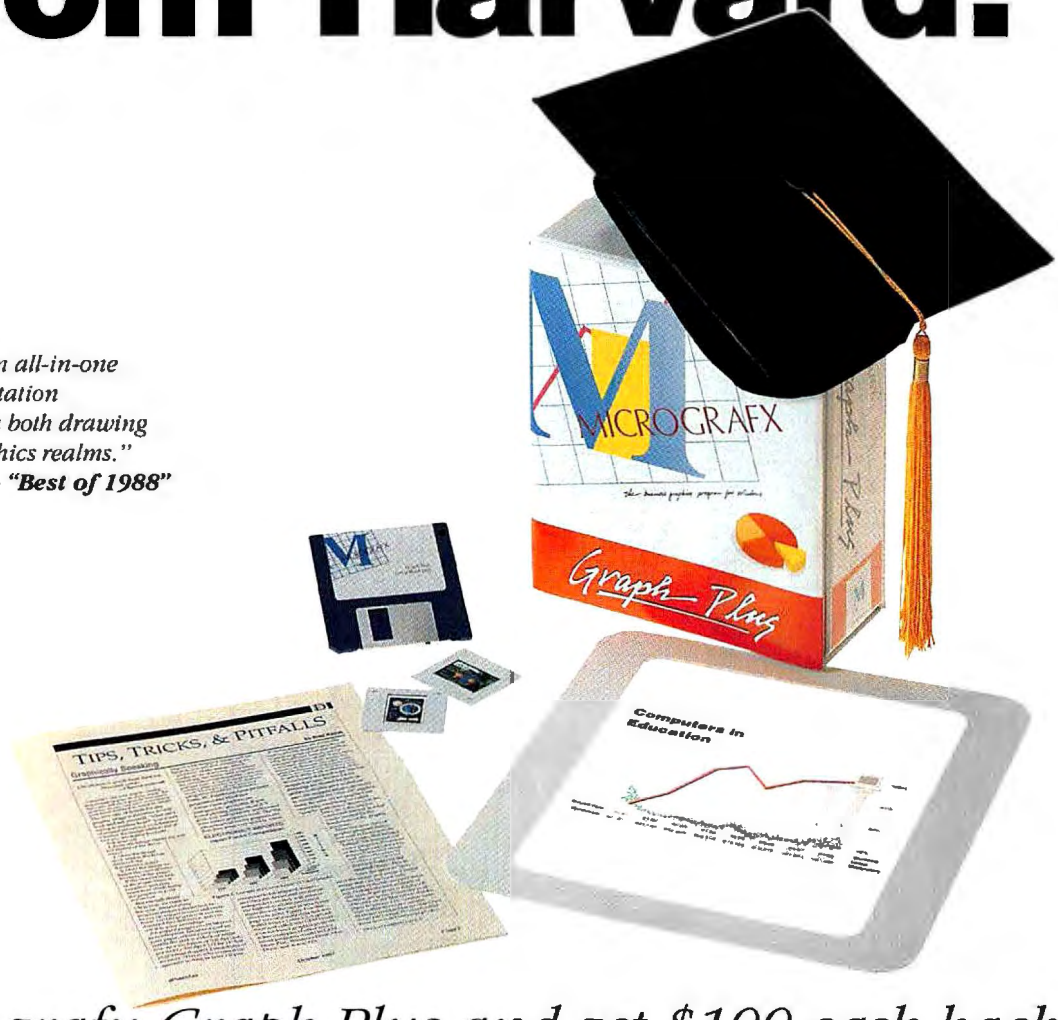

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The Workstation Blues

Now that computer hardware is a full two generations ahead of PC software, users have a right to ask if the promise of greater productivity from more powerful workstations will ever pay off.

ROBERT CARDIN

Richard Landry

"I got those workstation, I got those workstation blues... I got too much workstation, but no work to do...."

I'm the first to admit that Muddy Waters is probably not playing this tune from his vantage point in the sky. But plenty of us down here below have been waiting patiently for software to fulfill the promise that's been inherent in hardware since the birth of the 286. To us, mounting hardware bills and a drought of software to take advantage of our investment in technology seem like reason enough to sing the blues.

Intel recently turned up the volume on this melody with the introduction of the 80486 microprocessor. A logical extension of the 386, the 486 is also especially suited to multiprocessing—getting a task done more quickly by dividing it among two or more microprocessors within a single PC. No personal computer—AT class, Micro Channel, or any other—can manage that job today. But the truth of the matter is, machines that can are just around the corner.

Meanwhile, the big news on the software front is that Lotus has given up trying to make *1-2-3* release 3.0 live within DOS's 640K memory budget (see the preview in *PCW*, May 1989) and has opted instead for DOS extender technology like that in Borland's *Paradox/386*. DOS extenders can give 286 or 386 systems with a megabyte or more of memory some extra breathing room for large programs or files. There's even some behind-the-scenes talk about establishing a DOS extender standard to compete with EMS 4.0. But almost everyone who entertains that notion also knows it's a patch. More memory space will make DOS programs run better, but you have to wonder if that justifies the expense of equipping yourself with a fast 286 or 386.

It's practically an article of faith among PC vendors that the more power available on the desktop, the better. As the gap between Intel's and Lotus's announcements shows, however, the industry is struggling to match reality to its notions of the way things should be. Nobody wins when hardware makes great leaps forward while software sees only incremental improvements. For all we know, by the time software acquires some next-generation capabilities, Micro Channel and EISA, 286 and 386 will all be obsolete. Just the thought gives prospective PC buyers pause.

We can take some comfort, however, from observing what's happening today with UNIX workstations. Power hasn't been a problem for workstations for some time; vendors like Sun and Hewlett-Packard seem most concerned with getting computers to communicate in ways that are simple and natural to users. Peer-to-peer networking—where each workstation has the power to host information and share it with every other workstation on the net—has replaced the PC's more hierarchical scheme, where a powerful central server provides information to a work group that has less powerful PCs. UNIX workstations don't use their power just to blast bits faster—they use it to let people communicate more effectively. If we accept this as a model of the way computing will evolve, today's PC LANs are pale shadows of their future selves.

Still, it's worth noting that UNIX workstations have the same problem that power PCs do—not enough software that

(continues)

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PC WORLD

turns them into more than hot iron. Their superior peer-to-peer networking support still awaits the word processors, spreadsheets, data bases, and E-mail software that can unlock its potential. Ironically, *Paradox*—the same program that employs incremental DOS extender technology—is one of the few programs today that can take advantage of the network both to give users free access to all the information that resides on it and to exploit its processing power. But *Paradox* is a PC program—not a workstation DBMS.

So can anyone guess what benefits we'll get from the PCs of the future? It's pretty easy to figure the hardware side of the next generation's productivity equation. Networks and 386 PCs will provide the grist for computing well into the mid-1990s. And the software side? It's still too early to say what will make the hardware hum.

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

POWER TIP NO. 52

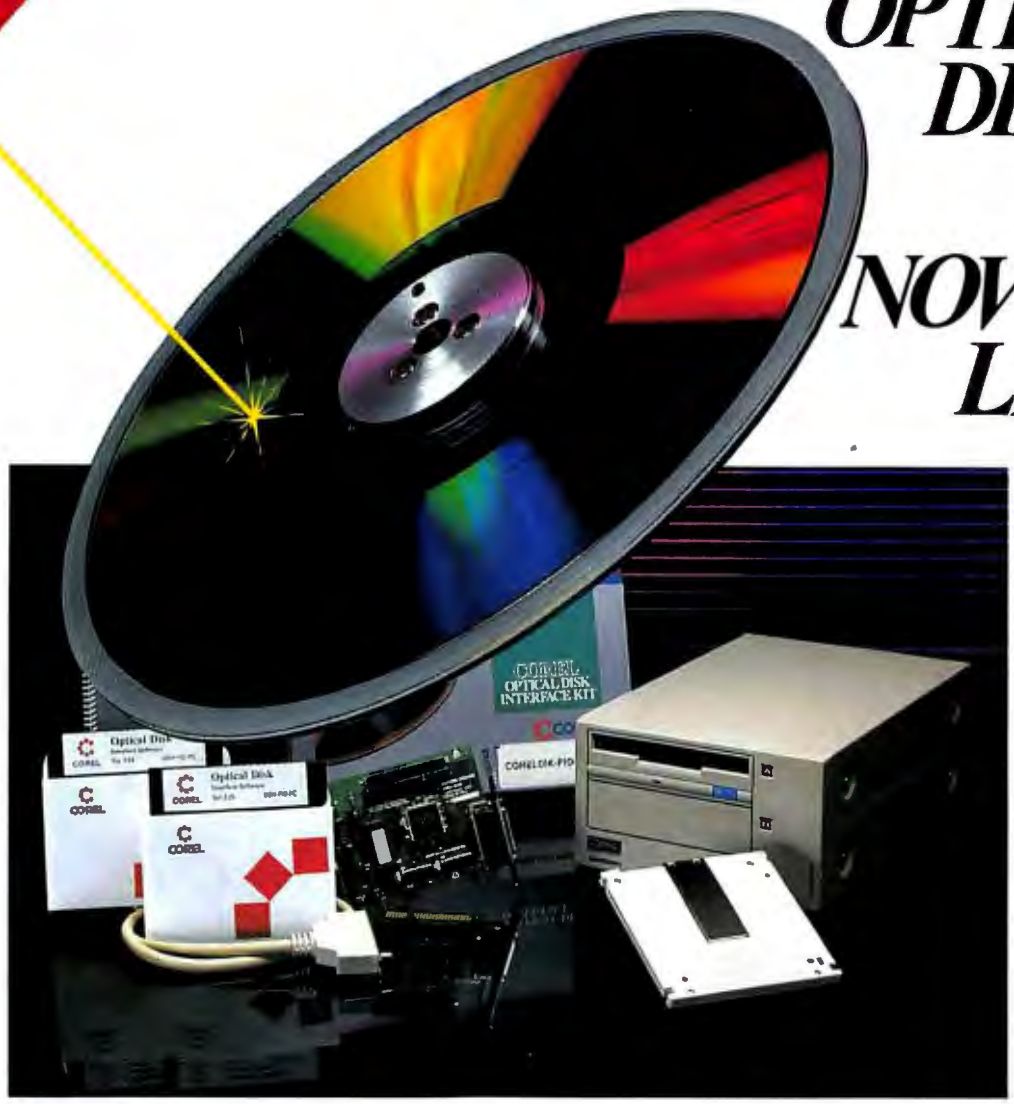
Professional Write Page Jumps

Here's a quick way to jump to a page in *Professional Write 2.0*. Just press <Ctrl>-J, enter the desired page number, and press <Enter>.

Wendy Grubnow
Market Communications
Software Publishing

Break through!

COREL OPTICAL DISKS for NOVELL LANS



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continued on following page

EQUITY COMPUTERS

Equity I+	Equity Ie	Equity II+	Equity III+	Equity 386/20
8088 CPU	8086 CPU	80286 CPU	80286 CPU	80386 CPU
4.77/10MHz	8/10MHz	8/12MHz	6/8/12MHz	8/20MHz
5 OPEN SLOTS	4 OPEN SLOTS	5 OPEN SLOTS	8 OPEN SLOTS	8 OPEN SLOTS
640KB RAM	640KB RAM	640KB RAM	640KB RAM	IMB RAM

continued from previous page

For straightforward word processing, spreadsheets and business graphics, the 8088-powered Equity I+ is an uncommonly good value. It's Epson's most popular computer with first-time buyers, schools and small businesses.

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LETTERS

Reactions and responses from the PC World community

Where's the OS/2 Payoff?

I agree with Richard Landry's comments about PC productivity and cost [*PCW*, January 1989]. Although I am a *Windows* fan, I'm not certain that OS/2 is a step in the right direction, either. The cost of equipping a machine to run OS/2 seems ridiculous. It will demand at least 4MB of memory; for the kind of applications that will make OS/2 successful, you'll probably need upwards of 8MB to 10MB. Given those costs, I don't see why anyone would stick with the PC architecture. The Mac would be a far better choice. Since we'll all have to chuck our software to migrate to OS/2 anyway, why not go with proven technology? Even UNIX with a graphic interface would make more sense.

Kerry Dawson
Toronto, Ontario, Canada

Who's Reading Your Mail?

Judy Getts's article "How Private Is E-Mail?" [*Industry Outlook*, *PCW*, February 1989] suggests E-mail communications may not be as private as mail delivered by the U.S. Postal Service. The Electronic Communications Privacy Act of 1986 clearly protects the privacy rights of electronic mail users. It provides for a term of imprisonment and a fine of up to $250,000 for any person who accesses an electronic communications service without authorization.

The article states that an electronic mail service can be required to disclose a message to a law enforcement agency with a warrant issued by a judge, but it fails to point out that the situation is no different for letters in the care of the Postal Service, Federal Express, Airborne, and all of the other "hard copy" carriers.

Edward J. O'Malley
Vice President, Corporate Systems Integrity
MCI Communications
Washington, D.C.

Know Your SYSOP

Mary Dolce is incorrect when she says that virus software cannot attach to read-only files [*Another Angle*, *PCW*, February 1989]. Any virus clever enough to find .EXE or .COM files—and that's not all that clever—can change their file attributes, wreak havoc, then reset the read-only attribute.

The best way to protect yourself is to deal with bulletin boards whose SYSOPs you know and trust. Good SYSOPs don't want or tolerate viruses on their boards. Stick with BBSs that test each uploaded program, and avoid downloading from those that don't.

J. Brook Monroe
Durham, North Carolina

Backing Up Again

Thanks for your article on tape backup ["Tape Backup on a Budget," *PCW*, February 1989]. While it was informative, it left some questions unanswered. The NSTL test report included the backup times and the number of files backed up, but not the number of bytes backed up, so data rates were not calculable. What good is a number-of-files statistic anyway? Just how fast are these drives?

Jon Bondy
Ardmore, Pennsylvania

The review in February compared five popular, inexpensive tape backup units. The first-past-the-post approach is fine for this kind of comparison. However, readers looking at other types of backup drives need more information to calculate transfer rates. In this issue's "Reviews" section, we take a second look at the QIC-40 tape backup units. The test report (continues)

ANTHONY RUSSO

Spreadsheet Rivalry Heats Up

products are not displayed in computer stores.

'Things are getting down and dirty,' a computer analyst observes.

The Spreadsheet Market

OTHER 6.1%

RACE
VS. PO

We Interrupt T War For This Im

To all those unlucky enough to be stuck smack in the middle of the current spreadsheet confusion, take heart.

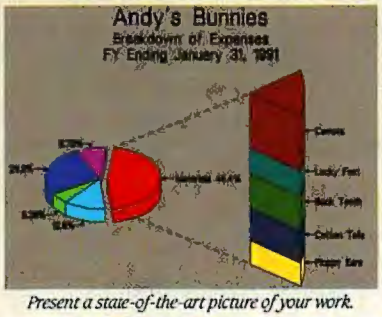
There is, at last, a viable alternative to war: revolution.

One that delivers even more performance than you have (ahem) been waiting for, but without demanding expensive new hardware or extensive retraining. And without abruptly cutting you off from any user in your company, even those on mainframes.

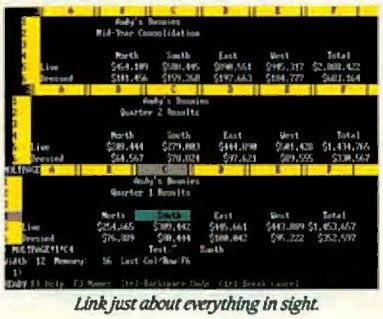
The name of the spreadsheet is SuperCalc®5.

And what it can do for you is, frankly, quite revolutionary.

Let's begin at the end. Stand-alone quality graphic capabilities have been built in. Offering hundreds of presentation treatments from word charts to three-dimensional bar, pie, scatter, and polar graphs.



Present a state-of-the-art picture of your work.



Link just about everything in sight.

And with SuperCalc5, you select fonts, lines, boxes, grids and shading. All of which can be used to produce the highest quality customized reports.

Plus, SuperCalc5 actually makes productivity easier. An integrated Undo feature simply reverses unwanted commands. And a truly comprehensive system of debugging highlights costly errors and analyzes macro logic.

Perhaps even more impressive is the way SuperCalc5 can link spreadsheets. Up to 255

Catch bugs before they come back to bite you.

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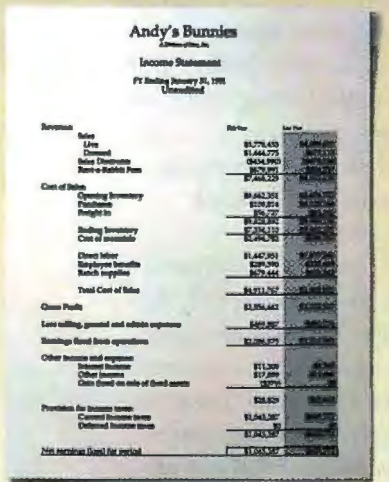
he Spreadsheet portant Update.

to be precise. Linking either in memory or on disk, either pages of the same spreadsheet or independent, either SuperCalc5's files or Lotus® 1-2-3®'s.



Produce annual-report quality output everyday.

Which brings us to the "L" word. SuperCalc5 not only reads and writes Lotus® 1-2-3® files, it totally coexists with Lotus.

Letting you easily move 1-2-3 macros into SuperCalc5 and back again. Even toggling between menus is a snap for SuperCalc5.

But not for Excel®.

Which now brings us to the "E" word. Unlike Excel, SuperCalc5 runs on all IBM® and compatible computers but also takes full advantage of 286 and 386 machines when *you* decide to make that transition.

And if all that isn't enough to make you run out today and join the revolution, there's even more incentive.

Like our free demo disk offer through July 31, 1989. And our $100 upgrade offer for just about any spreadsheet you're using. Call 1-800-531-5236. In Canada call 1-800-663-6904.

Which finally brings us to our admittedly biased outlook for the much touted spreadsheet war.

With SuperCalc5, peace is at hand.

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COMPUTER ASSOCIATES®
Software superior by design.

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methodology contains both the number and size of backed-up and restored files. —Ed.

Tax Facts

Why did you assess *J. K. Lasser's Your Income Tax* as suitable for renters and homeowners, but not for investors and the self-employed ["Personal Tax Preparation Software," *PCW*, February 1989]? It includes more forms that are of interest to investors than any of the other packages. On the other hand, it appears that *Ask Dan About Your Taxes* and *Tax Preparer* don't support Form 4952 (Investment Interest Income), which is important—if not critical—to investors. Yet you suggest that both of these are suitable for the needs of investors. Is there something beyond the supported forms that renders software suitable for investors?

James K. Patterson
Houston, Texas

The J. K. Lasser package offers only two built-in Schedule D forms, making it cumbersome for reporting extensive capital gains and losses. Also, it provides only two Schedule E forms, for a maximum of six properties. It's quality software for the average taxpayer's needs, but it may fail to satisfy an investor in multiple companies or multiple Schedule E properties. The other two programs' lack of Form 4952 is indeed a shortcoming, but it does not negate their other benefits: multiple copies of key forms, automatic data flow between forms, and the ability to handle investment-specific "what if" queries. —Alan Southerton and Cameron Wicker

Index Link

Thank-you for your informative magazine! I especially appreciate the year-end index you print every January. I am interested in having these indexes for use on my computer. Are they available in an electronic format?

Bryan Bird
Lindale, Texas

PC World's 1988 Index is available as a 153K hypertext file—PCW88.ARC—on disk or on line. Disks can be ordered directly from Bayside Indexing Service, 265 Arlington Ave., Kensington, CA 94707; the cost is $10, plus tax for California residents. Members of FOG, the International Nonprofit Computer Users Group, P.O. Box 3474, Daly City, CA 94015, can order it as FOG-DOS.328 for $4 ($8 for nonmembers). Specify the disk format (5¼ or 3½ inch) when ordering. PCW88.ARC can also be downloaded from CompuServe's IBMAPP forum, and GEnie's IBM PC roundtable. The index is in the public domain and can be circulated freely. —Ed.

Two-Fisted Printing

The utility SWAPLPTS.COM [*The Help Screen*, *PCW*, February 1989] is a lifesaver. Using SWAPLPTS, I can now switch printers from any application. I had never used DOS's DEBUG before, and SWAPLPTS worked the first time. Keep up the good work and don't change...unless it's for the better.

Jon M. Stewart
Palm Desert, California

Clarifications and Corrections

The review of HP's LaserJet IID (*The Hardware Shelf*, *PCW*, March 1989) should have stated that *WordPerfect* supports duplex printing and the IID's envelope feeder.

In the February 1989 article "Q&A Message Center" (*Tips & Techniques*), George Beinhorn suggests pressing <Esc> six times to return to the main menu so the macro will work from any point in *Q&A*. But if you haven't already saved your work, *Q&A* produces a warning screen. You need to create two memo macros to save your current file automatically. In the Write macro, for example, add the following commands to your macro file after <Alt>-M:

<capsf10> <capsf8> ZZ <enter> y

Then reload the macro using

<Shift>-<F2> G <Enter>

This macro saves your Write file to a temporary file ZZ, which you can retrieve with a command at the end of the macro.

Star-Dot-Star's January 1989 Where to Buy listing didn't mention Crescent Software's unlimited technical support during office hours for *QuickPak Professional*.

"Cut Costs on CompuServe" (*Tips & Techniques*, *PCW*, February 1989) should have stated that "CompuServe's rates remain the same at all times; Telenet and Tymnet reduce their rates at night." *PC World* regrets the errors.

To send correspondence, please see How to Contact PC World, page 4. ●

LAN's Best Friend

Dependable UPS systems from American Power Conversion support the UPS monitoring functions of:

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- Banyan Vines

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110SE	Compact UPS for Macintosh SE or PLUS and diskless workstations
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520ES *	For NetWare, VINES, and 3-COM file servers
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*These models provide interface for use with optional interface kits.

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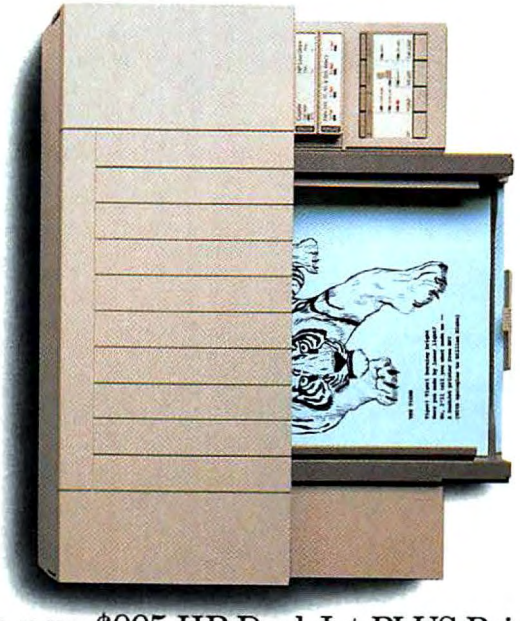
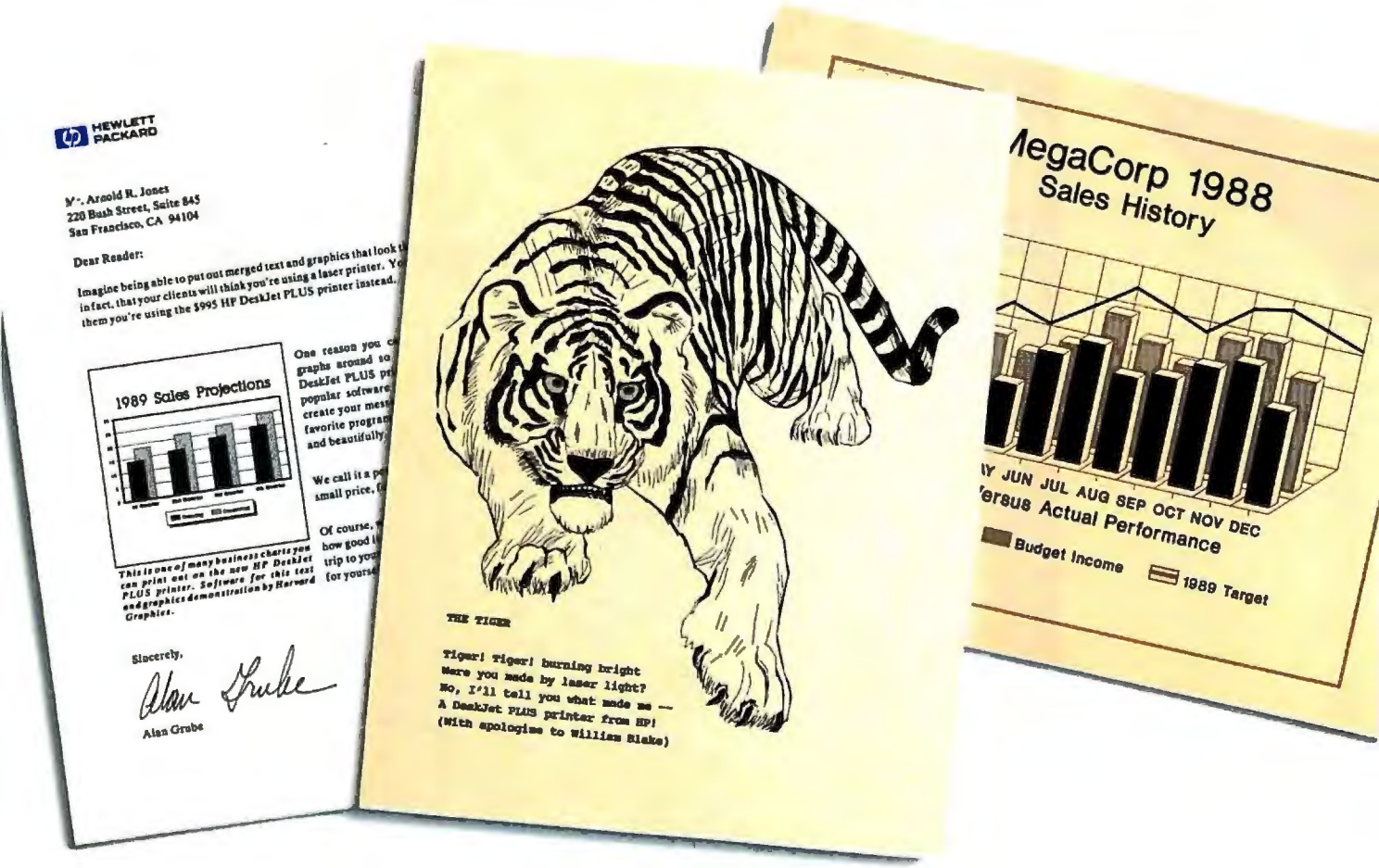
We keep telling people this is not a laser printer.



The new $995 HP DeskJet PLUS Printer.

But they keep looking at the evidence.



You won't believe your eyes (or ears), either. The HP DeskJet PLUS printer gives you the same crisp, black lettering. Clean, sharp graphics. And whisper-quiet operation. But it uses advanced inkjet technology to supply these laser-like qualities for the price of a 24-wire printer.

For just $995, you get 300 dpi in a trim 15-pound package that's twice as fast as the original. What's more, it has built-in landscape and improved font selection. Including ten built-in fonts and over 100 optional fonts, with sizes up to 30 points. And its 20,000-hour MTBF assures a long, happy life.

So call **1-800-752-0900, Ext. 276J** for the name of your nearest authorized HP dealer. Then judge the HP DeskJet PLUS printer for yourself.

HEWLETT PACKARD

Documents created using Wordperfect 5.0 and Harvard Graphics software. ©1989 Hewlett-Packard Company PE12912

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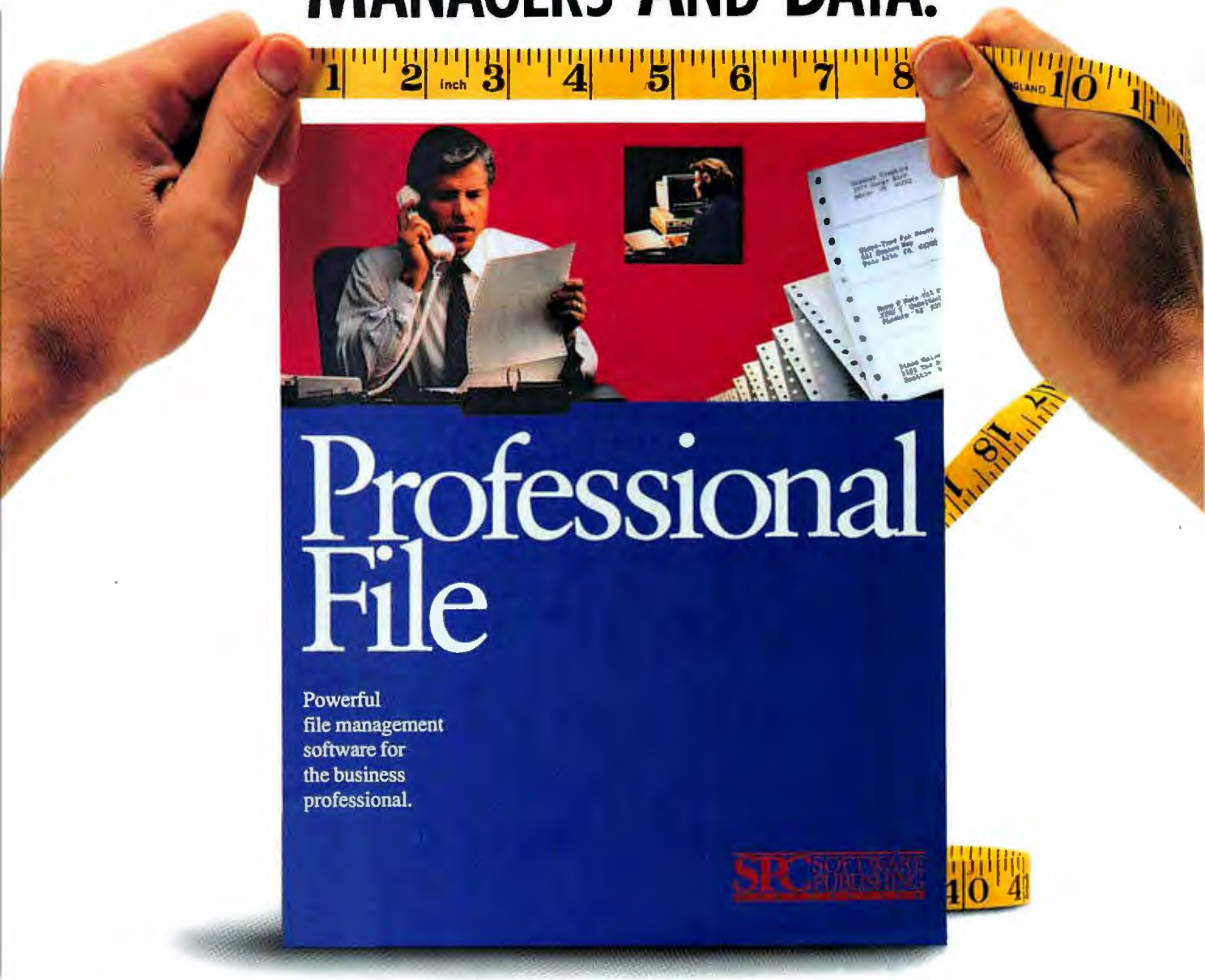
THE SHORTEST DISTANCE BETWEEN MANAGERS AND DATA.



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THE HELP SCREEN

PC World offers answers and advice at every level

Why a half-full disk won't hold more files, how to manage more memory-resident utilities than will fit in 640K, why dates differ in Excel for the PC and Excel for the Mac, and what spoolers and buffers can and can't do for desktop publishing

Karl Koessel

Limited Directory Space

Q. *I recently tried to clean up my hard disk by copying some old E-mail files to a floppy disk. Before all the files were copied, however, I received a 'File creation error' message. There's nearly 120K of disk space still free, and CHKDSK doesn't show any bad sectors. Why can't I put more than 112 files on a disk?*

William Garvey
Battle Creek, Michigan

A. When you format a double-sided double-density 5¼-inch (360K) or 3½-inch (720K) floppy disk, 3.5K of disk space is set aside for the root directory. Each directory entry—whether for a file, a label, or a subdirectory—occupies 32 bytes, so there's room for only 112 entries. Single-sided (180K) floppy disks get 2K root directories that hold a maximum of 64 entries; double-sided high-density (1.2MB and 1.44MB) floppies get 7K, with a capacity of 224 entries. Hard disks usually have 8K or 16K root directories that can accommodate 256 or 512 entries, respectively. Subdirectories, on the other hand, can grow; the number of entries they'll hold is limited only by available disk space.

Because the space held for the root directory doesn't change, you must use at least one subdirectory to put more files on a disk than its root directory can manage. If you create a subdirectory on your floppy disk and copy your files into it, you'll avoid the root directory file limitation and fill the disk. However, if there are more files to archive than will fit on one floppy, you have another problem: To copy the remaining files to another disk, you'll have to painstakingly specify each file name individually.

To make archiving E-mail (or any directory's files) easy, use this semiautomatic technique (which assumes that you are using DOS 3.2 or a later version and that the DOS commands ATTRIB and XCOPY are available from a directory listed in your system's PATH): First, format a few disks and use the command **MD A:\EMAILARC** to make a subdirectory on each disk. Let's assume that C:\EMAIL is the directory with the files you want to archive. Make \EMAIL the default directory for drive C:, and then issue the command **ATTRIB +A C:*.*** to set the archive flag of every file in the \EMAIL directory. Slip one of the archive disks into drive A:, use **CD A:\EMAILARC** to set the default directory for drive A:, and enter the command **XCOPY C: A: /M** to begin archiving. When the floppy has filled, DOS will display an 'Insufficient disk space' error message (don't fret), followed by the DOS prompt. Exchange the full floppy for a new one, and reenter the **XCOPY C: A: /M** command.

XCOPY's /M parameter tells XCOPY to copy only those files that have their archive flag set and to remove the archive flag from each file that is copied. Thus, each subsequent XCOPY /M command begins copying where the last XCOPY command left off, since only those files that still have their archive flag set are copied.

(continues)

Breaking the 640K Barrier

Q. *I work with Software Publishing's* Professional File 2.0 *on my AST Premium 286. I also use a pair of TSRs—Borland's* SideKick *and Personics'* SmartNotes*—that require 90K each. But because* Professional File *takes up 512K of the 640K of usable RAM, there's not enough memory left to install both utilities. So to use the utility not currently installed, I have to save my* Professional File *data, exit that application, uninstall one utility, install the other, and reload* Professional File *and the data.*

Is there a way for me to unload one memory-resident utility and load another without having to close Professional File? *Please keep in mind that I'm just a computer user, not a computer programmer.*

Robert B. Hendrix
Arcadia, Texas

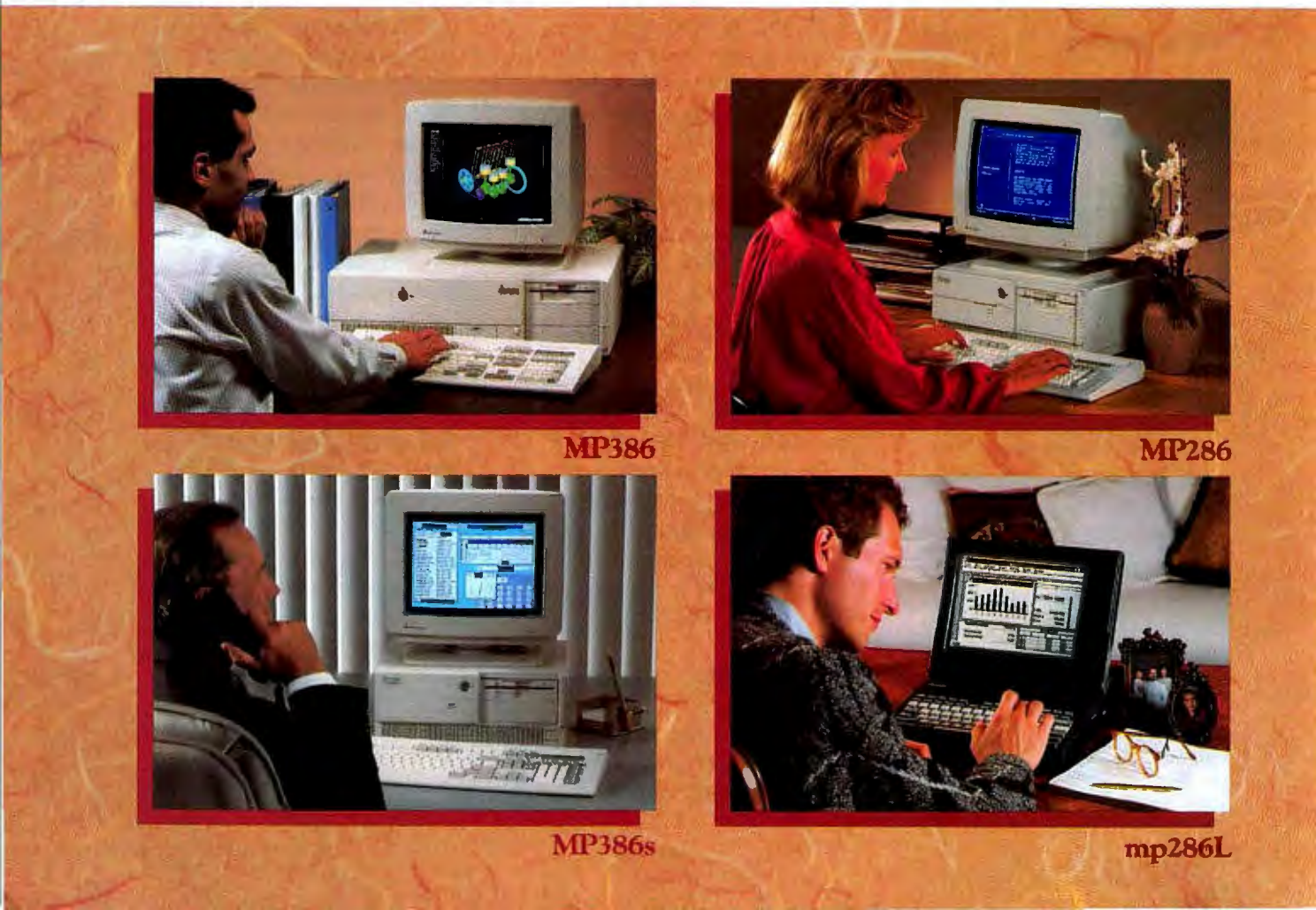
A. Many PC users are finding that 640K is not enough. Sometimes a favorite program is just large enough that it won't fit in the memory that remains after loading network drivers and terminal emulation programs. Others, like yourself, notice RAM cram when they try to add one more TSR to their usual set of programs.

While several TSR managers have popped up on the computer scene, Helix Software's *Headroom* stands out from the crowd. It's the only one I know of that enables you to swap TSRs while in the middle of an application and still use your TSRs as though they're both in memory. You could, for example, use *SmartNotes* to attach a note to a *SideKick* Notepad file. You can even use it to swap applications and TSRs in and out of memory with a single keystroke.

Headroom manages up to 32MB of TSRs and applications, resolves TSR conflicts (some are notoriously ill-behaved, especially in the presence of other TSRs), and uses extended memory, expanded memory, or a hard disk to hold swapped-out TSRs and applications. Swapped-out programs take up no user RAM, and *Headroom* itself uses only 50K.

WHERE TO BUY

Headroom
Helix Software Co.
83-65 Daniels St.



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LIST PRICE: $95 plus $5 shipping
REQUIREMENTS: 256K, DOS 2.0 or later version, hord disk; extended or expanded memory recommended
TECHNICAL SUPPORT: free, unlimited, no toll-free number, M–F 9–5
OTHER SUPPORT: none
Reader service no. 710

Four More Years?

Q. *In my office, we use* Microsoft Excel *on both PCs and Macintoshes. A co-worker and I have mastered the intricacies of file transfer so that we're able to exchange worksheets between his Mac and my PC, but the translation process seems to have one bug in it. If his spreadsheet contains a date like June 15, 1989, it will show up on my PC as June 15, 1985—exactly four years earlier. I've been changing all these dates manually, but there's got to be a better way.*

Kathy Lopez
Marysville, California

A. The Mac and PC versions of *Excel* are remarkably similar, but there are some differences, and you've discovered one. To understand why your dates don't agree, it might help to review how spreadsheets store and format date (and time) information.

Excel uses *1-2-3*'s date system, which treats dates as serial numbers, with each whole number equal to one day. As long as you input a date in a format that *Excel* recognizes, the program will store the date as a serial number and display it using the default date format. In the PC version of *Excel*, the number 1 translates to January 1, 1900; thus, when you enter 6/15/89, *Excel* translates that date into its equivalent serial value—32674. The 32,674-day total is one more than you'd expect, since *1-2-3*'s date system mistakenly classifies 1900 as a leap year. In the Mac version of *Excel*, however, the numbering scheme begins with January 1, 1904. Using that date as the starting point, June 15, 1989, would be represented by 31212.

Fortunately, there's a simple fix—at least for the Mac-to-PC direction. Open the worksheet in the PC version of *Excel*, and select Options Calculation 1904 Date System. Save the worksheet with this option selected so dates will appear as you expect (the file's serial date numbers are not changed).

(continues)

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Do they call it a h
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And you're certainly not about to search through each directory, much less load and unload every file to find it.

That's why we created Magellan.® The first utility that helps you find your files by letting you instantly see their contents as

[1]Applications supported in SpeedView include Lotus 1-2-3, Symphony®, Manuscript®, Agenda®, WordPerfect, dBase®, MultiMate®, Microsoft® Word, WordStar®, DisplayWrite, all ASCII files, plus many more.

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ard disk because at you're looking for?

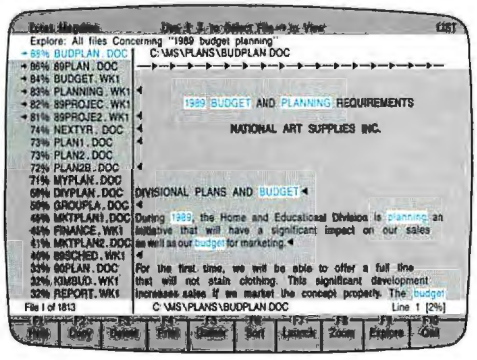
they appear in your favorite applications.

Without even having to load the specific applications that created the file.

With Magellan, all you need is a general idea of what you're looking for.

Because unlike other programs, the Magellan Explore function can perform a search on a phrase, a topic, an idea or even an entire file. Not just key words.

Then it lists your "found" files on the left of your screen in order of how relevant the contents are to the search topic.



The Magellan Explore and SpeedView functions let you locate everything related to a particular topic and see it as it would appear in its native application.

As fast as you can scroll down this list, the Magellan SpeedView function instantly displays the complete contents of each file on the right of your screen, highlighting the relevant text for you.

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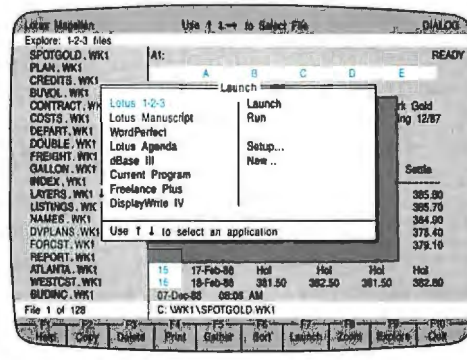

With one keystroke, Magellan loads the selected file and application, in this case 1-2-3, so you're ready to go to work.

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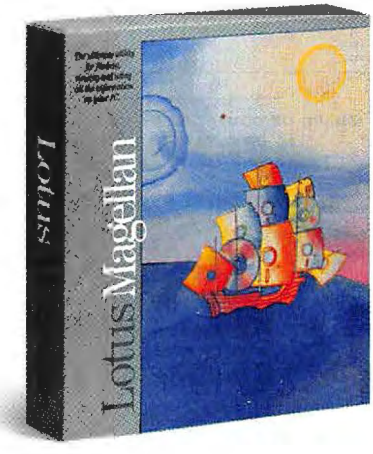

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F1

1) [redacted]	8)
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5) Accounting	12) Back up System
6)	13) Exit to Dos
7)	14) Configure Menu System

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Easily Command The Powers Of Dos
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4) PAYROLL
5)

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12) RESEARCH & DEVELOPMENT
13) PRODUCT MARKETING
14)
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Interestingly, the Macintosh version of *Excel* doesn't offer an equivalent function. If you import a worksheet created on a PC to a Macintosh, be prepared to fix the dates manually.

Buffers and Spoolers Demystified

Q. *I use* PFS: Professional Series *and* First Publisher *on my XT clone. Printing one page of text and graphics takes more than 45 minutes with my Star NX-10 dot matrix printer. During that time, I can't use my PC to do anything else.*

Will a spooler or buffer restore the use of my computer sooner, or must I get a faster printer? And while we're on the subject, just what is the difference between a spooler and a buffer, and what are the advantages and disadvantages of each?

Tom Gilmartin
Staunton, Virginia

A. What you really need is a faster computer. During most of the 45-plus minutes of "printing," your publishing program is making up the page before sending it to the printer. Neither a faster printer, a spooler, nor a print buffer will reduce page-makeup time. That said, here's an explanation of spoolers and buffers. Keep in mind that they are not mutually exclusive; many people use them together.

A print spooler is a memory-resident utility that intercepts an application's printer output and stores it on a hard disk (or, in some cases, in RAM). This process generally takes much less time than actually printing the output. Then the spooler sends the stored output to the printer as a background task, while you continue to work in the foreground.

A print buffer, on the other hand, is a hardware device that consists primarily of RAM and usually is connected between the PC and the printer. Like a spooler, a print buffer intercepts and stores an application's printer output so that control of the computer returns to the user more quickly. From then on, unlike the spooler, the print buffer alone handles the task of passing the print data to the printer. Thus the PC can work at full speed; it does not need to slice up its processing or disk-access time between the spooler in the background and the application in the foreground.

A spooler is far less expensive than a print buffer (buffer RAM can cost a bundle), but it's also slower; the amount of processor time that spooling steals from the main application can be annoying, especially on slower systems such as yours. Also, any PC (with the appropriate port) can use a printer and buffer, but a spooler makes sense only if you have a hard disk or a lot of free RAM. Some print buffers enable several PCs to share a printer, automatically queuing print jobs. For more information about print spoolers and buffers, see "Buyers' Guide: More Power to Your Printer," *PCW*, May 1989.

To send correspondence or to submit material for publication in this column, please see How to Contact PC World, page 4. ●

Sometimes even the most advanced technology starts with a simple idea.

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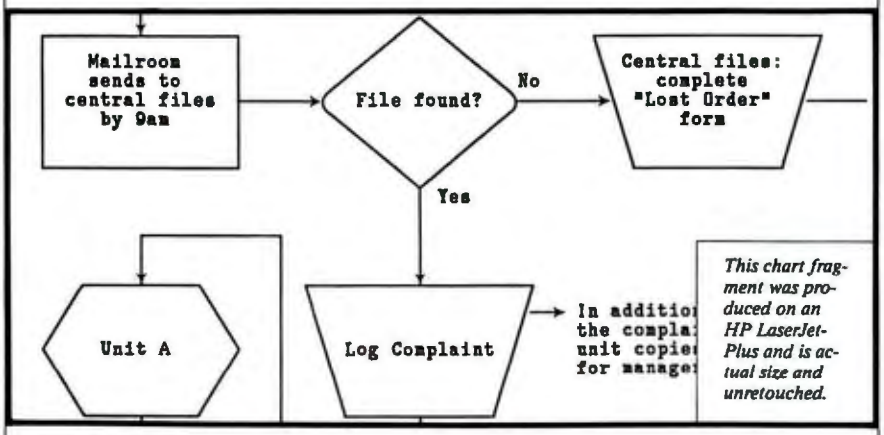

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Next in

PC WORLD

July

1989 Software Update
PC World's third annual blockbuster software issue explores six pivotal business applications. With the help of NSTL performance benchmarks and our extensive Features Evaluations, we look at more than 30 cutting-edge programs.

An All-Review Cast
Microsoft Word and *WordPerfect* may be well known, but they're not alone. We examine how skillfully eight leading word processors balance ease of use and power features. Plus, our Buyers' Guide to word processing utilities.

If you spend your workday filling out forms, don't miss our forms software roundup. Five packages prove creating attractive and useful business forms doesn't have to be a full-time job.

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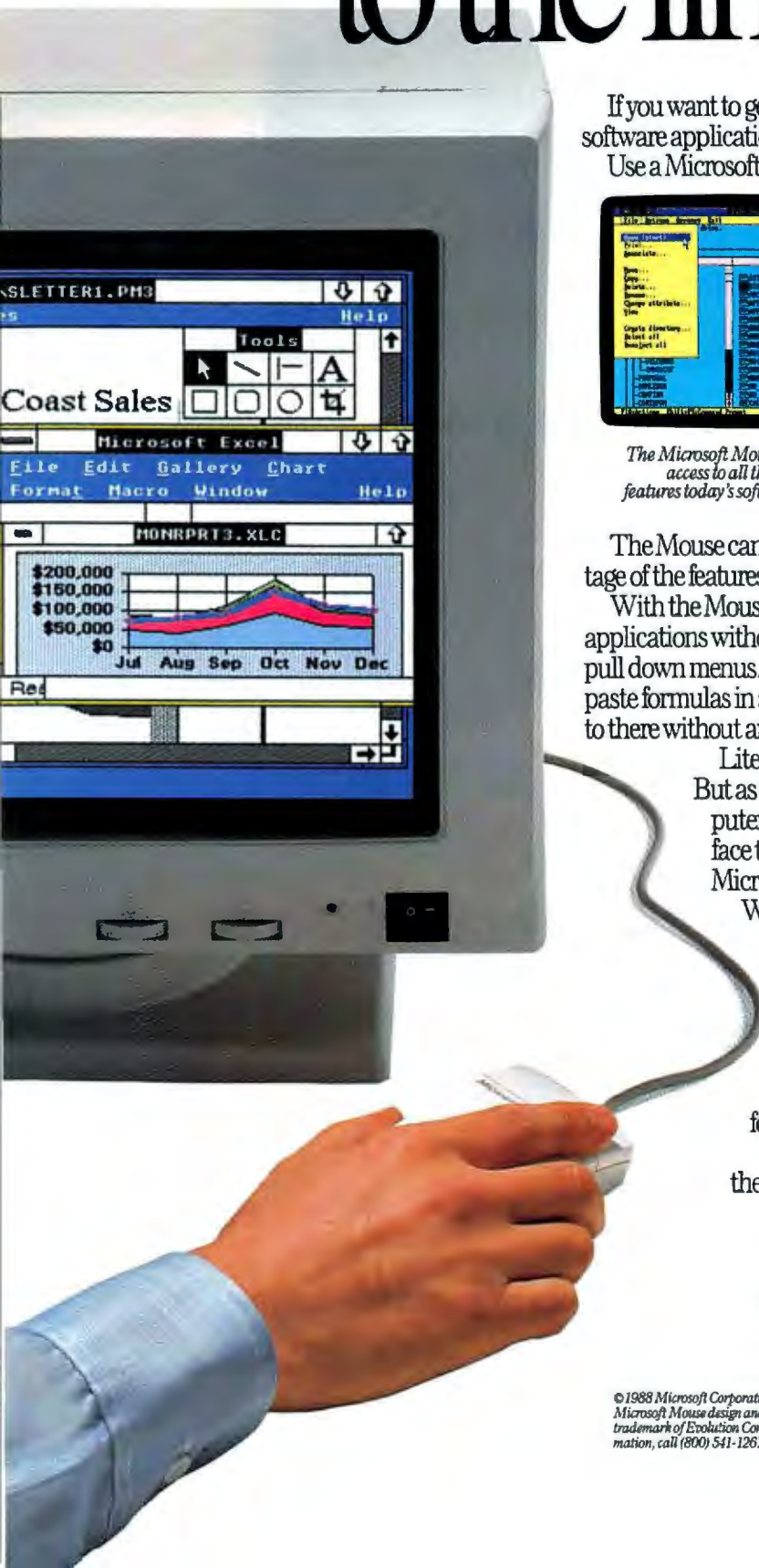
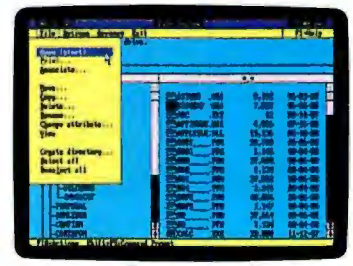
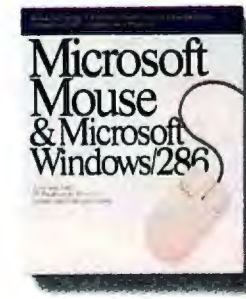


If you want to get the most out of today's new, high-powered software applications, we have a few words of advice:

Use a Microsoft® Mouse.



The Microsoft Mouse gives you easy access to all the powerful features today's software has to offer.



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WINDOWS JOURNAL

First-hand dispatches from the Windows front

In this new department, Stewart Alsop makes the Windows commitment. He offers a few thoughts on the state of the graphic interface and describes the ground rules for living with Windows.

Stewart Alsop

If you've been reading my columns here in *PC World* for the past 22 months, you know I've been writing about general industry issues. This new column is specifically about the experience of using *Windows* as a standard graphic environment, and its inception reflects the tremendous number of *Windows*-specific programs that have begun to come to market.

Some of those programs, like *Microsoft Excel*, Aldus's *PageMaker*, and *Xerox Presents*, are basically Macintosh software rewritten to run with *Windows*. But a lot of the new programs—Micrografx's *Designer*, Samna's *Ami*, Premise Software's *Designview*, Columbia's *Formbase*, and others—have been written specifically for *Windows*. They're also interesting applications in themselves.

This surge of new products means *Windows* is finally becoming a viable user interface and operating environment. Indeed, the introduction of original *Windows*-only software is beginning to build the same momentum and excitement that developed when software for the Macintosh showed up in quantity in 1986.

I think I have the credentials to write about *Windows*, not so much because I'm an industry analyst but because I actually use a lot of this stuff and know what it's like to experience both the joy of discovering a really good piece of new software and the frustration of struggling with a bad program. I've used DOS (reluctantly) for about six years, and I've been using a Macintosh to produce my newsletter for several years. I've also had intermittent experience with *Windows* since it was introduced, although I've never used it as my standard environment.

The Interface State of the Art

Here's where the state of the art is in graphic interfaces. The Macintosh is still the clear leader in interface design, not because Apple has some higher authority or moral position on the subject, but simply because the company has a longer history of selling such interfaces and dealing with user complaints and suggestions. Indeed, in real terms (as opposed to political positioning), Apple still maintains about a three-year development lead over Microsoft and the IBM world.

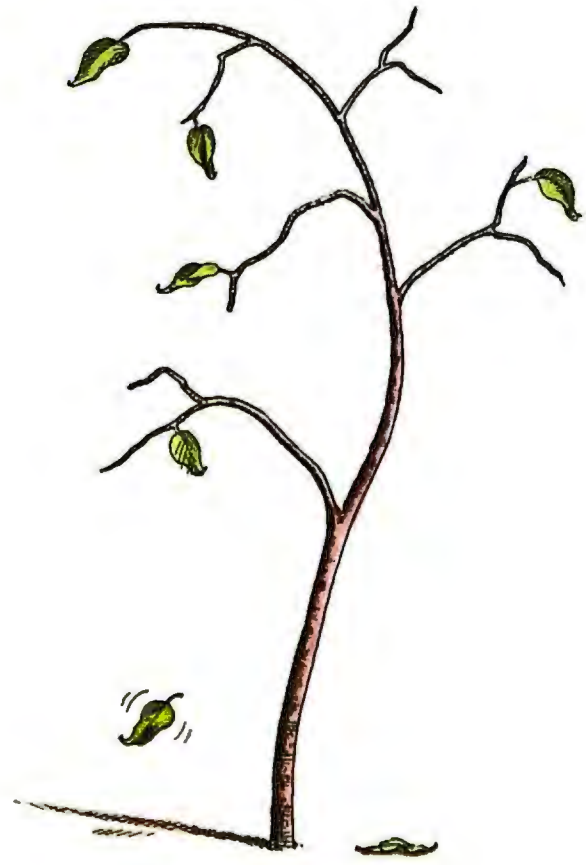
But Microsoft has made serious progress and is beginning to figure out what Apple has been talking about all these years. Though *Windows* still lacks many useful little utilities that populate the Macintosh world, it's now a usable environment with a distinct personality and a large and growing selection of application software.

IBM, on the other hand, is still in kindergarten when it comes to user interfaces; the Presentation Manager just isn't ready for prime time. In its innocent attempt to improve on *Windows*, IBM made Presentation Manager more difficult to use and thereby slowed its potential adoption rate.

For instance, *Windows* is plagued with something called the MS-DOS Executive, which is simply the DOS command line implemented with windows, pull-down menus, and dialog boxes. It's bad enough that what's supposed to be an easy-to-use graphic interface lacks a desktop metaphor, one of the most basic elements of such an interface.

(continues)

ANTHONY RUSSO



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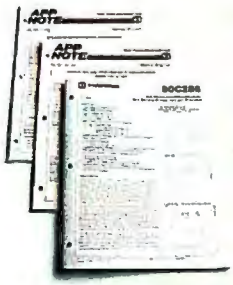

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Circle 176 on reader service card

What's worse is IBM's decision to *improve* on the DOS Executive by replacing it with three programs—Start Programs, Task Manager, and Filing System—each of which performs some group of tasks, the purpose of which isn't obvious. In short, IBM took a fairly simple file system and made it so complicated that even an experienced user like me has trouble figuring out what the pieces of it do. (That's only one of Presentation Manager's problems.)

After having OS/2 and Presentation Manager on my computer for a couple of months, I'm pulling them off. I'm going to write this column as if there were no software in the world except *Windows* software. What I will write about are *Windows* applications: how they work, how they feel, how they compare to other programs either in DOS or on the Macintosh. I'll try to point out the horrible gaffes *Windows* developers make as they learn to design graphic software, by Macintosh developers as they try to expand the market for their programs by rewriting them for *Windows*, and by new developers as they explore the bleeding edge of software design.

Taking the Windows Pledge

The premise of this new department is that I will use only *Windows* software on my PC. I won't quit *Windows* to accomplish something that *Windows* won't let me accomplish. And if *Windows* won't let me do it, then I won't do it. In my standard working day, I now swivel back

(continues)

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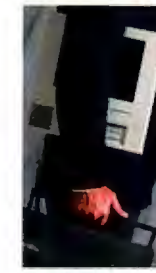

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and forth between the Macintosh *Finder* and *Microsoft Windows*.

I'm not totally roughing it, though—my PC is a PS/2 Model 70-121, and I'm running *Windows/386*. That means that I can run hostile non-*Windows* applications with *Windows/386* that won't run with *Windows/286*. For instance, I spend a lot of time and energy on the new Prodigy on-line service, for which I write a column and answer subscribers' questions. Prodigy's software is a true memory hog and about as truculent a DOS application as you will find, but it runs very nicely from within *Windows/386*. But apart from using Prodigy and making occasional forays into other, old-technology software—always from within *Windows*—I'm making the commitment to document what it's like to jump blindly into the new world of graphic environments, specifically the environment called *Windows*. ●

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

POWER TIP NO. 53

Setting Help Quickly in WordStar

From *WordStar 5.0's* opening menu, you can press H instead of JJ to set the help level. This isn't mentioned in the manual and it may sound trivial, but sometimes every keystroke counts.

George Beinhorn
Nevada City, California

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Circle 169 on reader service card

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Edited by ERIC BENDER

Sales Grow Quickly

PCs Aimed at Home Offices Create Mass-Market Appeal

Resellers Claim Increased Support

ROBBIE McCLARAN

Selling systems with a complete suite of hardware and software benefits consumers, says Amstrad's Vernon Moore.

Although the home-computer bust seemed to prove that you can't sell PCs like appliances or toys, last year 650,000 PCs moved through U.S. mass-merchandising channels, according to International Data Corporation estimates. "PCs are like VCRs now," says IDC analyst Bruce Stephen. "They've become a common piece of electronic equipment."

The number of PCs sold through department stores, camera shops, and electronics retailers remains slight compared to the 9.5 million units shipped overall. But mass-market unit sales swelled by 30 percent last year and should equal that growth in 1989, the Framingham, Massachusetts, research firm projects.

Retailers say they're being lured back into the PC market by consumer appetite for electronic typewriters, telephones, fax machines, and copiers—in short, for home office gear.

"We were in the computer business years ago," recalls Eugene Mondry, president and chief executive of Highland Superstores in Plymouth, Michigan. "We got out of that when the whole TV-game thing fell apart." But last November, Mondry's chain reentered the PC market. It now sells Amstrad, Blue Chip, Packard-Bell, and Head-Start computers alongside stereos, washers, and dryers in 84 retail outlets.

Predictions vary wildly on potential home business sales. John Rossi, president of Blue Chip International in Chandler, Arizona, cites estimates of 13 million full-time home-based businesses and insists that each could spend an average of $5200 on computer products. However, New York–based researcher Link Resources counts only 3.7 million full-time home businesses and says that work-at-homers who buy PCs pay an average of $2330 for hardware, software, and peripherals.

Traditionally, the only outlet for home-business sales was Radio Shack, says Vernon Moore, chief executive of Amstrad in Irving, Texas. "We've offered that customer an al-

(continues)

Pricing for Peripherals Reflects Industry Battles

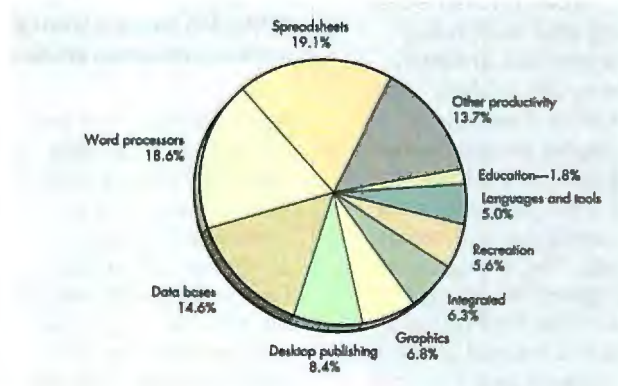
"Irrational" Hard Drive Costs?

PCs steadily offer a 20 percent improvement in price/performance each year, but PC peripherals don't capitalize so directly on the furious onrush of silicon technology; peripherals often don't slide down such steep price/performance curves. Instead, prices tend to reflect the vagaries of fierce industry battles.

Hard disk drives, which for peripherals do show exceptional price/performance improvements, also illustrate how one or two leading vendors can set

(continued on page 58)

Application Software Sales



The Software Publishers Association estimates that roughly $2.2 billion of PC software (at retail prices) was sold last year in North America, an increase of 44.5% over 1987. Spreadsheets clung to a narrow lead among applications.

Home Office

(continued)

ternative," Moore says. Sears recently joined the group of 1500 stores through which 100,000 Amstrad PCs move annually.

Mass-market buyers aren't shopping for cutting-edge technology. Until quite recently, when ATs and portables began to crop up, most big retailers offered only 8088- and 8086-based machines. Most home PCs are sold with 256K of memory and one or two floppy drives at around $800 sans monitor. Color is popular, but other options generally are limited to more memory, another floppy, and perhaps a hard drive.

Operating system, applications, and accessories are typically bundled into a complete system. "We make all the buying decisions for the consumer, and we make them very well," Amstrad's Moore claims.

While hard data is nonexistent, anecdotal horror stories from the home-computer debacle abound. But savvy consumers can get decent value from mass-market retailers.

"These companies usually offer much better pricing than dedicated computer retailers," says Harvey Rosenfield, a Los Angeles attorney and cofounder of the Network Project, which helps consumers deal with technology. "You don't get much support. But my experience has been that support is minimal at best in any retail shop."

Generally, mass-merchandiser support resembles that of mail order. Most major vendors offer one-year warranties, bundled or optional on-site service, and telephone support.

You can buy Commodore Business Products' Colt PC in a Toys "R" Us outlet. But the West Chester, Pennsylvania, supplier requires home-office retailers to be able to sell their machines intelligently, asserts Ken Weber, sales vice president. And Commodore prefers that its retailers sign a computer dealer contract for service and trained personnel.

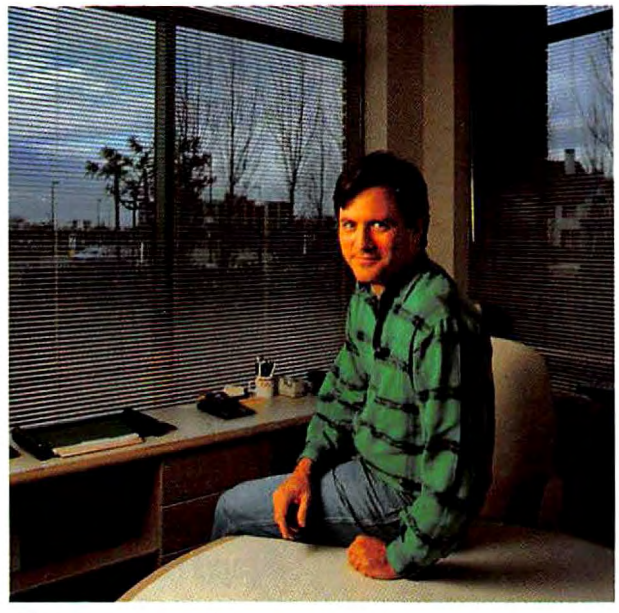
Other vendors echo the shift toward support and service. Blue Chip, for example, offers a one-year on-site service policy as a $65 option. And while many mass marketers rely on vendor service and support, others are beefing up internal efforts. Some have computer dealers set up in-store PC centers. And Highland will hire a special computer staff in each of its electronics/appliance stores, Mondry says.

—Mark Henricks

JOHN HARDING

Sun's TOPS-Up Strategy Adds Links to Other Nets

Pushing Ahead With Electronic Mail



TOPS's Rich Shapero insists that the need for easy-to-install-and-use work-group products will only increase.

You can share files between PCs and Macs on a *TOPS* network, and you don't need to be a rocket scientist to get it running. Leveraging these strengths, the net software has snared more than 600,000 users in less than three years. Now under the wing of workstation supplier Sun Microsystems, *TOPS* is gaining broad connections to other nets, and its electronic mail package is being groomed for a leading industry role.

Under an agreement inked last winter, Novell's popular *NetWare* software will incorporate support for both *TOPS* and UNIX net protocols. "You'll have transparent file access within the three environments," says Rich Shapero, general manager of Sun's TOPS division in Alameda, California. Additionally, *TOPS* users can tap some of *NetWare*'s sophisticated network-management capabilities.

"It's a real coup for TOPS; Novell has solved the migration problem," says Nina Burns, vice president of Infonetics, a market research company in Santa Clara, California. Moreover, prospects look good for further Novell/TOPS cooperation on distributed applications, directory services, and global messaging.

David Marshak, senior analyst with Patty Seybold's Office Computing Group, also applauds the Novell deal. But he points out that *TOPS* capabilities remain basic, and upgrades come rather slowly. Only recently has the PC version gained support for ethernet, the NETBIOS application interface, and a minimal-memory setup.

Sun clearly plans to put more spin on *TOPS*. "We could see selling a million nodes for file sharing and disk sharing," Shapero says. "Another million or two could be sold where the key service is messaging." This summer, TOPS will bundle an update of

(continues)

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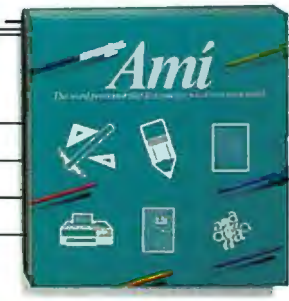

Requires IBM® AT, PS/2 or compatible (80286 or 386 CPU); CGA, EGA, VGA, or Hercules compatible displays; MS/DOS 3.0 or higher.

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Circle 220 on reader service card

Bitstream Carves Niche as Font Foundry for PCs

Embedding Fontware in Printers

As type fonts grow friendlier, many more users will actively exploit them, predicts Bitstream's Rob Friedman.

RICHARD HOWARD

Type fonts, acknowledges Bitstream president Rob Friedman, don't top the typical PC user's list of concerns. But as users discover how the artful application of fonts can spiff up reports and presentations, font libraries are starting to expand far beyond their original niche in desktop publishing.

Bringing the latest font technology to the masses, Bitstream still upholds the ancient publishing tradition of independent type houses. Formed in 1981, the 200-employee Cambridge, Massachusetts, firm first concentrated on creating digital type for high-end publishing machines. Each font was designed pixel by pixel in all permutations—size, style (such as bold), and output in various resolutions on various devices. Bitstream launched an aggressive effort to create master typeface outlines that could be scaled to any size.

As desktop publishing blossomed in the mid-1980s, an end-user market sprang into being. Bitstream began selling LaserJet typefaces in late 1986, but the big push with device-independent font libraries began a year later with the debut of *Fontware*.

Fontware comes in two parts: font outline libraries and an application-specific installation kit. The software modifies a given master font to create a downloadable bitmapped font that the application can drive. Bitstream sells more than 50 font libraries for PCs, each featuring four styles (typically roman, italic, bold, and bold italic) and selling for $195. Headline packages with four faces in one style are also priced at $195. Combos for newsletters, fliers, or books cost $395.

End-user sales account for slightly less than half of Bitstream's revenues; the rest comes from sales to publishing equipment manufacturers and to service bureaus. "We really compete against two alliances," Friedman says. In the LaserJet-compatible arena, Hewlett-Packard teams up with Compugraphic, a major publishing equipment supplier now promoting PC fonts. In the PostScript world, the allies are Adobe and Linotype—another large publishing veteran.

But the overall font battle boils down to PostScript versus all comers, with Bitstream leading the attack in LaserJet fonts and providing key technology for PostScript-clone printers.

Bitstream's most visible strength is font choice. It offers more than 200 fonts for either LaserJets or PostScript devices. In contrast, Adobe markets only 80 PostScript fonts, although it's busy licensing hundreds more from other suppliers.

Fontware's greatest limitation is that it lacks PostScript's ease of use. For example: During installation, *Fontware* crunches away for half an hour while generating a font in an offbeat size.

However, the latest release performs such scaling more quickly, reduces storage requirements, and allows applications to share fonts. Moreover, Bitstream has demonstrated next-generation code that's smaller, much faster, and highly suited for incorporating into

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TOPS

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its *Inbox* E-mail package in a plug-and-play solution. TOPS will offer *Inbox* on generous terms to current users and will help developers exploit its store-and-forward mechanisms in an effort to establish a broad standard.

But Marshak isn't sure that *TOPS* customers want to move beyond resource sharing. "Getting them to start cooperating using E-mail is a bigger leap; E-mail is usually imposed from the top down," Marshak says. "Logically, this is the right step for *TOPS*. I'm just not sure it's going to work."

In any case, Burns expects *TOPS*' domination of low-end net sales to continue. She projects that its share of the PC/Mac net market will rise from 8 percent in 1987 to 11 percent in 1991. And TOPS will continue to push ease of use and installation, Shapero says. Citing predictions that 28 million workstations will be networked by 1993, he declares that such expansion just won't happen with techie-oriented nets—"We'd need four million system administrators." —*E. B.*

OS/2 NEWS

Volume 1, No. 4.

A continuing report on advanced software for personal computers.

Sophisticated reminder system helps you automate your processing tasks.

Enyart Development Corporation has started distributing Tickler/2™. This advanced automated reminder system lets the user create a series of reminders to occur before, during and/or after an event. Tickler/2 can even remind your computer when to perform certain tasks. Because it can be used in conjunction with your data base, spreadsheet, E-mail and project management software, it gives you amazing versatility. For example, you could set up Tickler/2 to take a previously generated sales forecast spreadsheet, update it daily, print a report and electronically mail it to another computer at the end of every week...all while you're on vacation. For more information on the advanced capabilities of Tickler/2 call 1 303 286-8686.

PC Paintbrush now available for Presentation Manager.

The OS/2™ version of PC Paintbrush® uses Presentation Manager™ to make creative expression fun, fast and easy. PC Paintbrush for OS/2 is a graphics creation package that includes all the features of the DOS-based version. It lets you create intricate freehand graphics using the various brushes, lines, curves, colors and patterns. You can also use scores of drawing and text tools to create presentation-quality documents. For more information call ZSoft at 1 404 428-0008.

Word processing that goes beyond just words is introduced for OS/2.

DisplayWrite 5/2 Composer™ has been released by IBM. This advanced word processing software lets you scan photos and line art into your document, position them anywhere on the page, even make text flow around them...all without cutting or pasting. DisplayWrite 5/2 Composer capitalizes on the protected mode and multitasking capabilities of the IBM OS/2 environment so you can run it as a foreground or background operation. See your IBM Authorized Dealer or IBM marketing representative for complete information.

New relational data base system helps PC users handle large volumes of data.

R:BASE® is an easy-to-use OS/2 relational data base management system that features both menu and command-line interfaces. And because it includes LAN support for up to three simultaneous users (using the multitasking and networking support enhancements of OS/2), it's cost-effective as well. R:BASE also provides programming language support, and over 70 business and scientific functions are already integrated into the program. For more information on how R:BASE can help you manage large volumes of data call MICRORIM at 1 800 624-0810.

Symantec's Q&A provides powerful file management for OS/2.

Q&A™ is an integrated flat-file data base and word processor that offers OS/2 users a unique combination of power and simplicity. With Q&A you can take advantage of OS/2 benefits like multitasking and large memory. Q&A OS/2 also offers the ability to share data bases on a network with the DOS version of Q&A. Multifile lookup in Q&A means you can merge data from multiple Q&A data bases into customer-designed forms and reports. Q&A's executive word processor lets you create presentation-quality documents and easily perform mail merge with your data. For more information on how Q&A can solve your data base and word processing needs call 1 408 253-9600.

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Pricing

(continued from page 53)

pricing. This year, street prices for 20MB 5¼-inch drives slumped to around $200 when market leader Seagate dumped large amounts of inventory. As Seagate and its peers turn to 20MB 3½-inch and 40MB 5¼-inch drives, the cost of those devices will sink to the same level, predicts IDC analyst David Vellante.

In the midrange, Vellante sees street prices of half-height 100MB drives, now around $1000, dropping to $800 by year-end. Full-height 85MB drives, currently under $500, will stay near that price.

Generally, "the higher the capacity, the higher the chance for price to come down," notes Bob Katzive, vice president of Disk/Trend in Mountain View, California. But 380MB drives reflect "irrational" pricing, Vellante says, with some offered for little more than $2000, so costs for these drives are unlikely to dip soon.

Large production volumes depress pricing, but only to a point. While around 2 million tape backup units will ship this year, according to Katzive, prices won't change much. Ditto for CD ROM players, whose unit shipments are about one-tenth those of the tape drives. Katzive predicts "a slow decay" in CD ROM costs, which now range from $600 to $1100. He doubts that vendors will slash costs before CD-based software arrives.

Monitor technology is now quite mature, but last year any price/performance gains were wiped out by the dollar's fainting spells in the international currency markets. (Asian suppliers dominate monitor sales.) Still, competition should push prices down this year for VGA and multisync displays, predicts Joan-Carol Brigham, IDC's director of graphics and Macintosh research. EGA displays will remain about the same, and monochrome models probably have bottomed out, according to Brigham.

MATTHEW NIELSEN

With display adapters, "we're in a transition period," Brigham says. In 1988 memory costs drove up VGA board prices, which should remain steady through year-end. The cost of EGA adapters may even rise this year as larger suppliers abandon the market.

Early next year, as higher-resolution devices begin to elbow VGA aside, VGA boards will drop to $250 or less and monitors to $300 or below, suggests Sohail Malik, an analyst with Dataquest in San Jose, California.

Street prices on Hewlett-Packard LaserJets and compatible page printers, now around $2000 but sometimes dipping as low as $1600, probably won't drop much until late 1990, says Catherine Dingman, marketing analyst at CAP International in Norwell, Massachusetts. She attributes this to the weak dollar and lack of room to trim manufacturing costs. Street pricing already reflects slim reseller margins, comments Jim Upham, director of Dataquest's electronic printers service. "Hewlett-Packard dealers are giving the printer away to sell the consumables."

Both Brigham and Upham expect this year's crop of PostScript-clone printers to nudge pricing down, but only slightly. "The low end will be around $4000, no matter whose software is included," says Upham.

Similarly, pricing on 24-pin dot matrix printers should hold relatively steady this year, Upham predicts, with manufacturers focusing on adding functionality like better paper handling. By mid-1990, though, prices will erode almost to the level of 9-pin models.

Modems present a cheerful price picture for consumers; you now can buy 1200-bps models for as little as $50, notes IDC analyst Josh Gonze. He predicts that 2400-bps units from market leader Hayes, with a current street price of $445, will go for $400 by early next year. And by year-end even 9600-bps devices will sell on average for below $1000. —*E. B.*

Bitstream

(continued)

both printers and mainstream applications, Friedman says.

Bitstream fonts and typeface-scaling technology will be embedded in both LaserJet- and PostScript-compatible printers. While Friedman won't talk about LaserJet-compatibles suppliers, he asserts that Bitstream has "captured the vast majority of the PostScript-clone vendors." (Curiously, the PostScript "clones" may not run the original Adobe fonts—because their vendors have neither licensed nor duplicated Adobe's typeface-scaling technology.)

This year, spreadsheets and many additional word processors will support *Fontware*. Graphic operating environments will hasten the acceptance of font technology. And Bitstream will keep touting font freedom. "Different fonts give very different impressions, and we'll start explaining how you can give those impressions," explains Marketing Vice President Kelsey Selander. —*E. B.*

Mark Henricks is a PC World *contributing editor based in Dallas.* ●

TWO-FISTED MANAGEMENT
I'LL GIVE YOU A PERK!
BAP!
© 1989 MAREK, 32

NO, IT'S NOT A CAR RENTAL COMMERCIAL. IT'S ARNOLD HARRIS AND ASSOCIATES.
Last shuttle to Boston departing Gate 20 in two minutes
WORLD RECORD TIME:
15:54:3
CURRENT TIME:
13:40:1

Infrared surveillance cameras, wiretap kits, two-way wrist TV with cable! I'm sorry, sir, but...
BEEP BEEP
And just how do you expect me to survive in today's competitive marketplace?

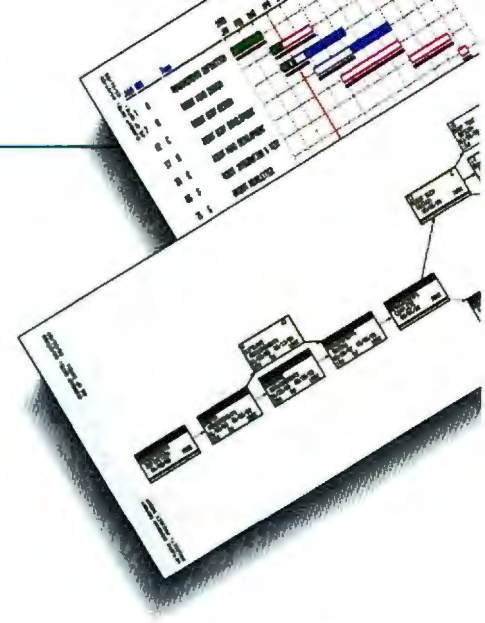
ANY CEO CAN RIDE EXECUTIVE 1ST CLASS BUT IT'S AN INSPIRING LEADER WHO RIDES COACH WITH THE TROOPS.
STRANGE BODY ODORS
SQUOOSH
MOO
OOPS

FOR SOME IT IS THEIR FIRST MIDDAY PEAK HOUR FLIGHT.
Omigod! I'll never have this done in time
My slides! Where are my presentation slides?!
My tummy hurts

Attention! Due to unexpectedly heavy air traffic we are being kept in a holding pattern. Sorry for the delay.

TIME, AND CORPORATE AGENDAS, WAIT FOR NO MAN.
Wait, sir, where are you going? You must remain seated.
Let's go!! Move! Move!

FORTUNATELY, SEASONED SHUTTLE VETERAN THAT HE IS, MR. HARRIS HAS PLANNED FOR JUST ABOUT ANY EVENTUALITY.
That's right, we're comin' in at 24° latitude, 78° longitude, across from the plaza



Project Scheduler 4™

The difference is graphically clear.™

Project Scheduler 4 set new industry standards for power, speed, and ease of use. Now Version 1.5 raises PC-based project management to an even higher level. In business after business, people are making the change to Project Scheduler 4. Why? The following comparisons make the reasons graphically clear.

Features	Project Scheduler 4	Time Line 3.0™
Gantt chart mode	•	•
Network chart mode	•	•
Spreadsheet mode	•	
Selectable Gantt graphics	•	
Fine grain summary Gantt charts	•	
Network chart automatic task placement	•	•
Multiple auto network draw algorithms	•	
Network chart interactive task placement	•	
Resource allocation & costing	•	•
Resource automatic time based cost inflation	•	
Resource calendars	•	
Automatic resource leveling	•	•
Interactive resource leveling	•	
Multiple project structures	•	
PERT schedule probability analysis	•	
Schedule & cost tracking	•	•
Independent multi-project support	•	
Integrated printer & plotter graphics	•	
Postscript graphics support	•	
Full data export	•	•
Full data import	•	

Benchmark All times in seconds	Product	Number of tasks 100	200	300	400	500
Schedule Recalculation	Project Scheduler 4	0.8	0.9	1.0	1.1	1.2
	Time Line 3.0	10.3	22.6	372.4	1024.8	1283.6
Display Network Chart	Project Scheduler 4	1.0	1.1	1.2	1.4	1.5
	Time Line 3.0	134.5	*	*	*	*
Load Project File	Project Scheduler 4	2.7	3.8	5.7	7.7	13.5
	Time Line 3.0	18.4	32.4	84.2	180.9	244.5
Save Project File	Project Scheduler 4	3.1	4.5	5.4	6.4	8.1
	Time Line 3.0	18.1	35.6	75.0	102.4	128.0

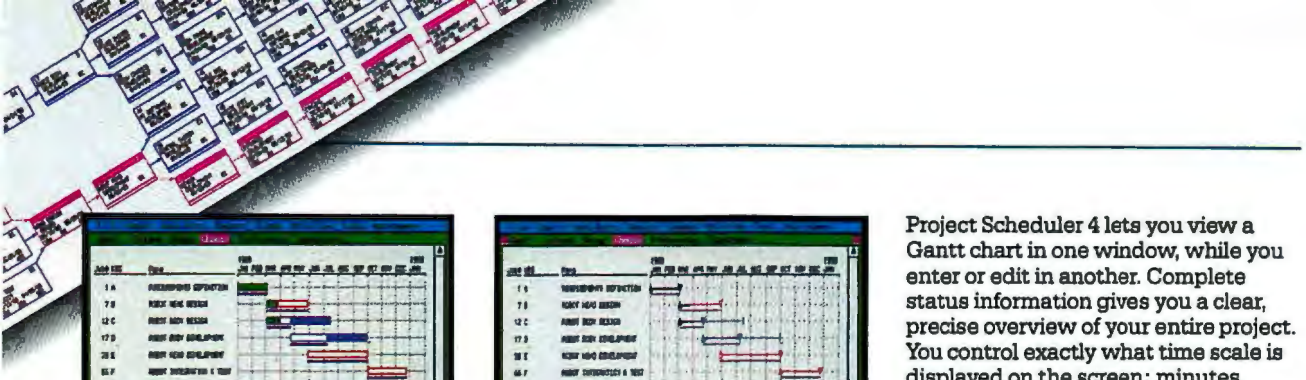
*After computing for over 12 minutes, Time Line displayed an "Unable to display Network View" message. All benchmarks were run on a 12 MHz 286 with 640k RAM.

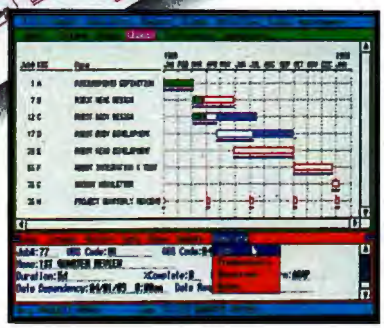
Unmatched power at your fingertips.

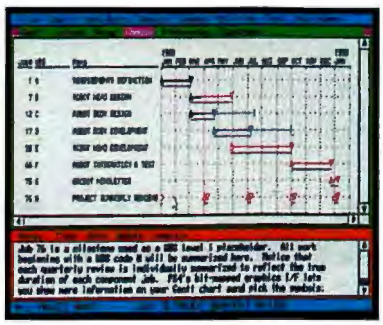
Project Scheduler 4 offers an impressive list of industry-leading power features. Projects are planned and tracked in a full graphics environment. You understand more because you see more on the screen. At last, PERT and Gantt charts make sense. Responsibilities, deadlines, and resource bottlenecks are spotted at a glance. You see more on paper, too. Beautiful, graphic reports print sideways, so you never have to cut and paste. They're instantly understandable. Not to mention simple to generate for impressive presentations.

Time-saving, world-class speed.

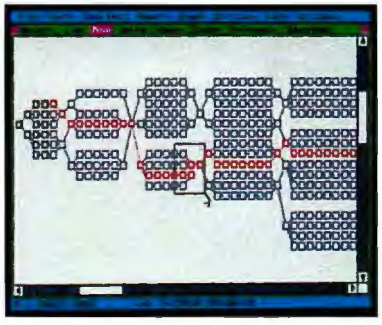
In benchmark tests, Project Scheduler 4 consistently outperforms all the competition as the fastest full-featured product in the industry—by a very wide margin. After all, what good are power features without the speed to make them useable. And the bigger your project, the more speed counts. Even at the 1000-task level, Project Scheduler 4 takes only 1.5 seconds to perform schedule recalculation. When your time is on the line, your project scheduler should help you manage it, not waste it.

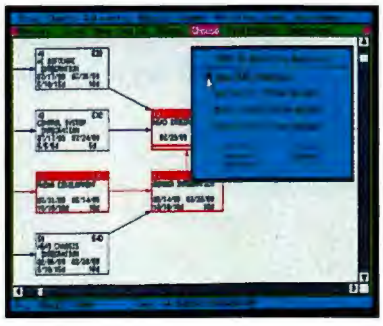




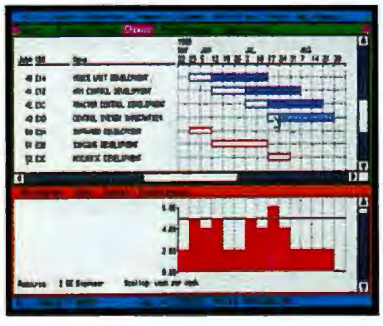


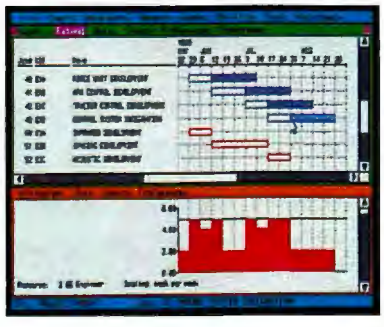
Project Scheduler 4 lets you view a Gantt chart in one window, while you enter or edit in another. Complete status information gives you a clear, precise overview of your entire project. You control exactly what time scale is displayed on the screen: minutes, hours, days, weeks, months, or years. Display preferences include alternate Gantt chart symbols, free and total float, baseline, WBS and OBS filters, and much more.





Four reduced network zoom levels let you view more or less detail, depending on what you need to see. Each level provides drawing tools for positioning tasks in the network and changing predecessor relationships. When working with PERT probability analysis, Project Scheduler 4 lets you control probability weights and specify alternative task duration times, while the program instantly recalculates the critical path.





In Gantt Histogram mode, a single mouse click quickly finds resource overloads and displays a list of problem tasks. To see the planned resource utilization for a task, point at it in the Gantt chart, and the corresponding area in the histogram is automatically shaded. Project Scheduler 4 lets you level resources interactively using Gantt chart Extend or Delay mode. In the example on the right, Extend mode is used to expand the duration of a task that shows free float—eliminating resource overload with a single click of the mouse.

Function	Project Scheduler 4	Time Line 3.0
Advanced graphical user interface	•	
On-line help	•	•
Step-by-step assist mode	•	
Full mouse support	•	

Time Line 3.0 is a registered trademark of Symantec Corp.

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Scitor Corporation

Zenith, AST, and Everex Hit 33

Three 33-MHz machines move enough MIPS to scare a VAX—and they're not from Compaq or IBM.

Eric Knorr and Mike Hogan

A 33-MHz 80386 PC is like one of those stereo systems that can blow your living room apart. Who, you wonder, needs that much power?

Ah, but have you ever used *Windows?* Or—gasp—OS/2 with Presentation Manager? If these environments catch on, today's cutting-edge 80386 will become a ho-hum business machine. After all, a 33-MHz machine cranks through graphics-intensive applications about as fast as an AT runs character-based standbys.

Competition to bring out the first legitimate system with a 32 percent faster clock rate couldn't be hotter. At this writing, Zenith, AST, and Everex are three of the major players that may well beat Compaq to dealer shelves with an AT-compatible 33-MHz system using Intel-sanctioned 80386-33 chips. The Zenith Z-386/33 was scheduled to ship in April, while the AST Premium 386/33 should appear this month. Everex plans to release the Step 386/33 in April, but volume deliveries probably will start in midsummer.

SNAPSHOT

Z-386/33

Zenith's large-footprint 33-MHz 386 entry features a small 16K static-RAM cache.

KEY FEATURES

- **Up to 32MB of CPU-speed memory**
- **Memory cache and I/O bus controller are removable**

AVAILABILITY

Scheduled for April

PRICING

$7999 to $13,499

Zenith Data Systems
1000 Milwaukee Ave.
Glenview, IL 60025
800/842-9000

Reader service no. 761

Priced at $7999 in its base configuration, the blazing Zenith Z-386/33 features a removable memory cache and three 32-bit, CPU-speed memory slots.

Zenith Rises

The Z-386/33's architecture, like the Z-386/25's, is unusual. Though the CPU, coprocessor socket, and most support chips are on the motherboard,

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

the machine won't run without a 32-bit expansion board that controls the bus.

Like any machine that runs over 25 MHz, the Z-386/33 employs a very fast, very expensive cache of static RAM for no-wait-state operation. At 16K, the memory cache is smaller than most, thanks to a write-back scheme that eschews the Intel 82385 cache controller (now considered standard). Certain operations (like hosting multiple UNIX terminals) may benefit from a larger memory cache; the static RAM resides on a special removable board, offering the possibility of future upgrades.

The bigger-than-AT Zenith Z-386/33 offers external access to four half-height drives, with room for a fifth inside. It also provides space for 8MB in SIMMs on the motherboard, along with four 32/16-bit and three 8/16-bit slots. One of the 32/16-bit slots holds the bus controller board, but the remaining three can hold one 8MB board each, for an impressive capacity of 32MB of CPU-speed RAM.

With 2MB of RAM, a single floppy, an ESDI controller, and one parallel and one serial port, the Z-386/33 goes for $7999. Add *Windows/386*, DOS 3.3, a 16-bit VGA board, and a 150MB ESDI hard disk, and you shell out $11,499. A 320MB ESDI hard disk version costs $13,499.

The sleek AST Premium 386/33 holds its CPU, cache controller, and memory cache on a removable board, while offering CPU-speed access to 36MB of 32-bit memory. The base configuration costs $6965.

AST's Challenge

Like its 25-MHz predecessor, the Premium 386/33 sports a modified passive backplane (which includes the BIOS). The only difference is faster main memory and a new CPU board, though end users can't perform the upgrade themselves.

AST has opted for conventional 82385-based memory caching with a 32K cache, both of which reside on the CPU board, along with Weitek and Intel math coprocessors and up to 4MB of memory.

The Premium 386/33 has the same smartly styled AT chassis as its 25-MHz sibling. There's room for five half-height drives, three of which are externally accessible. Without using a slot, you get one parallel and two serial ports, a floppy/tape controller, and an AT-style hard disk controller. Two 32/16-bit slots can be stuffed with memory cards holding up to 16MB of CPU-speed RAM each, for a total of 32MB on the memory bus. You also get three 8/16-bit slots (one of which must hold a controller if you opt for an ESDI hard disk).

A bare-bones Premium 386/33 with 2MB of RAM and a floppy drive sells for $6965. Add a 110MB ESDI hard disk and it goes for $8595, while a unit with a 320MB ESDI drive costs $11,295. AST bundles DOS 3.3 and disk caching software with every system.

Everex Steps Out

Ever since the Step 386/20, Everex has won praise for its scalable memory cache, expandable to 256K. The Step 386/33 enjoys the same feature, but the motherboard is substantially modified.

Due to timing constraints, turning up the clock meant getting rid of the Step's sole 32-bit slot, leaving space for only 8MB of 32-bit CPU-speed RAM—with conventional 1MB SIMMs. Everex took the unorthodox step of creating its own 4MB SIMMs, raising the memory bus capacity to a per-

SNAPSHOT

Premium 386/33

AST's design includes an Intel 82385 cache controller and many bundled features.

KEY FEATURES

- **Up to 36MB of CPU-speed memory**
- **Built-in parallel and serial ports, floppy/tape controller, and hard disk controller**

AVAILABILITY

Scheduled for June

PRICING

$6965 to $11,295

AST Research
2121 Alton Ave.
Irvine, CA 92714
714/863-1333

Reader service no. 762

SNAPSHOT

Step 386/33

Everex's top-end desktop includes a scalable memory cache.

KEY FEATURES

- **Up to 16MB of CPU-speed memory**
- **Proprietary main-memory and static-RAM SIMMs**

AVAILABILITY

Scheduled for summer (in volume)

PRICING

$6799 to $9788

Everex Systems
48431 Milmont Dr.
Fremont, CA 94538
415/498-1111

Reader service no. 763

Like earlier Step models, Everex's Step 386/33 offers a memory cache expandable to 256K and a handy LED readout for diagnostics. With 2MB of RAM and a single floppy, the unit goes for $6799.

fectly respectable 16MB. The remaining SIMM sockets accept special static-RAM SIMMs, resulting in an array of memory options more flexible than before.

The Step's chassis hasn't changed; all five half-height drive bays are externally accessible. No firm slot count was available at press time, leading us to believe that the release date might slip. Prices are $6799 for a floppy-only unit with 2MB of RAM but no video board or monitor; $8549 for a unit with a 160MB ESDI drive; and $9798 for a 330MB ESDI configuration.

Tomorrow's graphical software aside, all three entries point toward the traditional high-end roles: network server, desktop publishing, engineering, and multiuser systems. And now that you've caught up with another technological watershed, get set for the 80486... ●

Eric Knorr is a senior editor and Mike Hogan is news editor for PC World.

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Circle 279 on reader service card

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Circle 148 on reader service card

A HyperCard for the PC

Apple's HyperCard has been cloned for the PC in the form of HyperPAD.

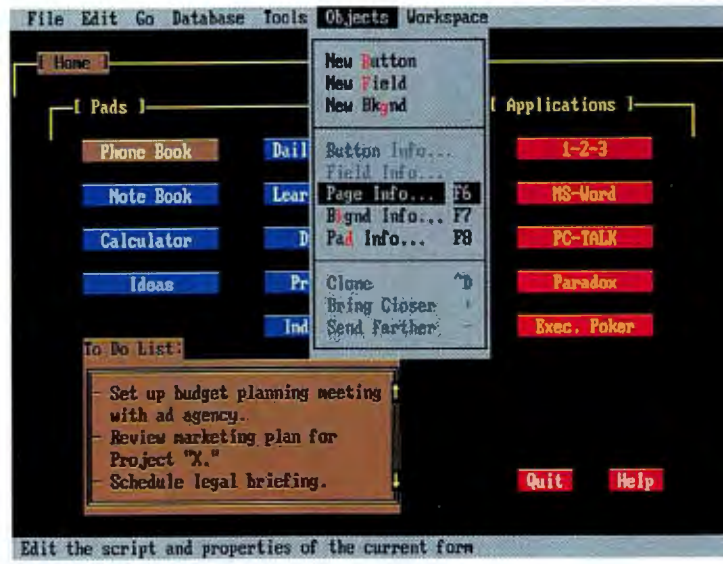
Is programming for the rest of us finally at hand?

Danny Goodman

In the sixties, the chant was "Power to the People!" Today it's "Power to the User!" And for good reason. As most PC veterans can attest, bending a general-purpose program like *dBASE* or *1-2-3* to their needs has meant long, frustrating hours of coding.

HyperPAD from Brightbill-Roberts may change all that. Like *HyperCard*, its Mac inspiration, *HyperPAD* (*PAD* stands for personal application designer) is a menu- and prompt-driven, object-oriented application environment that allows users to create custom programs without writing a ton of code. *HyperPAD* can't produce graphics—it's completely character-based—but it needs only 384K of RAM and runs quite nicely on a dual-floppy PC.

Building an application is like fitting Lincoln Logs together. In this case, the logs are *objects*—predefined, self-contained elements that can be used over and over again (see "The Object Is Software Design," Special Report: Languages, *PCW*, April 1989). *HyperPAD* comes with basic objects, such as scrolling fields, and buttons that can call on a comprehensive set of built-in flat-file management, math, and financial functions. Two dozen prefab applications (called *pads*) that you can endlessly modify will also be part of the deal.



The HyperPAD Home Pad can be a central control panel linking other pads, external programs, and personal reminders.

Keep in mind that *HyperPAD* can't build a *PageMaker 4.0*. But it's perfect for whipping up simple accounts payable/receivable applications, electronic Rolodexes, to-do lists, calendars and schedules, time and billing programs, and custom DOS shells for launching applications. Better still, because objects can be linked to anything—text, other objects, programs, or batch files—you can easily automate a mess of tasks. (One supplied pad, for example, tracks appointments, expenses, and reimbursements, then automatically bills clients and records payments.) Dip into *HyperPAD*'s English-like script language and you can extend the actions of an object, create custom functions from scratch, and even

produce interactive, hypertext training programs. (*HyperPAD*'s screen-capture function makes the latter especially easy.) If you want form-fit applications or push-button control of your PC, *HyperPAD* could be the answer.

Inside HyperPAD

HyperPAD's central metaphor is the pad, which consists of a data base of full-screen pages. An individual page can hold fields or buttons that trigger various actions. On an underlying master page, you can also specify objects that should appear on all pages. A simple *HyperPAD* phone book, for example, could include a master page displaying fields for name, address, and phone number, plus buttons that advance you to the next page or run an auto-dialer.

Most of *HyperPAD*'s powers can be tapped from its pulldown menus, but creating an application that requires data validation, lookup tables, and similar functions means resorting to *HyperPAD*'s PADtalk script language. If you've shied away from programming in the past, PADtalk may be your easiest introduction: A simple 5-line script tied to a button can accomplish a great deal for little effort. At the same time, the language offers powers lacking in *HyperCard*'s HyperTalk equivalent: CASE structures, Boolean operators, and several text conversion functions.

But you won't need PADtalk at first. *HyperPAD*'s object orientation makes it easy to create your own applications by borrowing parts from existing pads. When you find a button that does what you want, you merely copy it into the pad you're designing. All properties of that button, including its border, colors, and script, tag along for the ride. If you create a button from scratch, *HyperPAD* lets you establish a link to any page in any pad. *HyperPAD* records the link in the button's script, which you can then edit.

Using pads takes some getting used to. You can't pop one up as you would *SideKick*. But you can create a centralized pad that lists other pads, spreadsheets, word processors, and other DOS programs and lets you launch them with the click of a button. When you quit the program, you return to the starting pad and page.

Pulling data out of *HyperPAD* is a snap. You can print tabular reports, labels, and cards. Data is easily exported in .DBF, ASCII, and .GX2 *Show Partner* formats.

No Graphics, No Big Deal

Part of *HyperCard*'s appeal is its ability to create and incorporate *MacPaint*-like graphics. You don't have that luxury with *HyperPAD*, which is both good and bad news.

The good news is that *HyperPAD* applications can run on any MS-DOS machine, because borders, shadows, and other effects are generated with the PC's speedily drawn character graphics. Brightbill-Roberts also includes a surprisingly capable draw program for dashing off snazzy-looking forms, buttons, and other objects.

The bad news? With screen resolution essentially limited to 25 lines by 80 characters, buttons, borders, and other elements will look rather chunky.

Budget Publishing

Like *HyperCard*, *HyperPAD* is a natural software publishing tool. Note that you can't compile a pad into a stand-alone application, so you must own a copy of *HyperPAD* ($99.95) to actually run a pad. For $495 you can get the program plus *HyperPAD Reader*, a run-time module that developers can distribute to 25 users. Brightbill-Roberts is working on a site-licensing plan and currently offers unlimited copying of the *Reader* for a mere $3000.

HyperPAD is an important release in a new generation of object-oriented program generators that includes Maxem's *Cause* and Asymetrix's *Open Book*. *HyperPAD* isn't as visually appealing (or as fun) as *HyperCard*, but PC managers, training directors, and the rest of us shouldn't be without it. ●

Danny Goodman is author of The Complete HyperCard Handbook *(Bantam Books, New York, 1988). He also developed TENpointO's* Focal Point *series of* HyperCard-*based programs.*

SNAPSHOT

HyperPAD

Brightbill-Roberts' HyperCard work-alike lets nonprogrammers create applications easily, but it can't handle graphics.

KEY FEATURES

- **Object-oriented so programs can be built Tinkertoy style**
- **Creates DOS shells and interactive tutorials**
- **Over 20 sample applications**
- **Runs on 8088 machines with only 384K of RAM**
- **Imports/exports .DBF and ASCII files**

AVAILABILITY

At press time release was scheduled for April 1989

PRICING

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MultiSync 2A. One super VGA monitor.

VGA mode shown at 320 X 200

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And since you're most likely buying a board that goes beyond VGA, your monitor should too. For literature call 1-800-826-2255. For technical details call NEC Home Electronics (USA) Inc. at 1-800-FONE-NEC.

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MultiSync 2A. One SuperVGA monitor.

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Circle 312 on reader service card

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Compaq 286e

A Penny-Wise and Smart-Looking Compaq Desktop

The next best thing to getting a budget price is getting more product for the same dollars. The new Compaq 286e models are priced like their Deskpro 286 counterparts but with goodies like VGA graphics, more standard memory, and greater expandability thrown in. With better value and a new compact design, the 286e makes sense for secretaries, casual users, word processing specialists, and others who formerly may have had to make do with lesser compatibles, or do without.

Then again, you may want that smaller footprint and smart new styling on your own desk, at home or at the office. You'll have the same switchable 8/12-MHz one-wait-state processor as the Deskpro 286, but the smaller motherboard holds more—VGA graphics; hard and floppy controllers; and serial, parallel, and mouse ports. You also get 1MB of motherboard memory out of the box, 384K more than the Deskpro 286's 640K. You'd have to spend almost $900 to bring the original Deskpro up to the same mark.

The 286e has the same 16-by-15-by-6-inch cabinet design as the Compaq 386/20e and the same high degree of integration on the system board. One of the 286e's five AT-compatible slots also runs its 16-bit memory at the processor's top speed of 12 MHz. You can use 1MB SIMMs for another 3MB of memory, or opt for the 4MB variety to pack up to 12MB on one board for a total system memory of 13MB. That's a sharp improvement over the Deskpro 286's 8MB limit.

The rest of the 286e is familiar: a standard 1.2MB or optional 3½-inch 1.44MB disk drive, a socket for a math coprocessor, and a 140-watt power supply. But the prices are pleasant surprises.

A floppy-only Model I sells for the same $2699 as the Deskpro 286, while the midline Model 20 with a 20MB drive runs $3199, $400 cheaper than a 20MB-equipped Deskpro 286. Finally, the 40MB 286e Model 40 is priced at $3599, $600 less than its Deskpro 286 counterpart. You can buy 110MB drives from Compaq, as well as a range of tape backup, graphics, and communications board options. A VGA color monitor is another $599. Compaq Computer Corp., 20555 SH 249, Houston, TX 77070; 800/231-0900.
—Mark Henricks
Reader service no. 740

The new small-footprint Compaq 286e's higher level of system integration will save you at least $900 over a similarly configured Deskpro 286.

VIP SX386

ALR Systems Boast SX Appeal

Two of the most important price/performance boosters around are memory caching and the Intel 80386SX chip. Marry the two in an oversize shoe box, and you have Advanced Logic Research's VIP SX386 computer.

Although it operates at the same 16-MHz clock speed as other 386SX-based machines, the VIP SX386 outperforms its peers significantly by virtue of an 82385 cache controller, 16K of high-speed caching memory, and the ALR FlexCache architecture, claims the manufacturer. Another distinguishing feature: ALR has squeezed all of that into a box that measures only 15 by 7 by 4½ inches.

The VIP's small stature and big performance make it ideal for network or other workstation applications where you don't have room for one of ALR's heftier 386 desktop models or don't need quite the horsepower. ALR saves space by using a passive backplane design with circuitry embedded for a serial port and floppy and hard disk controllers. The CPU resides on a card that fits into an 8/16-bit slot.

The VIP SX386 is less expandable than more conventional designs, containing only three other 8/16-bit slots and one 8-bit slot for modems, network cards, and other add-ins. On the plus side, the modular CPU design simplifies future upgrades to a 20-MHz 80386. There's no FlexCache down the 80386 upgrade path, though, because the CPU card can't accommodate a full 80386 processor in addition to Intel's cache controller.
(continues)

ALR's VIP SX386 pairs memory caching with the Intel 80386SX chip in an oversize shoe box, bringing you high performance and 32-bit software compatibility at a budget price.

ALR VIP SX386

(continued)

The VIP SX386 comes with 512K of memory, which can be replaced with up to 8MB in 1-Mbit memory modules on the CPU card. An additional 8MB of memory can be added on a memory card, which is designed for an 8/16-bit expansion slot. If you go with a full-fledged 80386 CPU someday, you'll be able to install up to 10MB of 32-bit memory on ALR's RAM-PAK daughtercard, which plugs into the modular CPU card. ALR claims that it all runs fine on a small-sounding 65-watt power supply.

A 1.44MB 3½-inch floppy is standard in the $2395 model. A system equipped with a 28ms 40MB 3½-inch hard disk can be had for $3695. A monitor and display cards are extra. Advanced Logic Research, 9401 Jeronimo, Irvine, CA 92718; 800/444-4ALR. —*Mark Henricks*

Reader service no. 741

Laserfold 240

Near Laser Quality at Double Speed

When you need hard copy fast and you don't mind if it's not presentation-pretty, the Laserfold 240 continuous-form laser printer from Pentax Teknologies provides a quick-but-not-too-dirty solution.

The Laserfold 240's tractor feed shoves fanfold paper at 16 pages per minute through the desktop-size carriage, a rate twice as fast as most laser printers can claim. That's the quick part.

Out the other side comes 240-dpi-resolution text—shy of most lasers' 300-dpi resolution but clean enough for departmental statements, invoices, and other in-house business, technical, and accounting documents. And if you've ever dropped a stack of alphabetically ordered letters

(continues)

Kyocera A-800

High-Resolution Scanning, Low Price Tag Double Play

With an 800-dpi enlarging/reducing scanner, you can scan and edit 8½-by-11-inch or larger art at high resolution, then shrink it to fit page layouts. Compacting the image this way before printing also improves the output from 300-dpi laser printers. But high-res scanners typically cost several thousand dollars, which brings us to Kyocera's A-800.

The A-800 would deserve a look if all it offered was up to 800-dpi resolution at a 300-dpi price. But it also has the power to enlarge images from 25 to 1067 percent or reduce them by up to 25 percent while scanning. You can enlarge them another 25 percent while printing.

Bundled *ImageDesk* application software handles the enlarging and reducing chores and lets you select gray-scale or line-art scanning for up to three windows per page (many scanners support only one window). Otherwise, the A-800 is a fairly standard flatbed unit, scanning at 14 seconds per 8½-by-11-inch page and offering 16 levels of gray. At $1895, the price tag fortunately hasn't been excessively enlarged. Another $895 buys a document feeder you'll need to scan legal-size documents.

Kyocera ships the A-800 with a run-time version of *Windows*, an interface card, cable, and *ImageDesk* software. It requires 512K of memory. Kyocera Unison Inc., 1321 Harbor Bay, Alameda, CA 94501; 800/334-6506. —*Mark Henricks*

Reader service no. 743

Kyocera's A-800 scanner brings you 800-dpi scanning resolution at a 300-dpi price, plus the ability to enlarge images up to 1067 percent or reduce them by 25 percent while scanning.

Order from your software dealer, or call 1-800-232-8228, in Florida (305) 477-2703 (9 a.m. to 5 p.m. Eastern Time); VISA and Mastercard accepted. By mail, Send check or money order to FINALSOFT CORPORATION. Include street address-UPS will not deliver to P.O. boxes.

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Circle 84 on reader service card

KX-P1124

Panasonic Packs Features and NLQ Printhead in a 24-Pin Package

Your trusty 9-pin dot matrix printer is fine for simple drafts and an occasional interoffice memo, but obtaining letter-quality text usually means standing in line at the departmental printer station or tapping into a network printer queue. The Panasonic KX-P1124, a 24-pin dot matrix printer, offers an alternative by delivering near letter quality without stretching your pocketbook.

At $529.95, the KX-P1124 is a bargain hunter's dream, with standard features that usually cost several hundred dollars more—such as bottom and front paper feed, the ability to recall three print settings, quiet mode, and 360-dpi graphics resolution. The KX-P1124 prints text at a respectable 192 characters per second (cps) in 12-pitch draft and 63 cps in 12-pitch NLQ, and offers a mean time between failures of 4000 hours.

The KX-P1124 also boasts the paper-handling moxie to tackle any chore. The printer features a push/pull tractor and several paper paths. You can use rear feed or bottom feed to load fanfold paper, labels, or four-part forms. A feature called P-Cut automatically advances the perforation on fanfold paper to the tear bar for easy separation and then repositions the next sheet for printing. Additionally, the KX-P1124 offers paper parking so you can print letterhead, envelopes, or cut sheets without removing tractor-fed paper. You can print single sheets by sliding them through a front slot or by feeding them through an optional cut-sheet feeder that holds an 80-page stack. There's no wide-carriage version of the KX-P1124, but the 11.7-inch-wide carriage accommodates single letter-size sheets in landscape mode.

Panasonic puts the KX-P1124's extensive features at your fingertips with a front control panel that includes buttons to select print modes, fonts, pitch, form length, margin settings, and printer default settings. You can also save up to three print settings in printer EPROM and activate them from the front panel.

The KX-P1124 packs the popular Epson LQ-2500 and IBM Pro-

(continues)

Panasonic's KX-P1124 24-pin dot matrix brings near letter quality to your desktop, superb paper-handling, and 360-dpi graphics resolution.

Laserfold 240

(continued)

printed on a sheet-feed machine, you'll appreciate the way continuous paper resists inadvertent reshuffles.

Pentax, a long-time supplier of laser engines, tweaked conventional electromechanical designs so its printer could use continuous-form paper without creating a fire hazard. Special retractors prevent overlong contact between the fanfold paper and the heated fuser.

That's not the only thing that distinguishes the Laserfold 240 from desktop publishing machines printing on single sheets of paper. Besides having limited resolution—and a lack of graphics capability—the printer is restricted to Bitstream's Letter Gothic font and won't accept paper wider than 9¼ inches.

However, its quiet 53db operation, small footprint (about 18 by 7 by 20 inches), and minimal service requirements make the Laserfold 240 ideal for any workplace that needs decent-looking, continuous-form hard copies in a hurry. Its toner cartridge is good for 4000 pages, while the engine is designed for a 600,000-page life.

At $2995, the Laserfold 240 won't bust your budget either. It comes with serial and parallel ports for hookup to your PC. Pentax Teknologies Inc., 880 Interlocken Pkwy., Broomfield, CO 80020; 303/460-1600. —*Mark Henricks*

Reader service no. 742

The Laserfold 240 pushes fanfold paper through its desktop-size carriage at 16 pages per minute with a respectable resolution of 240 dpi.

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CrossView

A New Take on Basic Data

Traditionally, we have relied on spreadsheet or data base programs as data analysis tools. But *CrossView* from DataEase is a free-form data analysis program that enables users without programming skills to analyze very large amounts of data quickly.

Whether you are trying to forecast sales trends or doing a little ad hoc market research for your company, the program can help you cross-tabulate ASCII data from any application. It does so by converting data into an array of unique values, identifying key patterns, and breaking data down into five views—cells, columns, rows, pages, and hyperpages (attachments to a page).

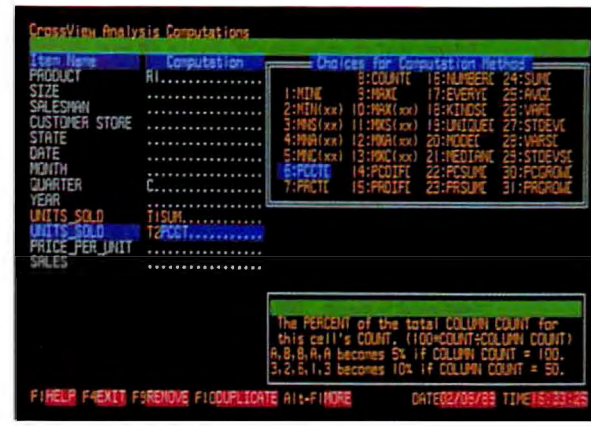
Unlike a spreadsheet, which offers a fixed two-dimensional view of data, *CrossView* creates a multidimensional view that enables you to consider several variables at once. Unlike a data base, *CrossView* identifies key patterns in data without a predefined report.

In addition to the five data views, *CrossView* offers 31 mathematical and analytical functions via pop-up menus. Included among the functions are formulas for sums, averages, variances, medians, standard deviations, and percentages; and functions can be nested.

A single keystroke zaps data from a view into a .WK1 file format for "what if" analysis with spreadsheets such as *1-2-3*, *Quattro*, or *Excel*. *CrossView* also imports *DataEase* data base reports.

The single-user copy of *CrossView* retails for $2000; copies for five additional users can be had for $3000. The program requires DOS 3.0 or a later version, 640K of memory, and a hard disk. DataEase, 7 Cambridge Dr., Trumbull, CT 06611; 203/374-8000.

Reader service no. 748



No spreadsheet or data base experience necessary; CrossView lets you perform free-form analysis on large amounts of data from a variety of applications.

Fatcat

A Bundle of Utilities From SoftLogic—Disk and File Management Programs

Disk utility programs are a mixed bag. Some are known for their file-recovery abilities, others focus on disk management features, and still others have scored because of their versatility. SoftLogic Solutions, a software publisher with a broad line of stand-alone utilities, has mixed its own bag of programs and serves them up as *Fatcat*, a disk and file management system that promises to make your PC purr.

Fatcat is built around the Viewer, a shell-type pulldown menu system that provides rapid access to all the program's features. The usual file copy, move, rename, and delete options work with single and multiple files, and you can edit files, password-protect them, change attributes, execute programs, and exit temporarily to DOS—all via point-and-shoot menus or keystroke combinations.

For each file, you can create a 35-character description that is retained in the Viewer. Be advised, though, that the descriptions are stored in a different FILE$.DIR file within each directory containing a decribed file. Delete a FILE$.DIR, and you lose the descriptions for that directory.

The Viewer shines in its tie-in to SoftLogic's repertoire of disk optimization, data recovery, and file compression programs. Without leaving the Viewer, you can optimize hard or floppy disks through a complete version of SoftLogic's popular *Disk Optimizer*. If you want to delete files yet keep them stashed away on your hard disk "just in case," you can tell *Disk Optimizer*'s Data Guardian function how many days—up to 255—you want to keep them around.

(continues)

KX-P1124

(continued)

printer X24 emulations and seven resident fonts—two draft and five NLQ (Courier, Prestige, Bold PS, Script, and Sans Serif). It doesn't support font cards, but for more typographic variety, you can add a $60 32K expansion chip to the standard 6K buffer for downloadable fonts. The printer produces 11 print sizes that stretch from a tiny 20 characters per inch (cpi) to an ample 5 cpi.

An optional cut-sheet feeder costs $169.95, and a serial interface is priced at $109.95. Panasonic Industrial Co., Two Panasonic Way, Secaucus, NJ 07094; 800/742-8086, 201/348-7000. —*Wes Nihei*

Reader service no. 744

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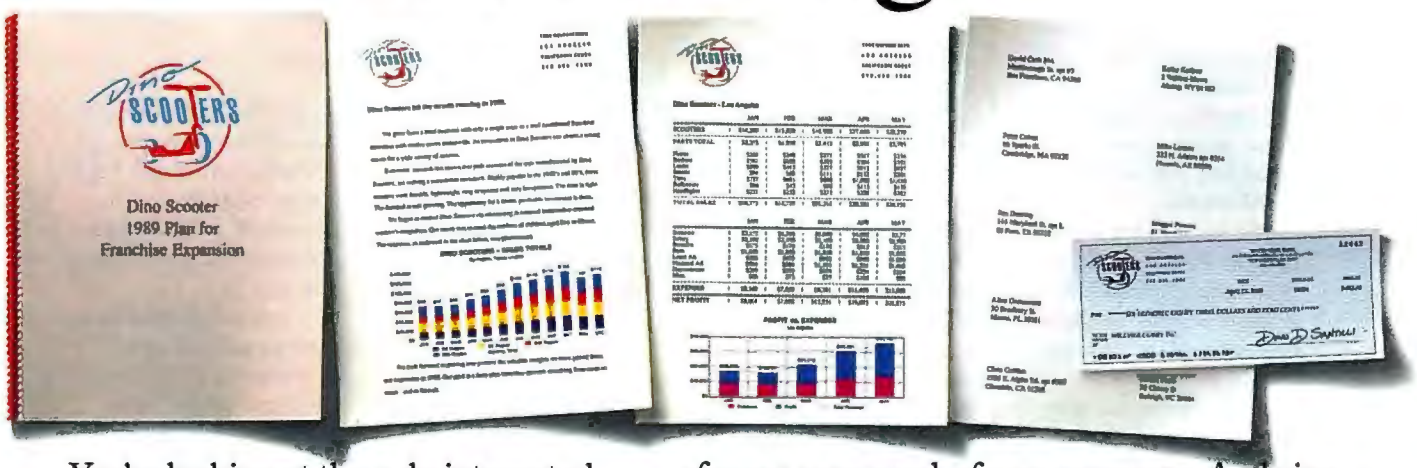

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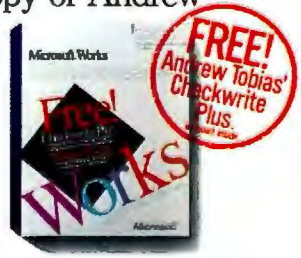

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TurboSearch

Needle-in-a-Haystack Searching Across Applications

Ashton-Tate can help you if you need to quickly track down wayward files lost on a crowded hard disk. *TurboSearch* probes your disk for word processing, data base, or spreadsheet files created by several popular applications including *dBASE*, *1-2-3*, *Framework*, *WordPerfect*, and *XyWrite III Plus*, automatically reading files in binary or ASCII format.

TurboSearch works by organizing your files into libraries that can mix and match files from different applications. You can have 3072 files per library and 500 libraries per subdirectory. The program stores the contents of each file in an index, which it uses for the searches.

The program can find a file by name, date, or character string (up to eight words simultaneously). Additionally, the program supports Boolean logic and proximity ("sounds like") searches. Once you've made a "hit," you can browse the files, print them out, or use them with the original application. If your search yields too many files, just a few keystrokes refine your criteria and initiate a secondary search to further narrow your hit list.

TurboSearch automatically creates an alphabetized dictionary of all the words in library files, and you can use the dictionary to build a keyword index for a manuscript.

The program requires DOS 2.1 or a later version, plus 512K of memory; a hard disk is recommended. The suggested price is $179. Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90502-319, 213/329-8000.

Reader service no. 749

Equity Ie

A Model 30 Plus

Epson has introduced a clone of IBM's PS/2 Model 30 that sports a selectable 8/10-MHz 8086 processor and four 8-bit expansion slots—as compared to the Model 30's 8-MHz speed and three slots.

The small-footprint (14 by 16 by 4½ inches) Equity Ie includes an MCGA graphics adapter on the motherboard that is capable of 640-by-480-pixel resolution in two colors or 320 by 200 with 256 colors. It comes with 640K of memory; built-in serial, parallel, and mouse ports; an 8087 math coprocessor socket; and a 101-key keyboard.

The Ie's three configurations include a model with a single 3½-inch floppy drive for $1149, a two-drive model for $1349, and another with a floppy and a 20MB hard drive for $1749. Epson America, Inc., 23530 Hawthorne Blvd., Torrance, CA 90505; 213/539-9140.

Reader service no. 751

Epson's new IBM PS/2 Model 30 clone, the Equity Ie, brings a 25 percent faster processor and an additional 8-bit expansion slot to the party. The small-footprint unit includes MCGA graphics on the motherboard.

Fatcat

(continued)

The files are unaffected by disk optimization and can be manually deleted if you decide not to wait out the protection period. They are recoverable through a directory-by-directory undelete program that can also reclaim just-erased files even if they weren't run through Data Guardian.

If you want to save disk space on active as well as guarded files, *Fatcat*'s version of SoftLogic's *Cubit* compresses files for you manually or automatically. *Cubit* achieves average reductions of 70 percent on *1-2-3* worksheet files, 55 percent on word processing and text files, and 45 percent on data base files.

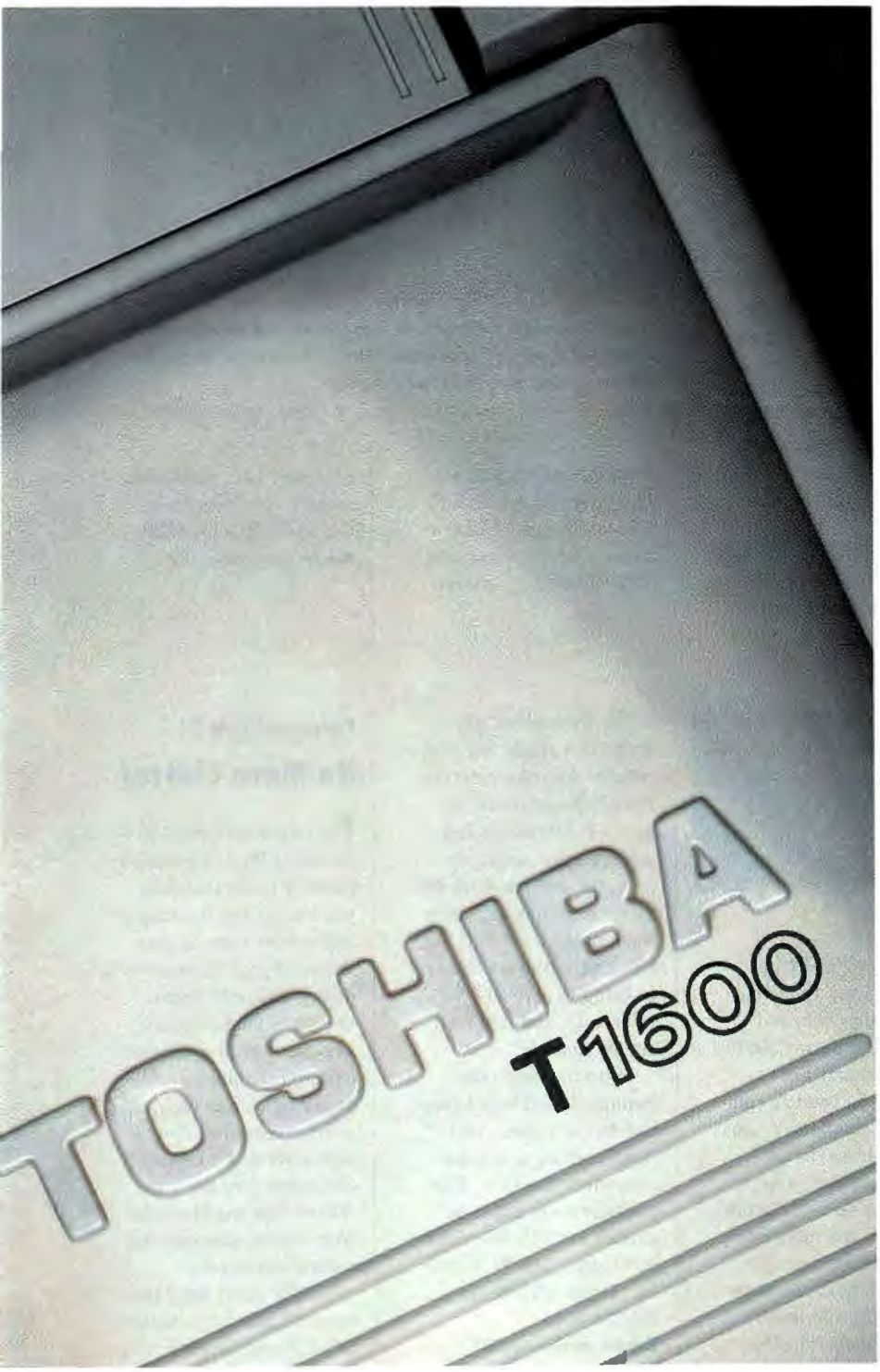
Another program "refreshes" your entire nonremovable hard disk (whether partitioned or not) by reading each track and writing it back. Done periodically, this process reportedly makes all the tracks on your disk retain their magnetism at top strength, whether data is written to them regularly or not.

Fatcat also lets you incorporate files within "folders" à la Macintosh; point to the file on the Viewer, and it opens automatically within the application that created it. About the only thing *Fatcat* won't do is format a disk. It leaves that up to DOS or any other utility you might have floating around your hard disk. *Fatcat's* file-search feature will gladly help locate them.

The $139.95 *Fatcat* requires DOS 2.0 or a later version and 256K of memory. SoftLogic Solutions Inc., 1 Perimeter Rd., Manchester, NH 03103; 800/272-9900, 603/626-9900 in New Hampshire. —*Glenn Grant*

Reader service no. 745

Now there's a battery-powered 286 with the one feature you've been waiting for.



That little package you've been expecting from us has just arrived.

The new Toshiba T1600. The fastest battery-powered portable computer we've ever made.

It packs a powerful 12MHz 286 microprocessor. One full megabyte of RAM that's expandable to 5MB. Plus a fast 20MB hard disk.

Equally impressive is its 1.44MB 3½ inch diskette drive, detachable, backlit EGA-compatible display and two expansion slots for access to an internal modem, LANs, mainframes and much more.

But at a total weight of under 12 pounds, the T1600 is bound to spend a lot of time *outside* the office. Which is why we added some other important features.

Like AutoResume, which lets you restart your work wherever you finished. And space for two removable, rechargeable battery packs no larger than the palm of your hand.

All of which makes one thing about the T1600 unmistakably clear.

It was definitely worth the wait.

T1600: Battery-powered 80C286/12MHz, 20MB hard disk at 27msec, 1.44MB 3½" diskette drive, 1MB RAM expandable to 5MB, detachable backlit EGA-compatible LCD, removeable rechargeable battery pack, coprocessor socket, 7 standard interfaces, 2 expansion slots for general purpose options. For information call 1-800-457-7777. Toshiba PCs are backed by the Exceptional Care Program (enrollment required).

In Touch with Tomorrow

TOSHIBA

Toshiba America Information Systems, Inc., Computer Systems Division

Circle 267 on reader service card

CrossFile

Tapping the Big Box

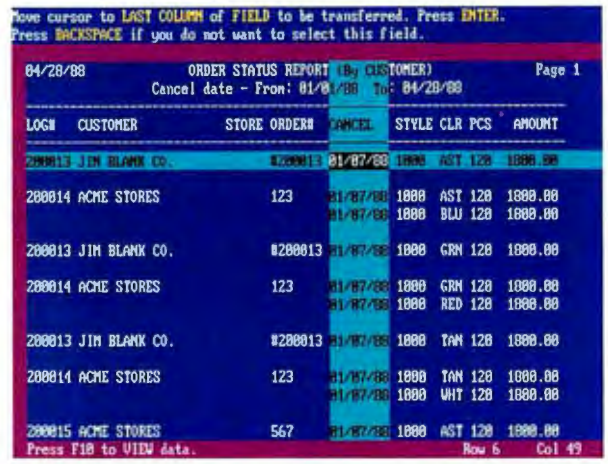
CrossFile from Saxon Systems automates the transfer of data between mainframes and popular PC applications or between PC programs.

Primarily for use in transferring output from mainframe software such as accounting programs, *CrossFile* captures structured report-layout data being sent to a printer and outputs that data as files in formatted ASCII, comma-delimited ASCII, *1-2-3*, *Symphony*, DIF, *dBASE*, *Excel*, *Quattro*, and *SuperCalc 4* formats.

To transfer accounting data, you simply capture the accounts receivable program's printer output using Capture, a small memory-resident utility. Then *CrossFile* converts the data into the appropriate format. Since the program also filters data, you can be selective about the data your application gets. The program reads *1-2-3*, *dBASE*, *Excel*, *Quattro*, and DIF files for conversion to any of the output formats. *CrossFile*'s one restriction is that the data for translation must be arranged in tables, with vertical columns for fields and horizontal rows for records.

You can use *CrossFile*'s menu system or program your data conversions from the command line. The program retails for $150 and requires DOS 2.0 or a later version and 512K of memory. Saxon Systems, Inc., 18007 Kensington Ave., Cerritos, CA 90701; 213/404-4030.

Reader service no. 752



CrossFile automates the transfer of data between and among mainframes and popular PC applications, filtering the data so that you see only the portions of a report that you want.

UPDATE

PlanPerfect 5.0

Future Perfect

PlanPerfect 5.0 provides expanded financial functions, including present and future value payment, 22 possible cases for amortization, and the ability to apply statistical functions against populations as well as samples. You can put variables inside formulas and link two open worksheets displayed on screen to an unlimited number of worksheets on disk, retrieving live data and formulas.

The *PlanPerfect* upgrade also lets you combine bar, line, pie, and area graph information in the same chart. For example, if you want to compare your company's sales in units versus dollars, you can combine graphs with the same or different scales. You can integrate logarithmic scaling with linear scaling at the same time on different axes.

In addition, *PlanPerfect 5.0* supports the enhanced file and printing capabilities of *WordPerfect 5.0*, including 32 fonts and attributes such as strike-through or subscript in a single cell and support for color printers. *PlanPerfect 5.0* can import *1-2-3* formulas and cell macros (except for printing and graphing features) and then export them back to *1-2-3*. It also has a bulk-convert feature to bring in several *1-2-3* release 1A and 2.01 files simultaneously.

You can choose the familiar *WordPerfect* function key interface, pull-down menus, or a slash-command interface. The package costs $495; upgrades are $75. WordPerfect Corp., 288 W. Center St., Orem UT 84057; 801/225-5000.

Reader service no. 753

Professional Write 2.1

No More Clutter

The latest version of *Professional Write* includes a preview mode that lets you look at the typefaces and format control characters of your documents before you print them. Designed for managers who don't need extensive editing capabilities and prefer quick and easy word processing, *Professional Write 2.1* keeps its edit mode free from the clutter that would result from continually showing control characters.

Unlike some word processors, including version 2.0 of *Professional Write*, version 2.1 allows you to change fonts and other print controls from preview mode. You also can

(continues)

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If you made the finest modems in the world, would you trust their performance to someone else's software? Software you knew really couldn't deliver?

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Circle 343 on reader service card

Volkswriter 4

Popular Style

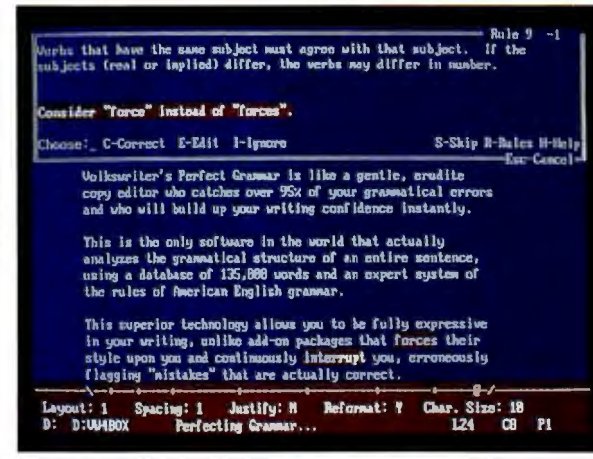
An update of the veteran *Volkswriter* adds a grammar and style checker and comes at a reduced cost. Lifetree claims that *Volkswriter 4*'s Correct Grammar module, based on Houghton Mifflin's *CorrecText Grammar Correction System*, can detect and correct 95 percent of all grammatical errors in any document. The price reduction to $199, $96 less than *Volkswriter 3*, is meant to help *Volkswriter 4* compete with executive word processors such as Software Publishing's *Professional Write* and Symantec's *Q&A Write*.

Correct Grammar uses a data base of 135,000 words and more than 1000 rules of grammar. You can elect full grammar and spell checking or spell checking only. One keystroke activates the checker, which highlights errors in spelling, syntax, subject-verb agreement, pronoun case, plural and possessive forms, hyphenation, and punctuation. It also identifies stylistic fine points such as split infinitives, wordy prepositional phrases, and clichés. Once Correct Grammar flags an error, it suggests alternatives and lets you accept or reject them.

Additionally, *Volkswriter 4* offers a feature that automatically prints the address from inside a document onto an envelope. Other new features include point-and-pick file retrieval, a file directory display sorted by date, a word counter, and an undelete option.

With Correct Grammar, the program requires DOS 2.0 or a later version, 640K of memory, and a hard disk. Without Correct Grammar, the program requires 320K and no hard disk. An upgrade from *VolksWriter 3*, including Correct Grammar, costs $88; without Correct Grammar, the upgrade is $39. Lifetree Software, 411 Pacific St., Monterey, CA 93940; 800/543-3873, 800/831-8733 California.

Reader service no. 755



Volkswriter 4 gains a grammar and style checker and cuts its price.

askSam 4N

The LANSam

The text-based information manager *askSam* is now available in a network version that runs on 3Com, Novell, Token-Ring, *TOPS*, Banyan *Vines*, Ungermann-Bass, and other NETBIOS networks.

askSam version 4N allows only one user at a time to update a file but permits multiple simultaneous queries of a file.

Like the stand-alone program, *askSam* version 4N features global scanning. *askSam* allows free-form entry of data, to which structure may or may not be added. It comes with a range of query and retrieval commands and includes a full-screen text editor and report generator.

askSam version 4N is priced at $895 for up to ten workstations running off one file server. Each additional set of ten users accessing the same server costs $500. The software requires DOS 2.0 or a later version and 256K of memory. askSam Systems, P.O. Box 1428, Perry, FL 32347; 800/327-5726.

Reader service no. 756

Running on 3Com, Novell, Token-Ring, TOPS, Banyan Vines, Ungermann-Bass, and other NetBIOS networks, askSam version 4N permits multiple simultaneous queries against a file.

Professional Write 2.1

(continued)

bring graphs from *Harvard Graphics* into the program.

Finally, *2.1* adds the ability to read and write *Microsoft Word 4.0*, *OfficeWriter 6.0*, and *WordPerfect 5.0* files and includes font support for IBM, Epson, Panasonic, and Okidata 24-pin dot matrix printers as well as lasers.

Professional Write, which still retails for $229, requires DOS 2.0 or a later version and 512K of memory; a hard drive is recommended. Software Publishing, Inc., 1901 Landings Dr., Mountain View, CA 94039-7210; 415/962-8910.

Reader service no. 754

The devil made you do it. That is, MS-DOS® made you do it. The commands were obscure. The file names made no sense. You couldn't even find the directory, much less the subdirectory.

And so, another talk with the man upstairs.

SOFTBREEZE™ CHANGES THINGS FOR GOOD.

Introducing SoftBreeze,™ the fastest way to make your operating environment intelligible.

With SoftBreeze, you use on-screen menus and plain English language to manage your files and disk logically. So you don't have to memorize DOS commands.

And you can use 48 characters to name a file. So it's easy to sort, locate, retrieve, and view files. Not to mention copy, delete, back up, and print them.

SoftBreeze offers you multitasking and "cut and paste" features, too. Which means you can access all of your applications quickly. And transfer information efficiently.

AN ANSWER TO THE PC MANAGER'S PRAYERS.

For the PC manager, SoftBreeze is a breeze. Your users no longer must endure an eternity of training. And you don't have to answer endless calls for help.

The program also installs automatically, and is fully compatible within networked architectures, even LANs.

What's more, SoftBreeze uses less than 30K RAM, so it doesn't waste memory needed to run other programs. Which enhances the utility of your 512K-1MB PCs.

And finally, you can easily customize individual environments and use powerful diagnostic tools to find and solve problems quickly. Control at last.

Soft Breeze™
User Interface

We put the *personal* back in PC.

ABSOLUTION ABSOLUTELY GUARANTEED.

For a limited time only, you can get SoftBreeze for just $129 ($169 after June 30). No other user interface offers so many features, uses such little memory, and is this affordable. In fact, you can try the package for 30 days. If you're not completely satisfied, your money will be refunded in full.

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Introductory Offer

$129

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(Order 24 hours a day, 7 days a week)

System requirements:
IBM PC, XT, AT, PS/2 and compatibles, with hard disk. At least 512K and MS-DOS 3.x.

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Circle 257 on reader service card

RealWorld 5.0

A New World

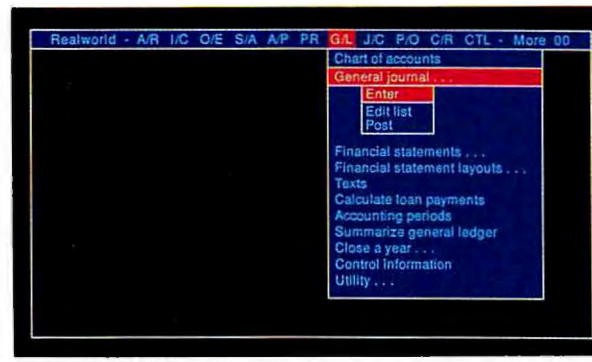
Functional improvements and a rebuilt interface are the hallmarks of version 5.0 of the 11 *RealWorld* accounting packages. You now enjoy a choice of *RealWorld*'s traditional menu structure or a new windowed interface with pulldown menus and the ability to define shortcuts for navigating among one or more *RealWorld* applications.

You'll can open more than one *RealWorld* accounting module at a time and switch back and forth between them, and build groups of modules that load and execute together at a single command. Additionally, RealWorld has streamlined the installation procedures and added predefined financial statement layouts, charts of accounts, and other aids to speed setup.

The company has expanded field amounts to 999 million and general ledger account numbers to 16 digits, and changed cash-flow statements to better meet government standards. The accounting suite includes general ledger, accounts receivable, accounts payable, professional invoicing, payroll, inventory control, order/entry billing, job cost, and purchase order—each priced at $695 for single-user versions and $795 for network versions. Single and multiuser sales analysis modules are $350 and $400, respectively, while the corresponding check reconciliation programs are $230 and $265.

Upgrades are available to registered users for $295 per module for single-user versions or $325 for network versions. *RealWorld* modules require DOS version 3.3 or a later version, 640K of memory, a hard drive, and a 132-column printer. RealWorld Corp., 282 Loudon Rd., Concord, NH 03302-2051; 800/255-1115.

Reader service no. 757



Version 5.0 of RealWorld gives you the choice of its traditional menu structure or a new windowed interface with pulldown menus, plus shortcuts for navigating the commands in RealWorld applications.

Designer 2.0

Multitasking Designer

Micrografx's new version of *Designer* offers a graphic user interface compatible with OS/2 Presentation Manager's and includes enhanced color support and an auto-trace tool.

Designer 2.0 works under *Windows*, but you can obtain a special Presentation Manager version free with proof of purchase of OS/2 Standard or Extended Edition 1.1. This version takes full advantage of PM's multitasking, extended memory, and protected-mode capabilities.

Either version of *Designer 2.0* lets you mix up to 16 million colors, including all Pantone Matching System shades, and create gradient color fills. You also can produce spot or four-color separations.

Designer 2.0's auto-trace tool lets you trace any scanned image or part thereof to create resolution-independent, object-oriented outlines composed of editable Bezier curves. The new version of the freehand drawing tool also creates Bezier curves and smooths them dynamically, in addition to creating straight-line vectors as before.

Designer 2.0 has enhanced import/export capabilities and comes bundled with *Windows* drivers for PostScript printers. Other enhancements include context-sensitive help, improved text handling with word wrap, and image mirroring.

Designer 2.0 requires DOS 3.1 or a later version, 640K of memory, and an 80286-based computer with at least 640K of memory, an EGA or better graphics adapter, mouse support, and a hard disk. It retails for $695 but is free for subscribers to Micrografx's extended technical support service. Other registered users can upgrade for $99. Micrografx, Inc., 1303 Arapaho, Richardson, TX 75081; 214/234-1769.

Reader service no. 758

Micrografx's latest Designer is compatible with OS/2 PM's graphic user interface and includes enhanced color support and an auto-trace tool.

For more information about any product, contact the manufacturer or circle the number on the reader service card. ●

Mark Henricks is a PC World *contributing editor, Wes Nihei is a* PC World *assistant editor, and Glenn Grant is a freelance writer based in San Diego.*

OUR SILENTWRITER IS CREATING HEADLINES ON SEVERAL FRONTS.

Our Silentwriter™ LC890 is the first desktop publishing printer that gives you both popular standards for creating graphics and type: true Adobe PostScript® and LaserJet Plus emulation.

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EDITOR'S CHOICE

PC Week

NEC's SilentWriter Printer Boasts PostScript, HP LaserJet Plus Emulation

The new NEC SilentWriter LC-890 laser printer breaks new ground on several fronts. Until now, buyers of laser printers have been

NEC's LC-890 printer, however, makes that issue a moot point—and adds new meaning to the term "full featured." NEC

And because the Silentwriter has a simple, trouble-free printing mechanism, it will be creating headlines for years to come. In fact, it's twice as reliable as ordinary lasers, with an average life of 600,000 pages.

If you don't require the power of our LC890, consider the LC860 Plus for text and less complex graphics.

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NEC

C&C Computers and Communications

NEC Information Systems, Dept. 1610, 1414 Massachusetts Ave., Boxborough, MA 01719.

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The new COMPAQ DESKPRO 286e. Further proof that what's on the outside,

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says a lot about what's on the inside.

Compaq has earned a reputation for building the most powerful and reliable personal computers in the world.

In doing this, we've always given users the best combination of features needed to do their jobs. We've also never given up the belief that even the most basic needs deserve more than just basic solutions.

Built-in VGA graphics run up to 50% faster than other VGA controllers.

As further proof, we offer the COMPAQ DESKPRO 286e Personal Computer.

It brings together a 12-MHz 286 microprocessor and a long list of integrated features. All in a compact package that runs the latest applications, without taking up more desk space.

Five expansion slots give you room to grow: one for high-speed memory, and four for thousands of industry-standard add-ins.

Your users will find everything they need in a stand-alone PC, perfect for their growing business productivity applications.

You'll also find a PC that's been rigorously tested with a wide range of network products, so it's compatible in virtually any network environment.

Now for an inside look. High-performance VGA graphics are built right on the system board. So your users can have displays that are easier to read. You, in turn, will have compatibility with all your EGA- and CGA-specific software plus performance that's up to 50% faster than other VGA controllers.

Built-in interfaces mean you can connect a mouse, printer, modem or other tools without taking up a slot.

In memory, one megabyte is standard and is expandable in increments up to 13 megabytes using a *separate* high-speed memory expansion slot. This leaves four industry-standard expansion slots open for LAN cards, mainframe links, etc. to customize the COMPAQ DESKPRO 286e to your users' needs.

You can take customization a step further. The COMPAQ DESKPRO 286e can be configured with up to four internal storage devices. Choose fast 110-, 40- and 20-MB fixed disk drives; both 5¼- and 3½-inch diskette drives; even tape drives.

You'll get the flexibility to use both 5¼- and 3½-inch diskette drives, along with a wide variety of fixed disk drives and tape drives.

As you can see, the new COMPAQ DESKPRO 286e offers the same attention to detail that has made the COMPAQ name unmatched for performance, quality and reliability.

For a free brochure on the COMPAQ DESKPRO 286e and the location of an Authorized COMPAQ Computer Dealer near you, call 1-800-231-0900, Operator 92. In Canada, just call 1-800-263-5868, Operator 92.

COMPAQ

It simply works better.

Seven Top LANs: A Hard Look at Ease of Use

Network operating systems all claim to be faster, safer, and more feature-packed, but which are really easiest to install, administer, and use?

Robert Lauriston

When you're serious about networking an office full of PCs, chances are you have more in mind than sharing printers, sending E-mail, and exchanging files. That's because the mother lode of productivity lies in consolidating data with a multiuser application, usually a data base. And like it or not, multiuser software means buying a server plus a high-end, server-based network operating system (NOS) to match.

This roundup examines seven of the leading server-based NOS's. Two of these, 3Com's *3+Share* and Datapoint's *DataLAN*, run on top of good old DOS, while three new products—3Com's *3+Open*, IBM's *LAN Server*, and Torus's *Tapestry II*—run under OS/2. The two best packages, Novell's *Advanced NetWare 286* and Banyan's *Vines/386*, have proprietary operating systems.

The OS/2 NOS's are especially interesting. All three readily support DOS workstations and use the much-heralded Microsoft *LAN Manager* as their operating kernel. The packages reviewed here are interim products, but in the long run, *LAN Manager*'s concurrent processing and multithreaded code should bring major performance improvements (see "OS/2 in Transition," *PCW*, May 1988). *LAN Manager* also provides a platform for distributed applications (such as Microsoft/Ashton-Tate's forthcoming *SQL Server*) that speed work throughput by letting the server's CPU handle some critical computing tasks. Whether based on DOS, OS/2, or a proprietary operating system, the NOS's reviewed here all perform the same basic functions. They enable administrators to guard security by controlling user access to applications, data files, and network resources (printers, modems, and remote subdirectories). They run multiuser applications. And, with one exception, they work with the three major types of network boards: Ethernet, Token-Ring, and Arcnet.

Fundamentals aside, you'll find crucial differences, especially in ease of installation and administration. If you're smart, you'll leave installation to an outside expert in almost every case, but such tasks as adding users and changing access rights can be done by an in-house network administrator.

Administration ranges from straightforward to nightmarish. The acid test is wheth-

er or not a NOS enables administrators to assign access rights to network resources in user groups. If it does, a group member has a specific, predefined set of resource privileges once he or she logs on; the administrator changes rights merely by reassigning users to various groups. If it doesn't, users may have to enter a different password for each resource, and the administrator must change access rights user by user, resource by resource.

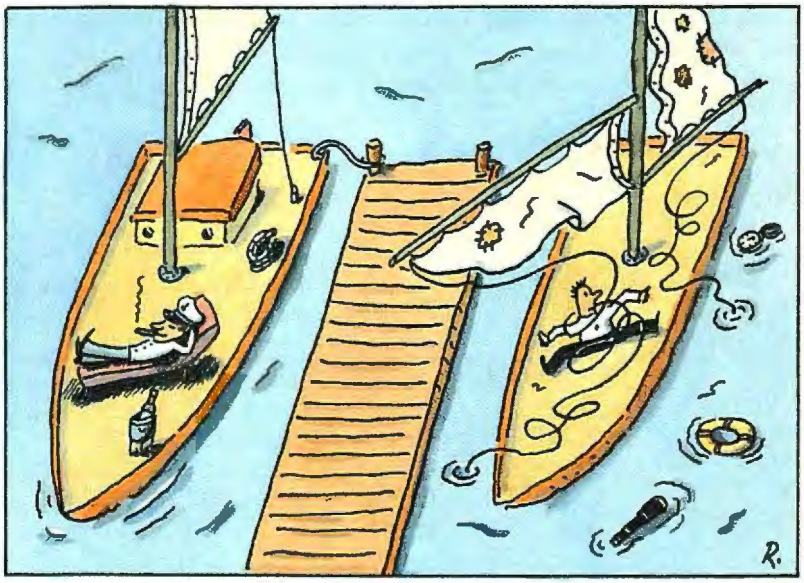
Performance is the most obvious selection criterion and the most overrated one. Server muscle and the amount of cache memory have a much bigger impact on network performance than which NOS you select. Nonetheless, under heavy network traffic, significant differences surface. National Software Testing Laboratories (NSTL) benchmarks, performed on a ten-node test bed, spotlight *3+Open*, *NetWare*, and *Vines* as the big speed winners.

To provide meaningful cost comparisons, all the NOS's are priced in the standard *PC World* configuration, which includes server software and software for ten workstations. If E-mail isn't available from the vendor, the cost of a third-party package ($695 for the popular *cc:Mail*) has been added.

Novell Advanced NetWare 286

Think networks and you probably think *NetWare*, for a number of good reasons. One of the fastest NOS's tested, *Advanced NetWare 286* offers excellent security features, Mac and OS/2 connectivity, and a reasonable price ($3690 with *cc:Mail* in the *PC World* configuration), making it the system of choice for all but the largest LANs.

NetWare speeds work for both users and the administrator. It lets you run applications, send messages, and access resources, either from the DOS prompt or via a logical menu system. Most network options—



MARC ROSENTHAL

including setting access rights by user group—are set with the easy-to-use SYSCON menu.

A generous 525K of usable workstation RAM remains after DOS 3.31 and *NetWare* are loaded—the most free RAM in the roundup. *NetWare*'s proprietary operating system, which runs the CPU in protected mode, provides automatic disk caching. Online help is available throughout, though it's quite difficult to use.

Several unusual features ensure data integrity. Hot Fix reads all data written to disk; if the disk data seems questionable, Hot Fix rewrites the original data to another location, tests the disk sector, and permanently locks the sector out if it doesn't pass. Support for disk mirroring (where a second hard disk acts as a continuous backup for the first) and other fault-tolerant features are available at extra cost.

In NSTL testing, *NetWare* took top place in every transaction-processing test, reflecting performance under heavy traffic from many users. It did quite well in the other tests too.

Dozens of handy network utilities ease such tasks as setting and tracking security,

FEATURES EVALUATION

NetWare and Vines: Top Picks for Administrators

NetWare's rich administrative features and remarkable ease of use add up to the best single-server network operating system in the roundup. Vines/386 runs a close second in administrative ease, and its distributed name service makes it a better choice for multiserver LANs.

● Yes
○ No
◒ Deficient

Standard features	Novell Advanced NetWare 286	Banyan Vines/386	3Com 3+Share	3Com 3+Open	IBM LAN Server	Torus Tapestry II	Datapoint DataLAN
List price[1]	$3690[2]	$5990	$3090	$3690[2]	$4685[2]	$4180	$5185[2]
Installation							
Dedicated server required	○	●	○	○	○	●	○
Menu-driven installation	●	●	●	●	●	○	○
Links to OS/2 workstations	●	○	●[3]	●	●	○	○
Links to Mac workstations	●	○	●	○	○	○	○
Minimum server RAM required	2MB	4MB	896K	4MB	3MB	4MB[4]	512K
Usable RAM in workstations	525K	481K	448K	448K	501K	472K	512K
Copy protected	○	●	○	○	○	○	○
Resource sharing							
Open files on other workstations	○	○	○	○	○	●	●
Menu-driven user software	●	●	●	●	●	●	●
Printing							
Share printer at server	●	●	●	●	●	●	○
Share printer at stations	○	●[3]	○	○	○	●	●
E-mail							
Maximum number of file attachments	◒[5]	10	25	◒[5]	◒[5]	1	◒[5]
Inter-LAN routing	◒[5]	●	●	◒[5]	◒[5]	●[6]	◒[5]
Other resources							
Messaging	●	●	●[7]	●	●	●	●
Scheduler	○	○	○	○	○	●	○
Share modem	●[3]	○	●[3]	●	◒[8]	●	○
Log-in via modem	●	●[3]	●[3]	●	○	●[3]	○
Administration							
Security							
User groups	●	●	○	●	●	○	○
Require regular password change	●	●	○	●	○	●	○
Restrict log-on time	●	●	○	○	○	○	○
Restrict workstation permitted	●	●	●	○	○	●	●
Limit subdirectory to one user at a time	○	●	●	●	●	●	○
Restrict individual files	○	●	○	●	○[8]	○	○
Distributed name service	○	●	●	○	○	○	○
Backup							
Back up server to tape	●	●[9]	●	●	●	●	●
Disk mirroring/duplexing	●[3]	○	●[3]	○	○	○	●[2]
Fault tolerance	●[3]	○	●[3]	○	○	○	○

[1] Price includes software for one server, ten workstations, and E-mail.
[2] E-mail not available from vendor; price includes $695 for third-party package.
[3] Available at extra cost.
[4] DOS server requires 640K.
[5] No E-mail included; depends on third-party E-mail package.
[6] Only if node is active when message is sent.
[7] DOS stations can only receive.
[8] OS/2 workstations only.
[9] Full server backup requires Banyan tape drive.

EXECUTIVE SUMMARY

Novell Advanced NetWare 286

LAN operating system

BEST BUY

Strong performance and low price—plus Mac, mainframe, and OS/2 connectivity—keep this industry leader at the head of the class. Administrative and security features are also top-notch. Ideally suited for single-server networks.

	POOR	FAIR	GOOD	EXCELLENT
Installation			●	
Resource sharing				●
Administration				●
Performance				●
Overall value				●

Reader service no. 622

managing different versions of DOS, troubleshooting disk problems, handling print spooling, and so on. The security capabilities are unusually sophisticated; you can even specify when a user can log on and from which terminals, and the maximum amount of server disk space each user can have. The downside to all this power is intricate administration, especially when you have to depart from the SYSCON menu.

Installing *NetWare* is fairly tedious. For one thing, an exhaustive disk-testing program must run overnight (or longer). For another, the installation program actually compiles a customized operating system for your server, which contributes to the superior performance. Most people prefer to hire a specialist to install *NetWare*, but if you decide to do it yourself, you'll find the documentation excellent.

NetWare has stood the test of time, and its large installed base means that third-party service and experienced administrators are easy to find. And *NetWare SQL*, Novell's *NetWare*-compatible distributed multiuser data manager, gives users one less reason to switch to OS/2. With innovation like this, *NetWare* is likely to stay at the top of its class.

Banyan Vines/386

Banyan's up-and-coming *Vines/386* is a top performer that's surprisingly easy to install and configure. At $5990 (with its own add-on E-mail package), it's also the most expensive NOS in the roundup, but powerful administrative tools make it well worth the money for large, multiple-server networks. Aside from expense, the only significant drawback is lack of connectivity to Mac and OS/2 workstations.

Working with *Vines/386* is straightforward. An easy-to-use menu of network commands is provided, but most commands can be entered from the DOS prompt. Once loaded, *Vines/386* leaves a fair-to-middling 481K of usable RAM for workstations. On-line help is available at the touch of a function key, and it's good enough that you may never need to crack the clear, well-organized manual.

Vines/386 is the only NOS in the roundup that specifically exploits the 80386 chip's superior memory management. That's undoubtedly one reason why NSTL testing shows *Vines/386* to be one of the fastest NOS's around. Under heavy traffic it won three out of eight tests (not all shown on accompanying NSTL Test Report) and came close to *NetWare* on the rest.

EXECUTIVE SUMMARY

Banyan Vines/386

LAN operating system

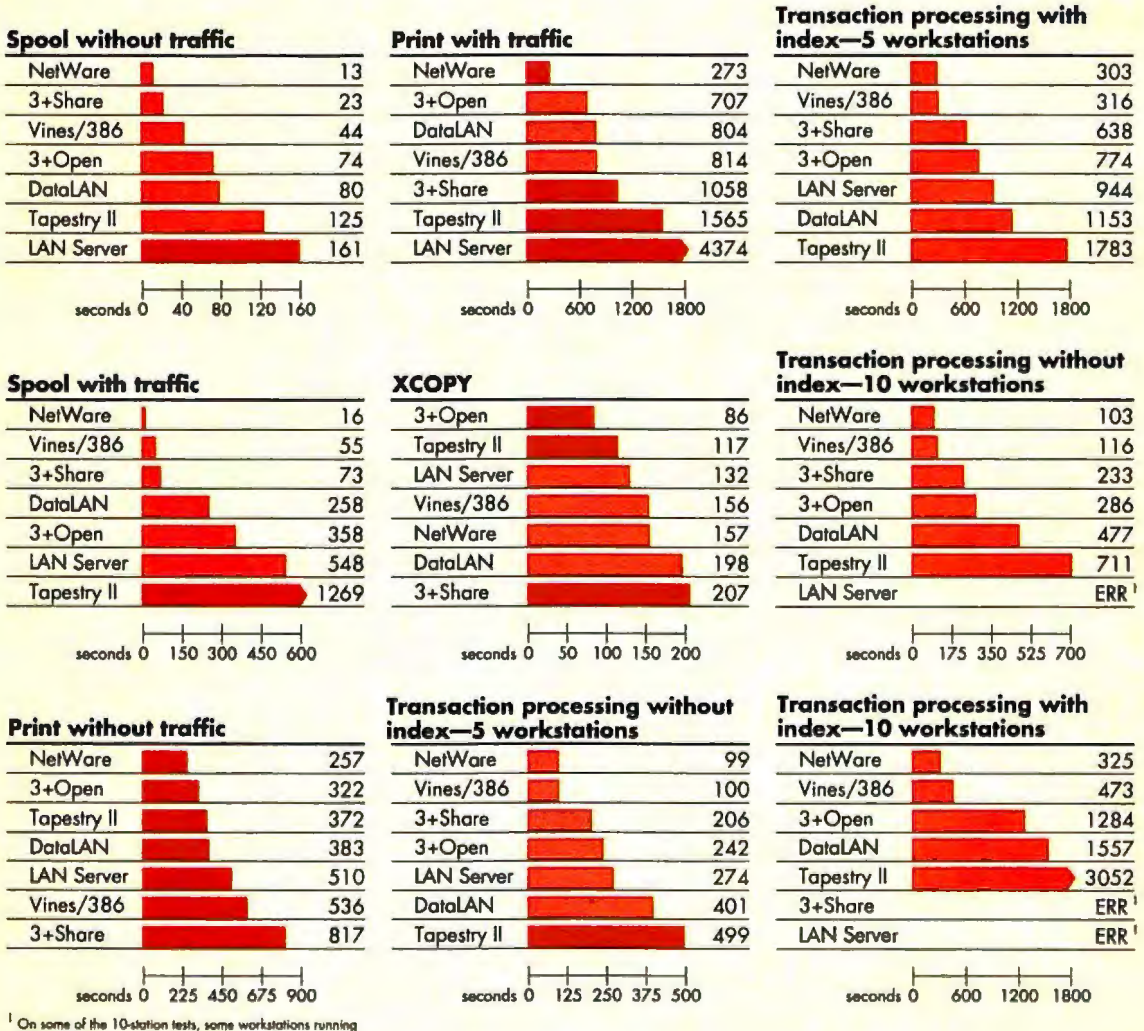
Powerful, elegant, and expensive, Vines/386's top performance and flexible addressing scheme suit it ideally to large, multiple-server networks. Easy installation and strong security features are added attractions; connectivity to non-DOS workstations is the only missing piece.

	POOR	FAIR	GOOD	EXCELLENT
Installation			●	
Resource sharing				●
Administration				●
Performance				●
Overall value				●

Reader service no. 626

For Speed and Ease of Use, Novell's NetWare and Banyan's Vines/386 Are Top LANs

Novell's NetWare takes top performance honors, especially in tests with heavy network traffic—and offers strong security and administration, too. Banyan's Vines/386 boasts easy installation and performs very well overall, particularly in the transaction processing benchmarks showing performance of a multiuser data base under heavy usage. 3Com's 3+Open is fastest by far in the XCOPY tests and will be a serious contender once it adds a full feature set under OS/2.



[1] On some of the 10-station tests, some workstations running IBM's LAN Server and 3+Share hung up or lost their network connection.

Methodology
The purpose of these tests was to compare the speed of network operating systems (NOS's) under varying traffic conditions. Performance was measured via a series of application tests run with and without network traffic, and transaction processing tests run first on 5 stations and then on 10 stations. Comparing "with traffic" versus "without traffic" values and 5-station versus 10-station values indicates how performance degrades as network use and size increase.

IBM's Token-Ring was chosen for NSTL's test LAN, as only Token-Ring hardware is supported by all seven systems. The server was a Compaq Deskpro 386/20 with a 130MB ESDI hard disk, 5MB RAM, an IBM Token-Ring Adapter II, and a Hewlett-Packard LaserJet Series II. The workstation used for the tests was a Compaq Deskpro 386/25 with a 130MB ESDI hard disk, 5MB RAM, and an IBM Token-Ring Adapter. Ten additional workstations were 12-MHz Deskpro 286s with 20MB hard disks, 1MB RAM, IBM Token-Ring Adapters, and DOS 3.31. Each NOS was adjusted for best performance on the test LAN according to manufacturer's instructions. (Since IBM's *LAN Server* doesn't run on an AT server, it was tested on an IBM Model 70-121 with 6MB RAM and a Token-Ring Adapter/A. For comparison, *3+Open* was tested on both servers; the only significant difference in results was that on the Model 70 it failed the spool and print tests.)

Heavy network traffic for the spool and print tests was simulated by 5 workstations running *Foxbase+/LAN*. Every 2 seconds each workstation performed a transaction consisting of finding a record by indexed search in each of three files (10K, 100K, and 5MB), locking them, updating them, and unlocking them. No log or history files were written.

Spool and Print
DOS COPY was used to send a 1.2MB, 300-dpi *Ventura Publisher* "print to disk" file to LPT1, which was rerouted to the server's print queue. Timing of both spool and print tests started when the COPY command was entered. Spool timing ended when the workstation returned a DOS prompt; print timing ended when the last page dropped into the printer tray. (*DataLAN* does not support printers attached to its dedicated server, so LPT1 was rerouted to another workstation's print queue.) This test was run with and without network traffic.

XCOPY
One hundred fifty-five files totaling 12.9MB of data in 10 directories were copied from the workstation to the server using the DOS XCOPY command. This test was run without network traffic and represents a best-case file-transfer scenario.

Transaction processing
Foxbase+/LAN was used to run a modified version of TP1, a standard test based on a retail banking system comprising 10 million accounts, 10,000 tellers, and 1000 branches. The standard unit of transaction selected was debit/credit. Test files on the server were Accounts (50,000 100-byte records), Teller (1000 100-byte records), Branch (100 100-byte records), Transaction (1000 25-byte records), and History (0 records for unindexed tests; 10,000 75-byte records for indexed tests).

For each of 500 transactions, a record was read from the Transaction file; located and locked in Accounts, Teller, and Branch; and added to History; then all records were updated and unlocked. Tests were done with 5 and 10 workstations (500 and 50 transactions per station, respectively) and were run with and without four indexes on the history file. (Indexing is more disk intensive and requires more files to be open.) The rate of transaction processing in these tests represents unusually heavy workstation activity.

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

Unlike *NetWare*, which lacks E-mail entirely, *Vines/386* comes with an excellent, menu-driven E-mail package that enables you to set up folders for storing mail. You also get a decent text editor and the ability to attach up to ten files to a single message.

Administration is relatively straightforward, and *Vines'* log-in security options are second only to *NetWare's*. Best of all, *Vines/386* includes StreetTalk, a distributed-resource manager that's a must-have for multiple-server LANs. StreetTalk tracks network users by name, enabling you to reshuffle resources without having to specify which server holds a given user's log-in data, security rights, personal directories, and so on.

Installation is completely automated and very easy. Aside from telling *Vines/386* what boards are in the server and what time zone you're in, there's nothing to do but swap disks when prompted. A hardware key (Banyan's annoying form of copy protection) must be attached to the LPT1 port; the key passes data through so you don't lose a printer port.

Vines/386 is pricey, and the missing link to Mac and OS/2 workstations may be frustrating. Your reward for living with these flaws is speed, easy installation, painless administration, a powerful feature set, and the convenience of StreetTalk. *NetWare* is still a better option for single-server networks, but in a large, multiple-server setting with only DOS workstations, *Vines/386* is the ideal choice.

NSTL BENCHMARK TESTING

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

3Com 3+Share

3+Share is one of the lowest priced full-featured LANs available ($3090 with its optional E-mail). Designed to handle large, multiple-server networks, it permits connectivity with Macs, mainframes, UNIX nodes, and OS/2 workstations. And although it's an add-on, *3+Mail* is one of the best E-mail packages available. Unfortunately, *3+Share* itself is sadly out of date. Performance is poor, and installation and administration are maddeningly difficult.

Even end users may find *3+Share* taxing. As with any other NOS, running remote applications is transparent, but using network resources is another story. *3+Share*'s command classifications—3F (file tasks), 3P (print), 3M (mail), and so on—are arbitrary and confusing, and on-line help is available for only one group of commands at a time. Administrators are advised to exploit *3+Share*'s menu generator, which, although difficult to use, produces menus that protect end users from the bewildering command shuffle.

With DOS loaded, *3+Share* leaves only 448K of usable workstation RAM, tying with *3+Open* for lowest count in the roundup. On the server side, the DOS 640K limit means you must choose between installing 3Com's E-mail option and allocating enough RAM for tuning network performance. Fortunately, 3Com's new 80386-based dedicated server, the 3S/400, solves the RAM allocation problem by exploiting extended memory. Optional fault-tolerant disk management software (much like *NetWare*'s) runs on both dedicated and nondedicated servers.

3+Share showed surprisingly poor performance on a ten-node network. It crashed on four NSTL tests (not all shown). On the tests it didn't flunk, its performance was generally below average.

One of *3+Share*'s strongest suits is its powerful distributed-resource manager, Name Service. Similar to *Vines/386*'s StreetTalk, Name Service greatly eases switching to and maintaining a multiserver network. The $595 *3+Mail* is also a big plus, offering an excellent text editor and an interface so easy the manual becomes superfluous. Another add-on, *3+Route* ($1500), provides transparent communications with other 3Com LANs.

3+Share's security features are limited, and its administrative features, although comprehensive, are exasperating to use. For example, to install a server-based multiuser application, you must log on and off several times under two different administrator names. Worst of all, *3+Share* does not enable you to assign access rights to user groups, making efficient security management impossible.

If administration is frustrating, installation is downright infuriating. *3+Share* includes a menu-driven installation program, but configuration and debugging must be done manually—and the documentation is both misleading and inaccurate. If you must install *3+Share* yourself, plan to spend hours on the phone with 3Com's technical support.

Sluggish performance and painful administration clearly indicate that *3+Share*'s time has come and gone. If you need speed, wide connectivity, distributed resource management, and the right tools for a large, multiple-server LAN, consider *Vines/386*—and read on to find out about *3+Open*.

EXECUTIVE SUMMARY

3Com 3+Share

LAN operating system

Despite low cost, an outstanding (optional) E-mail package, and the ability to connect with Macs and OS/2 workstations, *3+Share* misses the mark. The sore points are poor performance, painful installation, and difficult administration.

	POOR	FAIR	GOOD	EXCELLENT
Installation		●		
Resource sharing				●
Administration			●	
Performance		●		
Overall value			●	

Reader service no. 621

3Com 3+Open

3Com helped develop *LAN Manager*, so it's no surprise that *3+Open* is the best of the three OS/2 products reviewed. One of the fastest NOS's tested—blazingly fast in some tests—*3+Open* provides a set of administrative tools that are powerful, flexible, and easy to use. What's more, at $3690, *3+Open* (with *cc:Mail*) matches *NetWare*'s price exactly.

3Com clearly intends *3+Open* to do everything *3+Share* does and more, including running *SQL Server*. But at this writing, the company has not yet transferred all of *3+Share*'s features (Name Service, *3+Mail*, *3+Route*, Mac connectivity, fault tolerance, and so on) to *3+Open*, which means installing a second server running *3+Share* to get a complete package. And while 3Com claims that *3+Open* will have all these features by the time you read this, be forewarned that the current version harbors a number of minor but annoying bugs.

3+Open has the best-designed user interface in the roundup, with a look and feel just like that of DOS 4.0's DOS Shell. Users employ a mouse to navigate a series of handy, customizable, pulldown menus that integrate network resources, applications, and file management; context-sensitive help screens guide you throughout. You can get a DOS prompt if you want one, and all network commands have command-line equivalents. Unfortunately, *3+Open* still leaves only 448K at the workstation.

One of the top three performers on NSTL's tests, *3+Open* took the gold on the no-traffic benchmarks (not all shown) but slowed down significantly under heavy network traffic. This may have been due to OS/2's hefty RAM requirements, which left less RAM than other NOS's did for disk caching on the 5MB-equipped test server (not all tests are shown).

Administration relies on a user interface as logical and attractive as that enjoyed by end users. *3+Open* offers the best and most flexible security features in the roundup, including a flexible method of assigning access rights to user groups. Troubleshooting utilities still need work, however; trying to get an on-screen explanation of certain error codes caused the administrative program to crash. The program also occasionally registered false log-ons.

Like *3+Share*, *3+Open* has an awful installation utility, and the manual is only slightly better than *3+Share*'s. Vendor or other outside-expert installation is a must.

The jury is still out on *3+Open*. Its performance is impressive, and its administrative tools set a new standard for versatility and ease of use, but bugs in release software are always disturbing, and we have to take on faith 3Com's promise to swiftly incorporate such missing pieces as Mac connectivity. By the time you read this, other NOS's based on *LAN Manager* may already be giving *3+Open* serious competition.

EXECUTIVE SUMMARY

3Com 3+Open

LAN operating system

It's fast, it has a great user interface, it provides the best security around, and it even has a low price. The only problem with this *LAN Manager*–based product is that it's not quite ready for prime time and requires a second server running *3+Share* to provide full services. 3Com says these features will be built in by the time you read this.

	POOR	FAIR	GOOD	EXCELLENT
Installation	●			
Resource sharing				●
Administration			●	
Performance				●
Overall value			●	

Reader service no. 620

IBM LAN Server

LAN Server is unlikely to win converts to the IBM fold. Overpriced and underpowered, this *LAN Manager*–based product runs only on IBM PS/2 Models 50 through 80 and is compatible only with Token-Ring boards. Performance is mediocre, and at $4685 (in the standard *PC World* configuration) the package costs significantly more than *NetWare* or *3+Open*. One of its few pluses is

leaving workstations more than 500K of usable RAM.

Workstations linked by *LAN Server* must run either IBM OS/2 Extended Edition 1.1, or DOS 3.3 with IBM's *PC LAN 1.3* (which requires one copy per workstation). Extended Edition 1.1 incorporates the Presentation Manager, and the LAN features are well integrated into the user interface; by contrast, *PC LAN*'s interface is inconsistent and keystroke hungry. Worse, although adding applications to *PC LAN*'s menu is easy, you can do so only if the program files are on the server.

One of *LAN Server*'s biggest problems is bugginess. Following instructions to set up user accounts for DOS workstations can result in unusable log-ons. The system constantly loses track of log-ons and gives false 'you are already logged on' messages. In addition, several of the program's on-line tutorials crashed.

In NSTL tests, *3+Open* consistently outperformed *LAN Server*. Moreover, *LAN Server* froze during the toughest multiuser test.

LAN Server falls far short of *3+Open* in administrative and security features. Access restrictions are limited and do not extend to individual files, as with *3+Open*.

EXECUTIVE SUMMARY

IBM LAN Server

LAN operating system

Expensive, sluggish, and buggy, IBM's adaptation of LAN Manager will appeal only to those who follow the Big Blue road wherever it leads. As if by accident, it needs a PS/2 Model 50 or better as a server and works only with Token-Ring network boards.

	POOR	FAIR	GOOD	EXCELLENT
Installation	●			
Resource sharing				●
Administration	●			
Performance		●		
Overall value	●			

Reader service no. 624

Installation on the server is monotonous, requiring a lot of Extended Edition groundwork before you even begin to install *LAN Server*. And of course, you must run either the Extended Edition or the *PC LAN* installation routine on every workstation you add.

LAN Server is clunky, buggy, finicky, and feature poor. *3+Open*, with the same *LAN Manager* core, does more, works better and faster, and costs less. The only people who will buy *LAN Server* are those who are married to IBM for better or worse.

Torus Tapestry II

Like *3+Open*, *Tapestry II* is an OS/2 NOS in transition. By itself, this new *LAN Manager*–based product is pretty barebones; to get E-mail, a group scheduler, and many other useful features, you need a second server running the DOS version of *Tapestry*. In a single-server configuration, performance is generally below average, and the $4180 price is $490 more than *NetWare*'s.

Tapestry's well-deserved reputation for ease of use lies in its unique, character-based graphic interface. With its icon-based menu, it smoothly integrates network commands, E-mail, scheduling, user applications, and file management tasks. You navigate by mouse, cursor, or first letter of the icon name. A good on-line help system is available at all times, and the system leaves you a moderate 472K of usable RAM.

Despite OS/2, *Tapestry II*'s performance on the NSTL benchmarks was unimpressive. *3+Open* was significantly faster across the board, and on many tests *Tapestry II* was surpassed by *3+Share* and *DataLAN*.

The consistent interface helps to keep training costs down, but woe to those who have an application for which *Tapestry II* lacks an icon; getting to the DOS prompt is not particularly intuitive. Another annoyance: The E-mail package lets you attach only one file to each message. Other features are handier, including the ability to lock your terminal (with password protection) via the touch of a function key.

The two-server installation can complicate managing security and backup. *Tapestry II*'s security features are first-rate; the DOS version's, however, are not so hot. The killer,

EXECUTIVE SUMMARY

Torus Tapestry II

LAN operating system

Tapestry II's unique, icon-based interface is easy to learn and use, but overall this pricey *LAN Manager* variation is disappointing. As with *3+Open*, you need a second server running the DOS version to get all the features, a condition Torus says will be remedied soon.

	POOR	FAIR	GOOD	EXCELLENT
Installation			●	
Resource sharing				●
Administration			●	
Performance			●	
Overall value			●	

Reader service no. 625

once again, is lack of support for user groups. Likewise, installing the OS/2 package is far simpler than setting up the program on a DOS server. Difficulties inherent in the DOS version's copy protection scheme, and disorganized installation instructions in an otherwise worthy manual, add to the hassle.

Tapestry II's shell, which insulates users from the operating system, has considerable charm. However, the program itself is still incomplete. Like 3Com, Torus avers that the OS/2 version will soon have all the features of its DOS predecessor. Users might also ask for better performance, a lower price, and a bit more sophistication.

Datapoint DataLAN

DataLAN claims to be suitable for large networks. It's tough to see what's behind that assertion, though, because this DOS-based package both performs slowly on NSTL's high-traffic tests and lacks a distributed name service for multiple servers. And with *DataLAN*'s $5185 price tag, only *Vines/386* is more expensive.

DataLAN is pretty easy on end users but short on features overall. Users access network resources either by entering commands at the DOS prompt or by using a menu; unfortunately, administrators can't install applications as menu options. The on-line help doesn't add much to what you see on the menus.

After DOS and the networking software are installed, you're left with a healthy 512K of usable RAM. Disk mirroring software and a special backup package are available at extra cost.

DataLAN's performance is unimpressive, especially considering the system's price. Although it did better than some systems (which crashed under NSTL's heaviest traffic tests), overall *DataLAN* was significantly slower than *NetWare*, *Vines*, and *3+Open*.

Administrative tools are limited. The lack of user groups means each user's security rights must be assigned separately. Subdirectory security options don't go beyond read, write, and create; and no individual file restrictions are available.

The installation program leaves several crucial tasks undone, and the manual is unreadable and unindexed. In an apparent attempt to compensate, a blurry videotape walks you through a simulated (and confusing) installation process. Technically, *DataLAN* supports only Token-Ring and its own Arcnet boards, but the company claims it will run on any board that supports NetBIOS, including an Ethernet board.

Even on a small network, you can do better than *DataLAN*. It's more expensive than

EXECUTIVE SUMMARY

Datapoint DataLAN

LAN operating system

This system is easy to use, but its performance holds up only if LAN traffic is light. More to the point, high price, installation problems, and lack of support for group-based access rights make it an inferior choice.

	POOR	FAIR	GOOD	EXCELLENT
Installation			●	
Resource sharing				●
Administration			●	
Performance				●
Overall value			●	

Reader service no. 623

NetWare, which performs better, installs easier, and provides much stronger security and administrative tools. It's hard to see a situation in which *DataLAN* would be a smart buy.

LANs for All Seasons

If you plan to stick with a single-server configuration, you can't do better than *NetWare*. Top-notch security, powerful administrative features, and the cutting-edge advantage of *NetWare SQL* justify this proven performer's excellent reputation. A soon-to-be released upgrade, *NetWare/386* (which taps the special memory management power of the 80386), promises to boost this already speedy NOS to even greater heights.

Vines/386 is the NOS of choice for large, multiple-server LANs, provided the environment is limited to DOS workstations. In fact, *Vines/386*'s speed, elegant addressing scheme, and easy installation and administration make it a tempting candidate for smaller LANs as well.

3+Open may soon be hard to beat in both single- and multiple-server classes, provided it successfully incorporates *3+Share*'s power features. It's only a matter of time before *3+Share* is obsolete. However, the current interim version of *3+Open* is too buggy and incomplete to earn a recommendation.

Network software is changing fast, and the multiprocessing possibilities of OS/2-based NOSs are intriguing. But until those products give you something that *NetWare* and *Vines/386* lack, stick with the tried and true. ●

Robert Lauriston is a San Francisco–based computer consultant specializing in LAN installations and WordPerfect.

WHERE TO BUY

3+Open
3Com Corp.
3163 Kifer Rd.
Santa Clara, CA
95052-8145
800/638-3266
LIST PRICE: 5 users $995, unlimited users $2995
REQUIREMENTS: 80286- or 80386-based server, 4MB RAM, DOS 3.1 or later version on workstations, OS/2 1.0 or later version on server
TECHNICAL SUPPORT: no toll-free number, M–F 8–5
OTHER SUPPORT: BBS
Reader service no. 620

3+Share
3Com Corp.
LIST PRICE: $2495
ACCESSORIES: 3+Mail $595; 3+Route $1500; 3+Remote $750 per server, plus $295 per workstation; 3+Share for OS/2 workstation $995
REQUIREMENTS: 80286- or 80386-bosed server, 640K RAM, DOS 3.1 or later version
TECHNICAL SUPPORT: no toll-free number, M–F 8–5
OTHER SUPPORT: BBS
Reader service no. 621

Advanced NetWare 286
Novell, Inc.
122 East 1700 South
Provo, UT 84601
800/453-1267
LIST PRICE: $2995 per server; System Fault Tolerant version $4695 per server; Entry Level Solution NetWare 286 $695 (4 users), $1495 (8 users)
ACCESSORIES: NetWare Access Server $1995; NetWare for Macintosh $200; Btrieve File Monagement Software $595
REQUIREMENTS: 80286- or 80386-bosed server, 1MB RAM, DOS 2.0 or later version
TECHNICAL SUPPORT: toll-free number, 7 days, 24 hours
OTHER SUPPORT: CompuServe, user group
Reader service no. 622

DataLAN
Datapoint Corp.
9725 Datapoint Dr.
San Antonio, TX 7B284
LIST PRICE: 4 users $595, 8 users $1195, unlimited users $1995; Intro-Pack (software and hardware for 3 users) $1295
ACCESSORIES: Powersave $495 (network), $150 (workstation); Powermirror $695
REQUIREMENTS: 640K RAM, DOS 3.1 or later version
TECHNICAL SUPPORT: toll-free number, M–F 7–7
OTHER SUPPORT: user group
Reader service no. 623

IBM LAN Server
IBM Corp.
1133 Westchester Ave.
White Plains, NY 10604
800/426-2468
LIST PRICE: $1040 per server; IBM PC LAN 1.3 $235 per DOS workstation; IBM LAN Support Program $60 per DOS workstation
REQUIREMENTS: Token-Ring; IBM PS/2 Model 50, 60, 70, or 80 for server; 3MB RAM; mouse; IBM OS/2 Extended Edition 1.1 or later version on server; DOS 3.3 or later version on workstations
TECHNICAL SUPPORT: toll-free number, M–F 8–5
OTHER SUPPORT: free newsletter; classes available at extra charge
Reader service no. 624

Tapestry II
Torus Systems Inc.
2408 Twin Dolphin Dr.
Redwood City, CA
94065
415/594-9336
LIST PRICE: 5 users $1750, 8 users $2995, 20 users $6500; under 50 users, $395 per added workstation; over 50 users $300 per added workstation
REQUIREMENTS: 80286- or 80386-based server, 4MB RAM, OS/2 1.0 or later version on server, DOS 3.3 or later version on workstation
TECHNICAL SUPPORT: no toll-free number, M–F 9–5
OTHER SUPPORT: none
Reader service no. 625

Vines/386
Banyan Systems Inc.
115 Flanders Rd.
Westboro, MA 01581
508/898-1000
COPY PROTECTED
LIST PRICE: $4995 per server; E-mail $995
ACCESSORIES: Network PC Printing $495, Network Mail $995, Remote Dial-In $1495, Enhanced Network Management $595
REQUIREMENTS: 80386-bosed server, 4MB RAM, DOS 2.1 or later version
TECHNICAL SUPPORT: toll-free number, M–F 8–8
OTHER SUPPORT: user group, BBS, newsletter
Reader service no. 626

With CompuServe, you can fax from your computer without a fax board.

Now there's a faster, easier way to send letters, contracts, orders, or any kind of text directly from your computer to any fax machine in the world. Without adding an expensive fax board to your computer and sacrificing an expansion slot.

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Circle 40 on reader service card

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Our marketing people call the concept AMMA – for Advanced Memory Management Architecture.

I don't care what you call it. This is the computer that has left everybody behind, including Compaq.

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"If this is a race, we are out in front."

Steve Hui, President
Everex Systems, Inc.

IBM PS/2 Model 80 (20 MHz)	3.5 MIPS
Compaq DeskPro 386/20	4.6 MIPS
Everex STEP 386/20	4.9 MIPS
Compaq DeskPro 386/25	5.5 MIPS
IBM PS/2 Model 70 (25 MHz)	5.7 MIPS
Everex STEP 386/25	6.1 MIPS

Power Meter MIPS Version 1.2. The Database Group

EVEREX
STEP

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25-MHz Speedsters—A Buyer's Market

The 25-MHz era is in full swing. We run seven cutting-edge systems through DOS, OS/2, and server benchmarks—only to discover that performance isn't everything.

TJ Byers

Buy one of the fastest and most expensive systems available, and you'd be crazy to waste it on an easy job. That's why this roundup of seven 25-MHz 80386 PCs focuses on two of today's toughest tasks: serving a network and running OS/2 applications.

National Software Testing Laboratories (NSTL) ran three suites of application-based benchmarks: a new battery of file server tests, a revised set of OS/2 tests, and the usual DOS benchmarks. As you scan the scores, what pops out at you is how close the systems are in performance. In the nonindexed server transaction test, for example, the speeds of all the systems were essentially the same—for an interesting reason. By the time all that data reached the workstations, the speed of the network was more of a limiting factor than server performance was.

Another reason for the photo finish is the zero-wait-state, static-RAM memory cache that all these systems include. In the processing-only *1-2-3* benchmark, the speed difference between the slowest and fastest system was less than 8 percent. That gives much of the performance edge to the systems with the fastest hard disks and disk-caching software.

With performance so close, price looms large as a purchase criterion, along with warranty, service agreement, and company reputability. If you're looking for a file server, finding one with room for a clutch of expansion boards and two full-height drives may be the most important consideration.

To help you compare prices, we've standardized the configuration for these systems, including memory and mass storage befitting high performance: 4MB RAM and an ESDI hard disk that's as close to 100MB as possible (variations in hard disk size are noted in individual reviews). Also factored in are a 1.2MB floppy drive, a VGA board and a VGA color monitor, one parallel and one serial port, and a 101-key keyboard.

Acer 1100/25

At $9673 in our standard configuration, the Acer 1100/25 is a moderately priced unit with excellent DOS performance. The machine provides ample room for drives, expansion boards, and especially memory and comes with a respectable bundle of software. The downside is a question mark for OS/2 performance and a short-lived on-site service agreement.

On the network server tests the 1100/25's speed is satisfactory, but it slips slightly on the OS/2 benchmarks. Part of the blame probably lies in the fact that Acer was unable to provide its own working version of OS/2. The unit was tested with Compaq's OS/2 1.0B.

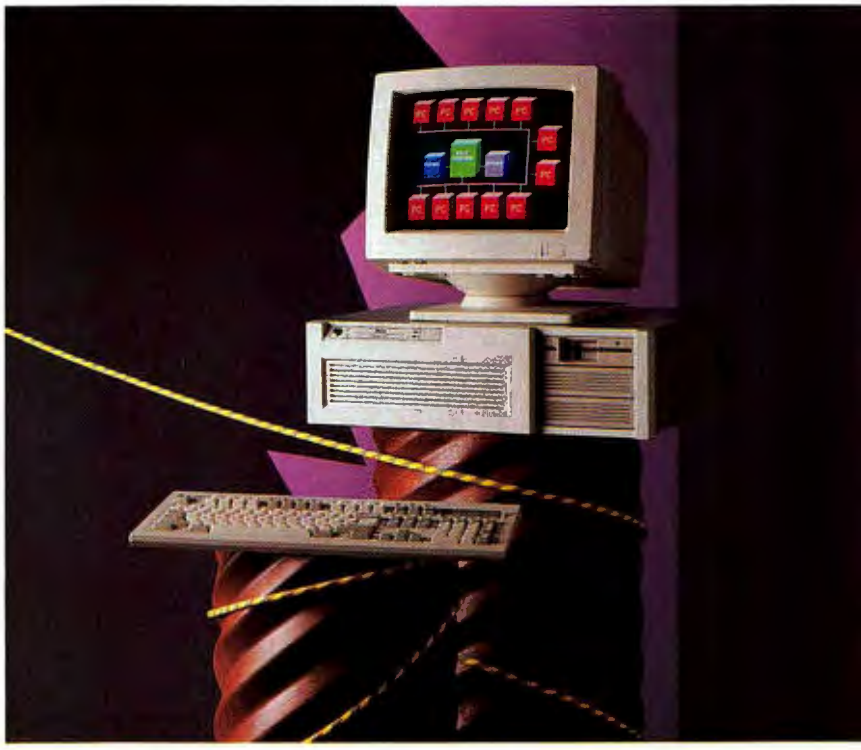
The 1100/25's motherboard holds up to 8MB of RAM in 512K SIMMs (Single In-Line Memory Modules). Two 32-bit slots accommodate a 16MB memory board each, for a humongous 40MB memory bus capacity. However, current versions of the expansion board stand their SIMMs upright, leaving too little room for a second board. The company says a skinnier board is coming soon.

The drive accommodations are classic for an AT-type chassis. There are two internal and three externally accessible half-height bays; as with almost all systems, you can configure any adjoining pair of half-height bays to hold a full-height drive. However, you get one less than the typical two 8-bit slots, and if you install two 32-bit memory boards, you lose one of the six 8/16-bit slots. One parallel and one serial port are built into the motherboard, leaving the 8-bit slot and four 8/16-bit slots open in this roundup's standard configuration.

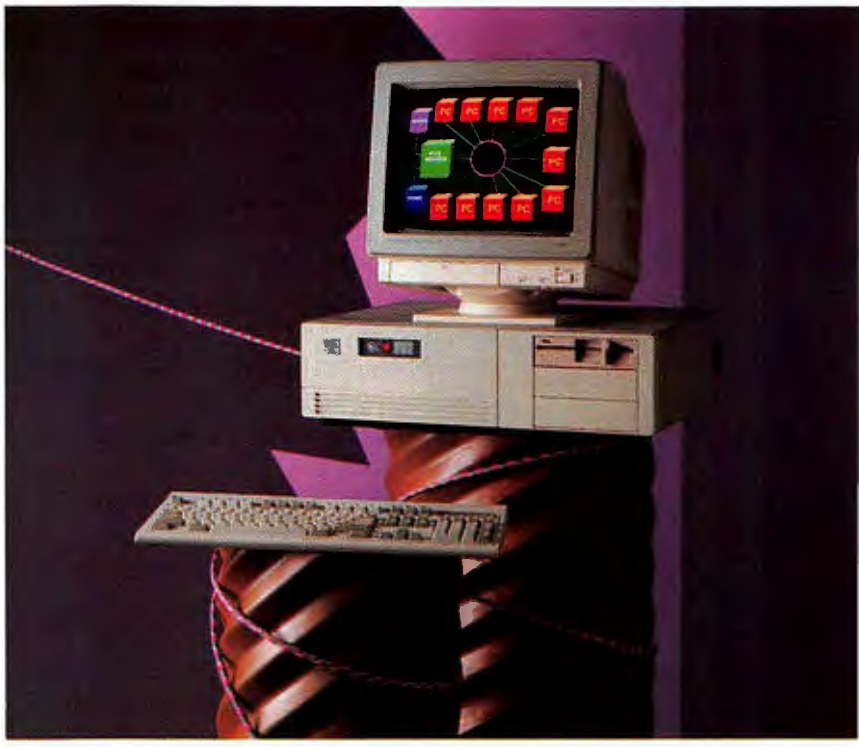
Like all the systems in the roundup except the Micro Express ME 386-25, the 1100/25 comes with an on-site warranty. However, it's limited to four months; the remaining eight months cover depot repair. With the exception of Hewlett-Packard and Micro Express, the other vendors include a full year's on-site service.

The 1100/25's generous software bundle includes DOS 3.3, GW BASIC, *Windows/386*, EMS 4.0 emulation, and disk caching. Like all the machines in the roundup, the 1100/25 offers ROM-based setup; unlike with some systems, DIP switches and jumpers may need attention during configuration.

As a network server, the 1100/25 would benefit from better controller throughput and a longer on-site repair agreement. And the jury's out on OS/2 performance, since no



With the System 325, Dell strikes again by offering a low price and solid performance, with a year's on-site service thrown in.



The second-fastest system in the roundup, the Micro Express ME 386-25 goes for an incredibly low $6325—with 4MB RAM, 150MB ESDI hard disk, and monitor, no less.

MARK JOHANN

EXECUTIVE SUMMARY

Acer 1100/25

25-MHz 80386-based computer

A moderately priced system that supports an amazing 40MB of CPU-speed RAM, the Acer 1100/25 is a blazing DOS machine, but it falters with OS/2. Another drawback is the relatively short on-site service agreement.

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

Reader service no. 680

Acer OS/2 was obtainable. Nonetheless, a reasonable price, blazing DOS performance, and large CPU-speed RAM capacity make the 1100/25 a good choice as a souped-up DOS workstation, especially for processing-intensive tasks.

Dell System 325

The System 325 sounds too good to be true—especially with Dell's recent price cuts. Its performance is nearly identical to that of the Compaq Deskpro 386/25, but at $8099 it's over $5000 cheaper (in the round-up's standard configuration but with a 150MB hard disk). Add excellent expandability, switchless installation, and a year's free on-site service, and you've got a *PC World* Best Buy.

The System 325 does well on the network server tests, though it's a bit slower than the Acer 1100/25 on the DOS benchmarks. On the OS/2 tests, the System 325 falls squarely in the middle of the pack running Dell's own version of OS/2.

You can expand the System 325's motherboard RAM to 8MB. If you're aiming higher, you can bring CPU-speed RAM to 16MB by filling the sole 32-bit slot with an 8MB board. Both the drive capacity and the number of industry-standard slots conform to the AT paradigm. All five half-height bays are externally accessible, providing numerous removable-media possibilities. In addition, you get an extra free slot, because one serial and one parallel port are built into the motherboard. In our standard configuration, both 8-bit slots and four 8/16-bit slots are open.

Compared with systems like the Acer 1100/25 that throw in *Windows/386* at no extra cost, the System 325 software package is underwhelming. The machine comes with diagnostics and today's leading disk-caching program, *Super PC-Kwik*. The ROM-based setup routine enables you to configure the system without jumpers or DIP switches.

The System 325 costs about $1600 less than the Acer 1100/25 and offers comparable speed. It also delivers a little more expandability, more hard disk space, and eight months' extra on-site service. And network administrators will love the fact that a system with a monster 322MB hard disk is only $900 more than the $8099 configuration reviewed here. Dell's machine isn't the fastest PC in the roundup, but in this crowd, a little slower than number one is nothing to sneeze at. This is a nice chunk of computing for the money.

EXECUTIVE SUMMARY

Dell System 325

25-MHz 80386-based computer

BEST BUY

This inexpensive system produced solid scores on the DOS, OS/2, and network server tests. Add plenty of room for boards, drives, and RAM—plus a year's free on-site service—and you have an outstanding value.

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

Reader service no. 681

25-MHz Systems: They Also Serve

With the exception of IBM's PS/2 Model 70-A21, all these systems have serverlike board, drive, and CPU-speed RAM capacities.

● Yes
○ No
◒ Deficient

	Acer 1100/25	Dell System 325	Everex Step 386/25	Hertz 386/25	HP Vectra RS/25C	IBM PS/2 Model 70-A21	Micro Express ME 386-25
Standard features							
Price[1]	$9673	$8099[2]	$9347[2]	$9053[3]	$14,705	$13,505[4]	$6324[2]
Coprocessor support	80387/Weitek	80387/Weitek	80387/Weitek	80387/Weitek	80387/Weitek	80387	80387/Weitek
Disk-caching software	●	●	●	◒	●	●	◒
Built into motherboard							
Parallel port	●	●	○	●	○	●	○
Serial port	●	●	○	●	○	●	○
Floppy disk controller	○	○	○	○	○	●	○
Mouse port	○	○	○	○	●	●	○
Memory bus capacity[5]	40MB	16MB	16MB	24MB	16MB	8MB	16MB
Expandability							
8/16-bit expansion slots/ number free	6/4	6/4	6/4	5/5[6]	6/4	3/3[7]	6/4
8-bit expansion slots/ number free	1/1	2/2	1/1[8]	1/1	2/1	0	2/1
Half/full-height storage device bays[9]	5/2	5/2	5/2	5/2	6/2	3/1[10]	5/2
300MB or larger hard disk available from manufacturer	●	●	●	●	●	●	○
Ergonomic design							
Switchless setup	○	●	●	○	○	●	○
Compact footprint	○	○	○	○	●	●	○
Complete documentation	●	●	●	○	●	●	●
Tilt-and-swivel monitor	●	●	●	●	○	●	●
Front-panel reset button	●	○	●	○	○	○	●
Front-panel on/off switch	●	○	○	○	●	●	○

[1] Price is based on the standard PC World configuration for 25-MHz 80386 systems, which includes 4MB RAM, a 100MB ESDI hard disk, a 1.2MB floppy drive, a VGA board and VGA color monitor, one parallel and one serial port, and a 101-key keyboard. Hard disk variations from 100MB are noted.
[2] With a 150MB ESDI hard disk.
[3] With a 110MB ESDI hard disk.
[4] With a 120MB ESDI hard disk.
[5] Includes motherboard memory and RAM installable in proprietary 32-bit slots accessed at full CPU speed.
[6] If no 32-bit memory boards are present, you can also use the two 32-bit slots as 8/16-bit slots and still have room for 8MB on the motherboard.
[7] One 16-bit and two 16/32-bit MCA slots.
[8] If no 32-bit memory board is present, you can use the single 32-bit slot as an 8-bit slot and still have room for 8MB on the motherboard.
[9] In most cases, two half-height bays can be converted into one full-height bay, and vice versa.
[10] Consists of two 3½-inch floppy drive bays and one 3½-inch hard disk bay.

Everex Step 386/25

The fastest system in the roundup, the Everex Step 386/25 weighs in with a mondo memory cache, a sizzling hard disk, and a roomy interior. At $9347 in the roundup's standard configuration (but with a 150MB hard disk), the system offers top performance at a price under the Acer 1100/25's.

As with the 1100/25, the Step 386/25's speed fell sharply on the OS/2 tests. When

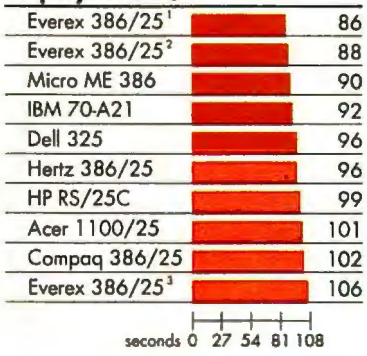
NSTL TEST REPORT

25 MHz: Speed to Spare for Business Applications

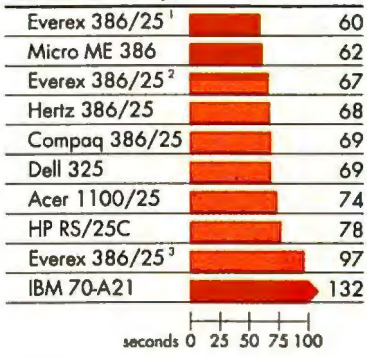
At 25 MHz, performance differences get a little academic, but the Everex Step 386/25 ended up the fastest system overall. The only system available with a variable-size memory cache, the Step 386/25 was subjected to the OS/2 benchmarks first with 64K, then with 256K of cache memory. Our tests prove that under OS/2, the size of the memory cache does make a difference; with 256K, the Step 386/25 improved by about 8 percent.

OS/2 Single-Tasking

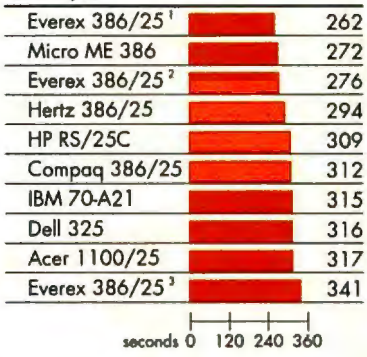
DisplayWrite 4/2



R:base for OS/2

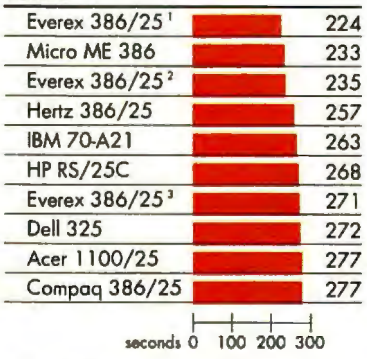


IBM C/2

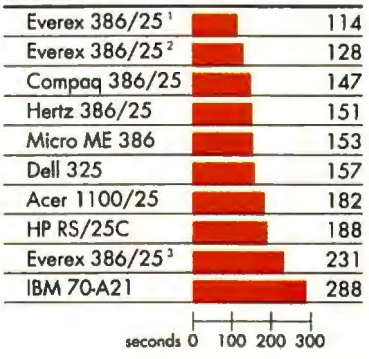


OS/2 Multitasking

Test 1

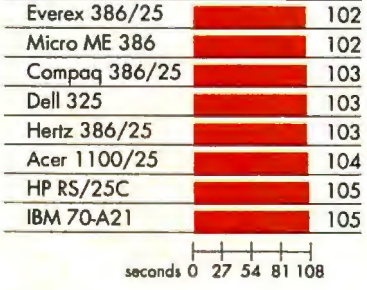


Test 2

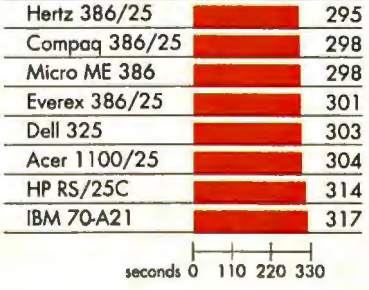


File Server

Foxbase+/LAN (unindexed)



Foxbase+/LAN (indexed)



[1] 256K cache memory, Compaq OS/2.
[2] 64K cache memory, Compaq OS/2.
[3] 64K cache memory, Everex OS/2.

Methodology
All machines were tested with 4MB of RAM, an ESDI hard disk and controller, a coprocessor, and a 256K disk cache in extended memory for all tests except the *1-2-3* benchmark.

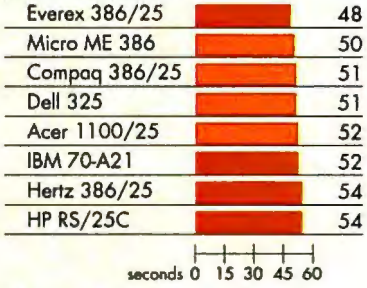
DisplayWrite 4/2
Although the hard disk access rate plays a small part in this benchmark, processing and memory access speeds are the most significant factors. Memory architecture affects memory access speed: Systems that require additional memory in standard expansion slots to run OS/2 exhibit below-average performance.

While *DisplayWrite 4/2* is loading, the keystrokes to start a *DisplayWrite* macro are entered. The macro loads a 35-page, 140-paragraph document, replaces each occurrence of the word *today* with *tomorrow*, uses the built-in spelling checker to look for any incorrectly spelled words (there are none), paginates the document, prints the first page to an IBM Proprinter II, and exits *DisplayWrite*.

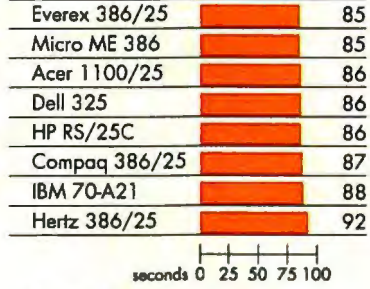
R:base for OS/2
Processing and hard disk random access speeds are the most significant factors in this benchmark. Disk caching dramatically improves apparent disk access speed. This benchmark measures the time it takes to produce a report based on a three-file join, select, and sort.

DOS

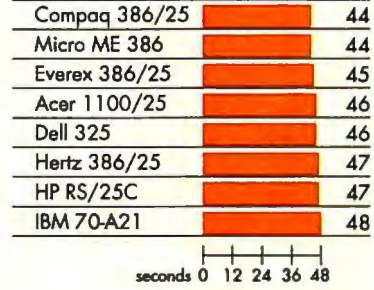
Microsoft Word



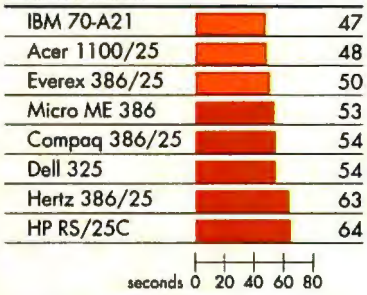
1-2-3



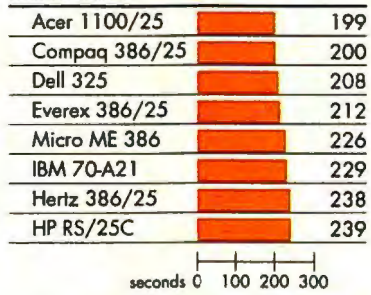
AutoCAD



dBASE III Plus



Microsoft C



IBM C/2
In this benchmark, processing and hard disk sequential access speeds are the most important factors. The benchmark measures the time required to compile the 25 source code files that make up *XLISP*, a public-domain LISP interpreter.

OS/2 multitasking test 1
In two sessions, IBM *C/2* compiles the 25 C source code files that make up *XLISP*. The results of this benchmark are determined by calculating the difference between the first session's starting time and the second session's ending time.

OS/2 multitasking test 2
This test includes the single-tasking *R:base for OS/2* benchmark along with two sessions of *Paradox for OS/2*. All sessions are run in the background. The two *Paradox for OS/2* sessions are started first, while the *R:base* session automatically starts 15 seconds later. The results of this benchmark are determined by calculating the difference between the starting and ending times for the *R:base for OS/2* benchmark.

File server tests
Each of the systems was set up as a server running Novell's *Netware/286 2.15* with the Transaction Tracking System installed. The network had five Compaq Deskpro 286 Model 40 workstations with 1MB of memory each; all workstations ran under Compaq DOS 3.31. The workstations used IBM Token-Ring Adapters, while the server used an IBM Token-Ring Adapter II. The drivers for the Token-Ring Adapters were from IBM's LAN Support Program version 1.01 and *Netware/286*.

Foxbase+/LAN (unindexed)
This transaction processing benchmark is run using *Foxbase+/LAN* version 2. The following files are used: Accounts (100 bytes per record, 50,000 records); Teller (100 bytes per record, 1000 records); Branch (100 bytes per record, 100 records); Transaction (25 bytes per record, 1000 records); and History (75 bytes per record, 0 to 10,500 records).

The benchmark uses no index. First, a record is read from the Transaction file. The record is located and locked in the Accounts, Teller, and Branch files. A record is then added to the History file and locked. All locked records are updated, and finally, all records are unlocked. Altogether, 500 transactions are processed in the test (100 per workstation).

Foxbase+/LAN (indexed)
The previous *Foxbase+/LAN* test is rerun with four indexes on the History file. The tests with indexes entail more disk activity and require more files to be open. The scores represent the average time it takes each workstation to complete the test.

Microsoft Word 4.0
A *Microsoft Word* macro loads a 35-page, 140-paragraph document and performs search-and-replace and spell-checking operations. The first page of the document is then printed. Although the results of the benchmark depend primarily on processor and memory access speeds, display adapter and hard disk speeds are also contributing factors.

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 processing and memory access speeds.

AutoCAD 9
In this benchmark, a three-dimensional sample drawing is retrieved and displayed using *AutoCAD*'s EGA driver. The zoom function is used to display the drawing from various perspectives; then the full drawing is printed. The results of the benchmark 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 the hard disk also have some effect.

dBASE III Plus 1.1
The *dBASE III Plus* test measures the time required to prepare and print a report of past-due invoices. The report includes calculated fields and is based on three files: a 500-record customer file, a 1000-record invoice file, and a 2000-record item file. When disk caching is not used, the random access speed of the hard disk is, after processor speed, the most significant factor in this benchmark. With disk caching, sequential read performance becomes more important than random access.

Microsoft C 5.0
The *Microsoft C* benchmark measures the time required to compile and link *XLISP*. The most important factors in this benchmark are processor and memory access speeds. The performance of the hard disk is also a factor; generally, disk caching has little effect.

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

With trademark LED readout aglow, the Everex Step 386/25 zips ahead of the pack. Recent price reductions and a large memory cache make it a very attractive buy.

we retested it with Compaq OS/2 1.0B rather than Everex OS/2 1.0, it ran the OS/2 benchmarks faster than any other system in the roundup. (To avoid potential compatibility problems, we don't advise using any system with a version of OS/2 not specifically supported by the vendor.)

The basic Step 386/25 configuration includes 2MB RAM in 512K SIMMs and 64K of cache memory. Depending on the type of SIMM you buy, with all eight motherboard SIMM sockets occupied, you get a 128K cache and 2MB, 4MB, or 8MB of main memory. A memory expansion board with the same capacity as the motherboard fits in the sole 32-bit slot, bringing the memory bus maximum to 16MB.

To determine the advantage of a larger cache, we tested the Step 386/25 under OS/2 with 4MB RAM and a 64K memory cache, then with 4MB and a 256K cache. The Step 386/25's performance—already the best in the roundup—climbed by an average of 5 percent with the larger cache. Compaq's OS/2 was used in both configurations.

The Step 386/25's housing is identical to the Step 386/20's (see "Surprise Values at 20 MHz," *PCW*, December 1988). Inside the chassis resides an AT-like mix of slots—if you count the 8-bit one that serves as part of the 32-bit memory slot. In our standard configuration, one 8-bit and four 8/16-bit slots are left open. You can run the expansion bus at both 8 and 12.5 MHz; I/O-intensive operations run slightly faster at the higher speed, but some boards can't handle the speed and may cause a system crash.

The only software you get with the Step 386/25 is MS-DOS 3.3 and a disk-caching utility. However, you also get ROM-based switchless setup—a definite improvement over the Step 386/20, which has a couple of vestigial switches and jumpers.

The Step 386/25's speed is dazzling, and extras like modifiable cache memory, an LED readout, and switchable I/O bus speed are welcome. If performance is your foremost concern, this machine is hard to beat—just wait for a version of Everex's OS/2 that works as well as Compaq's.

Hertz 386/25

Spotty performance at a modest price sums up the Hertz 386/25. It brought up the rear in the DOS tests, but its speedy hard disk propelled it to first place in the more strenu-

EXECUTIVE SUMMARY

Everex Step 386/25

25-MHz 80386-based computer

Breakneck speed plus a large memory cache adds up to the fastest system in the roundup. In addition, useful front-mounted controls put the Step 386/25 a cut above the average box. However, Everex OS/2 could use some work.

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

Reader service no. 682

MARK JOHANN

EXECUTIVE SUMMARY

Hertz 386/25

25-MHz 80386-based computer

The Hertz 386/25's fast hard disk placed it first in the network server tests, but the Intel motherboard makes for lackluster 25-MHz performance. Even with recent price cuts, the budget conscious can do better.

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

Reader service no. 683

ous file server test. The Hertz 386/25 costs more than the Dell System 325 ($9053 with a 160MB hard disk), but you get 10MB more disk space.

We selected the Hertz 386/25 for this roundup because its Intel motherboard is popular among clone makers. In other words, if you're considering a clone that's not reviewed here but has the same motherboard, our processing-intensive tests should give you at least some idea of what to expect. The prognosis is not so good: In the processing-only *1-2-3* benchmark, the Hertz 386/25 came in dead last.

The Hertz 386/25's motherboard holds 8MB without using a slot. Two 32-bit slots can hold one 8MB memory expansion board each, for a healthy memory bus maximum of 24MB. Free of memory boards, the 32-bit slots can be used as 8/16-bit slots, yielding slots for seven 16-bit boards and one 8-bit board. Hertz has built one serial and one parallel port into the motherboard, so our standard configuration leaves open the 8-bit slot and five 8/16-bit slots.

You'll find five half-height drive bays, three of which you can reach from the outside. The hard disk you choose comes formatted to your specifications with MS-DOS 3.3. Curiously, although they're free, you get DOS manuals only if you ask for them; the same goes for the *Super PC-Kwik* disk-caching program.

Problematic motherboard aside, the Hertz 386/25's hard disk equals one fast network server. But other systems in the roundup deliver better all-around performance for less.

HP Vectra RS/25C

Hewlett-Packard's Vectra RS/25C tower provides good drive capacity plus an under-the-desk footprint, both welcome features in a file server. Unfortunately, the $14,705 RS/25C is also the slowest and most expensive system in the roundup.

Ruggedness is the watchword here. This 70-pound unit has steel plating thick enough to withstand a bomb blast. Inside, a removable CPU board sits at the bottom of the tower and holds up to 16MB of 1MB SIMMs. This construction means you can replace the CPU board with an upgrade.

The slot count is AT-like—six 8/16-bit and two 8-bit—less than you'd expect from this behemoth. In this roundup's standard configuration, all but one 8-bit and two 8/16-bit slots are open. A Human Interface Link (HIL) port—designed for an HP touch screen, mouse, or printer—is built into the motherboard.

You can run the I/O bus at 8 MHz or 10 MHz, which may improve throughput with

EXECUTIVE SUMMARY

Hewlett-Packard Vectra RS/25C

25-MHz 80386-based computer

The Vectra RS/25C provides the lowest performance at the highest price. Its redeeming feature is a bulletproof tower chassis that supports more drives than any other system reviewed.

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

Reader service no. 684

less risk than the Everex Step 386/25's 12.5-MHz option. And with room for two half-height and two full-height drives, you're one half-height bay ahead of any other system in the roundup.

The RS/25C's software bundle includes a micro-to-mainframe program, EMS 4.0 emulation, and a hard disk manager. HP Vectra DOS is extra and incorporates a handy DOS shell. HP OS/2 is available, but as with the Everex Step 386/25, performance under Compaq OS/2 was better.

Setup is ROM-based but not switchless. An unusual warranty lets you choose between one year of depot repair and three months of on-site service. Additional service contracts are available at extra cost.

The RS/25C is bulletproof in more ways than one: Its chassis is indestructible, and the unit is backed by one of the most reputable companies in the business. Nonetheless, this reinforced tower is overpriced for its performance and warranty.

IBM PS/2 Model 70-A21

All workstations should look this good. Sporting a petite, stylish Model 50 chassis, the Model 70-A21 looks and feels like the PC of the future—until you check the benchmarks. Scoring in the bottom third in all three test suites, the 70-A21 is encumbered by a painfully slow hard disk. And its $13,505 price tag in our standard configuration (but with a 120MB hard disk) is downright scary.

Still, more manufacturers should mimic PS/2 features like tool-less disassembly and motherboard integration of VGA, mouse port, disk controller, and I/O ports. The 70-A21 also benefits from IBM's worldwide service network; on-site service is now priced at a paltry $25 for the first year.

The problems begin with specs. You can fit only 8MB of RAM on the memory bus—half the capacity offered by most competing systems. One 16-bit and two 32-bit Micro Channel slots are free in our standard configuration, but they all run at 10 MHz; any memory you install there will be accessed at less than half of CPU speed.

A worse constraint is limited options. For example, the 70-A21 comes with the slow 120MB hard disk, like it or not. Upgrading requires that you simply discard the sluggish unit, even if you buy the replacement from IBM. And of course, the number and variety of Micro Channel boards pale in comparison with the glut of AT boards.

It's unfair to judge a small machine like the 70-A21 as a server, but even as a workstation, space for devices is tight. Two external bays are dedicated to 3½-inch floppy or tape drives, while a single internal 3½-inch bay holds whichever IBM hard disk you choose. Sooner or later, IBM is bound to come out with a 25-MHz version of the Model 80 tower, which will be more suitable as a server.

The IBM Reference Diskette's setup, configuration, and tutorial routines still constitute the classiest system software act around. And of course, Programmable Option Select lets you plug in Micro Channel expansion boards and configure them without touching a switch or a jumper.

The 70-A21 is IBM's fastest machine, but its hard disk doesn't do it justice. Like most IBM drives, this one shines only on sequential disk reads—and that's probably due to IBM's fancy caching algorithms. This failing, aggravated by limited options and an exorbitant price, proves that looks aren't everything.

EXECUTIVE SUMMARY

IBM PS/2 Model 70-A21

25-MHz 80386-based computer

The small expansion capacity of this expensive system eliminates it from consideration as a server, and as a workstation it's a mediocre performer for its class. Classy configuration and a small footprint are its high points.

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

Reader service no. 685

Micro Express ME 386-25

If you're looking for a rock-bottom price and can live without on-site service, the Micro Express ME 386-25 is the system for you. Checking in at a low, low $6324 in our standard configuration, but with a 150MB hard disk, the ME 386-25 is far and away the cheapest system in this roundup and the second-fastest performer overall.

We chose to include the ME 386-25 for the same reason we looked at the Hertz 386/25—its ubiquitous motherboard. In fact, the ME 386-25's American Megatrends motherboard may end up in more systems than Intel's, and for good reason. In the processing-intensive *1-2-3* test, the ME 386-25 actually matched the top-rated Everex Step 386/25.

The ME 386-25 holds up to 8MB of RAM on the motherboard. You can expand CPU-speed memory to 16MB by installing an 8MB memory expansion board in the motherboard's sole 32-bit slot. One of the two 8-bit slots and two of the six 8/16-bit slots are filled in our standard roundup configuration. Five half-height bays are included.

The ME 386-25 comes with no software, not even disk caching. (NSTL tested the unit with the industry-standard *Super PC-Kwik*.) No OS/2 is available from the company, so the OS/2 tests were run with Compaq OS/2 1.0B. The only dividend is ROM-based configuration, but you may still need to fiddle with the system's switches and jumpers.

EXECUTIVE SUMMARY

Micro Express ME 386-25

25-MHz 80386-based computer

BEST BUY

A very low price and impressive speed are the Micro Express ME 386-25's trademarks. Although it lacks an on-site warranty, it's the perfect answer for anyone looking for cheap 25-MHz performance.

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

Reader service no. 686

WHERE TO BUY

Acer 1100/25
Acer Technology Corp.
401 Charcot Ave.
San Jose, CA 95131
408/922-0333
LIST PRICE: with 2MB RAM, one parallel and two serial ports, 101-key keyboard, mouse, Windows/386, MS-DOS 3.3, and GW BASIC $6295; with 100MB ESDI hard disk, 1.2MB floppy drive $7995; with 170MB ESDI hard disk, 1.2MB floppy drive $8295; with 380MB ESDI hard disk, 1.2MB floppy drive $9425
ACCESSORIES: 2MB SIMM memory kit $762, 4MB SIMM memory kit $1524, unpopulated 16MB memory expansion board $593, EGA board and monitor $775, VGA board and monochrome monitor $530, VGA board and color monitor $916, OS/2 $325
WARRANTY: one year parts and labor with first four months on-site TRW service, remaining eight months authorized dealership depot service
EXTENDED WARRANTY: through TRW
TECHNICAL SUPPORT: toll-free number, M–F 7:30–6
OTHER SUPPORT: CompuServe BBS
Reader service no. 680

Dell System 325
Dell Computer Corp.
9505 Arboretum Blvd.
Austin, TX 78759
800/426-5150
LIST PRICE: with 1MB RAM, 90MB ESDI hard disk, 1.2MB floppy drive, one parallel and two serial ports, VGA board and color monitor, 101-key keyboard $6299; with 4MB RAM, 150MB ESDI hard disk $8099; with 4MB, 322MB ESDI hard disk $8899
ACCESSORIES: 4MB SIMM memory kit $2199, 2MB memory board $100, 8MB memory board $4499, 1.2MB or 1.44MB floppy drive $130, mouse $60, 80387 math coprocessor $1000, MS-DOS 3.3 $100, MS-DOS 4.0 $120, OS/2 $325
WARRANTY: one year on-site service
EXTENDED WARRANTY: up to five years on-site service at about 10 percent of purchase price per year
TECHNICAL SUPPORT: toll-free number, M–F 7–7
OTHER SUPPORT: BBS
Reader service no. 681

Everex Step 386/25
Everex Computer Systems Division
48431 Milmont Dr.
Fremont, CA 94538
800/356-4283
LIST PRICE: with 2MB RAM, 64K cache, 1.2MB floppy drive, one parallel and one serial port, 101-key keyboard, DOS 3.3 $5599; with 4MB RAM, 128K cache $6399
ACCESSORIES: 8MB memory board with 128K cache $3799, 44MB hard disk $475, 160MB ESDI hard disk $1750, 330MB ESDI hard disk $2999, ESDI controller $235, EGA board $260, EGA monitor $485, VGA board $399, VGA multiscan color monitor $599, 80387 math coprocessor $995, Everex OS/2 $325, Weitek 3167 $2699
WARRANTY: one-year on-site service
EXTENDED WARRANTY: available through National Computer Service
TECHNICAL SUPPORT: dealer only
OTHER SUPPORT: dealer only
Reader service no. 682

Hertz 386/25
Hertz Computer Corp.
325 Fifth Ave.
New York, NY 10016
212/684-4141
LIST PRICE: with 2MB RAM, 20MB hard disk,
(continues)

Because Micro Express only sells direct, the lack of on-site service, even as an extra, is a severe stumbling block. Cost-effective independent service contracts are tough to come by, so you'll probably have to rely on the company's standard parts-and-labor warranty. The other side of that trade-off is a machine faster than the Dell System 325 for $2000 less.

A Pack of Winners

Which of the two Best Buys should you choose? The ME 386-25 and the Dell System 325 offer comparable performance, and both have serverlike expansion capacity. Saving $2000 and going with the lesser-known Micro Express makes perfect sense, but if something goes wrong, be prepared to ship your system back instead of having it serviced on site.

The two other obvious winners in this roundup are the Everex Step 386/25 and the Acer 1100/25. These systems are more expensive than the Best Buys, but they're sold through dealers rather than through the mail, making substantial discounts possible.

The Step 386/25 is for users who need performance above all, particularly those with an eye toward an OS/2 future (and a better version of Everex OS/2).

OS/2 aside, high-end PCs are becoming more and more alike, and not just in performance. CPU-speed access to 16MB of RAM—OS/2's maximum—is now the rule rather than the exception. And while free on-site service, ROM-based setup, and bundled disk-caching software used to be rare, they're commonplace for these contenders. Choosing between the top systems is getting harder, but luckily, it's also tougher to make a big mistake. ●

TJ Byers is a contributing editor for PC World.

WHERE TO BUY

1.2MB floppy drive, one parallel and two serial ports, VGA board and multiscan color monitor, 101-key keyboard $6595; with 40MB hard disk $6775; with 72MB hard disk $6995; with 110MB RLL hard disk $7195; with 160MB ESDI hard disk $8095; with 330MB ESDI hard disk $9295; with 650MB ESDI hard disk $10,495; with 1.2GB ESDI hard disk $14,395
ACCESSORIES: memory upgrades $479 per MB, 1.44MB floppy drive $149, OS/2 $325
WARRANTY: one year on-site service from Intel
EXTENDED WARRANTY: 15 percent of list price per year
TECHNICAL SUPPORT: no toll-free number, M–F 9–5
OTHER SUPPORT: none
Reader service no. 683

HP Vectra RS/25C
Hewlett-Packard Business Computer Systems
19091 Pruneridge Ave.
Cupertino, CA 95014
800/752-0900
LIST PRICE: with 1MB RAM, 103MB ESDI hard disk, 1.2MB or 1.44MB floppy drive, one serial and one parallel port, 101-key keyboard $10,295; with 155MB ESDI hard disk $10,895; with 4MB RAM, 155MB ESDI hard disk $13,295; with 4MB RAM, 310MB hard disk $15,696
ACCESSORIES: 4MB expansion kit $3195, VGA grophics boord $445, VGA manochrome monitor $250, VGA color monitor $695, 1.44MB floppy drive $325, I/O board $150, 80387 math coprocessor $1895, Vectro DOS 3.3 $120, Vectra BASIC $89, OS/2 $325
WARRANTY: one yeor ports and labor at HP depot, convertible to three months on-site service
EXTENDED WARRANTY: HP service contracts available
TECHNICAL SUPPORT: through dealer or $45 charge per problem using HP's toll-free number, M–F 7:30 a.m.–9 p.m.
OTHER SUPPORT: fee-based support packages
Reader service no. 684

PS/2 Model 70-A21
IBM
900 King St.
Rye Brook, NY 10573
800/447-4700
LIST PRICE: with 2MB RAM, 120MB ESDI hard disk, 1.44MB floppy drive, one serial and one parallel port, VGA board, mouse port, 101-key keyboard $11,295; with 4MB RAM, VGA color monitor, IBM DOS 3.3 $13,535
ACCESSORIES: 2MB 80ns memory module kit $1495, 8MB memory expansion board with 2MB $1695, 80387 math coprocessor $2395, IBM DOS 3.3 $120, IBM DOS 4.0 $150, OS/2 $325
WARRANTY: one year parts ond labor, on-site service $25 for the first year
EXTENDED WARRANTY: available through dealers
TECHNICAL SUPPORT: deolers only
OTHER SUPPORT: nane
Reader service no. 685

Micro Express ME 386-25
Micro Express
2114 S. Grand Ave.
Santa Ana, CA 92705
714/662-1973
LIST PRICE: with 4MB RAM, 1.2MB or 1.44MB floppy drive, ane serial and one parallel port, ESDI hard disk controller, 101-key keyboard $3999; with VGA board and color monitor, 150MB ESDI hard disk, DOS 3.3 $6324
ACCESSORIES: 1.2MB floppy drive $85, 1.44MB floppy drive $120, 40MB hard disk $425, 80MB hard disk $625, 100MB ESDI hard disk $1000, 150MB ESDI hard disk $1500, 300MB ESDI hard disk $2250, manachrome board and manitor $150, EGA board and monitor $550, VGA board and color manitor $750, mouse $89, 2400-bps madem $159, 80387 math coprocessor $525, DOS 3.3 $75, DOS 4.01 $85, disk cache $49
WARRANTY: 15 months parts and labor
EXTENDED WARRANTY: 8 percent of list price per year
TECHNICAL SUPPORT: no toll-free number, M–F 8:30–6
OTHER SUPPORT: none
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Solid Bargains in Personal Printers

Looking for an inexpensive printer to get you through the business day?

PC World rounds up seven 9-pin printers and finds exceptional value.

Paul Meyers

Not long ago, the 9-pin dot matrix printer was the Sancho Panza of the desktop, diligently tackling output chores with competence, if not grace. Then 24-pin output captured the public's eye, and the faithful 9-pin was relegated to back rooms.

However, shoppers who downplay these printers may overlook some genuine bargains. For less than $500 you can find 9-pin dot matrix printers with the fonts, type styles, and paper-handling features commonly associated with higher-priced devices.

For this review, *PC World* tracked down seven narrow-carriage 9-pin dot matrix printers: the Epson LX-800, Facit B1100, Mannesmann Tally MT85, Okidata Microline (ML) 320, Seikosha SP-1600AI, Star Micronics NX-1000 Multi-Font, and Tandy DMP-132.

How to Pick a 9-pin

For less than $500, a printer isn't going to be all things to all people. The trade-off usually occurs between print speed, print quality, and extras. Of the printers tested, only the Okidata ML 320 proved itself superior in all these respects.

Speed is probably a 9-pin printer's most important attribute. For this review, National Software Testing Laboratories (NSTL) ran benchmark speed comparisons using draft and letter quality text files and *1-2-3* bar charts. The fastest printer by far was the Okidata ML 320.

Another feature to look for is crisp output. All the printers produced legible text and graphics—though they occasionally sacrificed speed in the process. For example, the Facit B1100 generated terrific-looking draft text, yet was one of the slowest at printing drafts.

Paper-handling flexibility is a real plus in an inexpensive printer. Pull tractors are standard on every printer except the Star and the Okidata, both of which use push tractors. However, only the Okidata offers an optional bottom-load tractor for jam-free handling of labels and multipart forms. And just two printers—the Okidata and the Star—boast forms parking. Unfortunately, envelope printing is not a strong point for 9-pin printers; only the Epson and the Okidata print them well. But each printer handles multipart forms, accommodating at least one original and two copies.

Other important features to consider are emulations and typographic prowess. For the broadest possible software compatibility, a 9-pin printer should have either Epson or IBM printer emulation; the Okidata, Seikosha, Star, and Mannesmann Tally offer both.

ROBERT CARDIN

The Epson doesn't offer IBM emulation; however, it successfully completed NSTL's IBM speed tests. The Tandy, likewise, has no Epson emulation but completed three out of four Epson tests via its IBM emulation. None of the printers provide many typefaces: The Star has four, while most of the other printers are limited to two. The Mannesmann Tally is the only unit that accepts font cartridges. All the printers offer some combination of typographic styles such as italics, elite and pica pitches, condensed printing, and proportional spacing.

Finally, typographic features aren't worth much if they're difficult to select. Ideally, you should be able to choose them directly from the front panel, though many printers require you to fiddle with DIP switches or software settings.

Okidata Microline 320

Blazing speed, top-notch output, and precise paper handling put the Okidata in a class by itself. The ML 320 won the speed contest hands down and also produced the best-quality graphics. With comprehensive panel

FEATURES EVALUATION

Two Printers Sweep the 9-Pin Stakes

The Okidata ML 320 and the Seikosha SP-1600AI combine fast print speeds and top-notch output with the best features for the buck.

● Yes
○ No

Standard features	Epson LX-800	Fadit FI1100	Mannesmann Tally MT85	Okidata ML 320	Seikosha SP-1600AI	Star Micronics NX-1000	Tandy DMP-132
Price	$299	$325	$499	$499	$329	$299	$379.95
Buffer size	3K	8K	3K	8K	2.3K	4K	n/a
Maximum buffer size	35K	8K	3K	23K	8K	4K	n/a
Serial port	●[1]	●[1]	●[1]	●[1]	●[1]	●[1]	●[2]
Parallel port	●	●	●	●	●	●	●[3]
Paper handling							
Automatic paper feed	●	○	○	●	●	●	●
Forms parking	○	○	○	●	○	●	○
Push tractor	○	○	○	●	○	●	○
Pull tractor	●	●	●	●[1]	●	○	●
Tear bar	●	○	○	●	○	○	○
Envelopes	●	○	○	●	○	○	○
Labels	●	●	●	●[4]	●	●	●
Multipart forms	3	3	3	5	3	3	3
Optional bottom feed	○	○	○	●	○	○	○
Optional sheet feeder	●	○	○	●	●	●	○
Printer controls[5]							
Formfeed	●	●	●	●	●	●	●
Linefeed	●	●	●	●	●	●	●
Print quality	●	●	●	●	●	●	●
Pitch	●	●	●	●	●	●	●
Font selection	●	○	●	●	●	●	●
Line spacing	●[6]	●[6]	●	●	●[6]	●[6]	●[6]
Page length	●[6]	●[6]	●	●	●[6]	●[6]	●[6]
Microline feed	○	○	○	●	○	●	○
Margin sets	○	○	●	●	●	●	●
Typographic features							
Standard typefaces	3	1	2	2	2	4	2
Accepts font cartridges	○	○	●	○	○	○	○
Downloadable NLQ characters	6	6	256[7]	256	128	78	0
Compressed print	●	●	●	●	●	●	●
Italics	●	●	●	●	●	●	●
Graphics resolution (dots per inch)	240x72	120x144	240x240	288x288	240x72	216x240	240x72
Emulation modes							
Epson EX	●	○	○	●	○	○	○
Epson FX	●	○	●	●	●	○	○
Epson LX	●	○	○	○	○	●	○
IBM Graphics	○	○	●	●	●	○	●
IBM Proprinter II	○	●	○	●	○	●	○

[1] Optional.
[2] Supports Tandy computers only.
[3] Parallel cable required for use with IBM compatibles.
[4] Requires bottom feed option.
[5] All controls are front-panel-mounted unless otherwise indicated.
[6] DIP switch control.
[7] Draft characters only.

controls, an extensive printable selection menu, and low noise levels, the Okidata rates a Best Buy at $499.

Foremost among the ML 320's array of features is its paper-handling ability, which includes forms parking, forward and reverse microline feed, and a top-of-form control. The Okidata is also the only printer to accept five-part forms and offer an optional bottom-feed pull tractor. Front panel control is excellent.

Two crisp typefaces (Courier and Sans Serif) are available in three text modes—high-speed draft, enhanced draft, and near letter quality. The ML 320's 288-by-288-dot-per-inch (dpi) graphics resolution is the best of the bunch.

The ML 320 clearly ranks as a superior printer and a superior value, despite its relatively high price. With its speed, generous features, and competent paper handling, this is the best all-around printer reviewed.

EXECUTIVE SUMMARY

Okidata Microline 320

Nine-pin dot matrix printer

BEST BUY

Far and away the fastest printer tested, the ML 320 also possesses bountiful features and superior paper handling. Good print quality and the highest graphics resolution of the units reviewed help make this printer a Best Buy.

	POOR	FAIR	GOOD	EXCELLENT
Speed				●
Print quality			●	
Paper handling				●
Printer control				●
Typographic features				●
Overall value				●

Reader service no. 693

Star Micronics NX-1000 Multi-Font

The $299 NX-1000 Multi-Font upholds Star Micronics' reputation for packing features into low-priced machines. The Star's print quality and speed are about average for the printers in this review. But with four resident typefaces and terrific front panel controls, the printer is still a good buy.

The Star offers a push-tractor feed; other paper-handling features include microline feed, automatic paper loading, and forms parking.

The Star's forte is its superior printer controls. Four easy-to-use membrane buttons provide dedicated pitch and type style controls for four serviceable built-in typefaces (Courier, Sans Serif, Orator, and Small Caps

The blazing speed and ample features of the Okidata ML 320 (left) and the impressive speed and sharp NLQ text of the Seikosha SP1600-AI earn them Best Buy honors.

EXECUTIVE SUMMARY

Star Micronics NX-1000 Multi-Font

Nine-pin dot matrix printer

Loaded with extensive controls and a slew of paper-handling features, the NX-1000 proved just average in print quality and speed among the printers reviewed. Still, the Star is a good value for the price.

	POOR	FAIR	GOOD	EXCELLENT
Speed			●	
Print quality				●
Paper handling				●
Printer control				●
Typographic features				●
Overall value			●	

Reader service no. 695

ROBERT CARDIN

NSTL TEST REPORT

Nine-Pin Printers: Good Speed at a Good Price

The Okidata Microline 320 was the hands-down winner in every test.

IBM Emulation

Plain draft text

Okidata ML 320	232
Epson LX-800[1]	434
Seikosha SP-1600AI	475
Mannesmann Tally MT85	476
Star Micronics NX-1000	540
Facit B1100	608
Tandy DMP-132	700

Plain letter quality text

Okidata ML 320	695
Mannesmann Tally MT85	1549
Seikosha SP-1600AI	1553
Epson LX-800[1]	1598
Star Micronics NX-1000	1979
Facit B1100	2117
Tandy DMP-132	2438

Enhanced letter quality text

Okidata ML 320	136
Seikosha SP-1600AI	307
Epson LX-800[1]	312
Mannesmann Tally MT85	348
Star Micronics NX-1000	379
Facit B1100	416
Tandy DMP-132	495

Bar chart

Okidata ML 320	87
Seikosha SP-1600AI	216
Tandy DMP-132	230
Epson LX-800[1]	294
Star Micronics NX-1000	314
Facit B1100	354
Mannesmann Tally MT85	398

seconds 0 500 1000 1500 2000

Epson Emulation

Plain draft text

Okidata ML 320	226
Seikosha SP-1600AI	462
Star Micronics NX-1000	529
Tandy DMP-132	746
Epson LX-800[1]	940
Mannesmann Tally MT85	945
Facit B1100	n/a[2]

Plain letter quality text

Okidata ML 320	679
Seikosha SP-1600AI	1517
Star Micronics NX-1000	1939
Mannesmann Tally MT85	1982
Epson LX-800[1]	2069
Tandy DMP-132	2446
Facit B1100	n/a[2]

Enhanced letter quality text

Okidata ML 320	117
Epson LX-800[1]	274
Seikosha SP-1600AI	282
Mannesmann Tally MT85	333
Star Micronics NX-1000	392
Facit B1100	n/a[2]
Tandy DMP-132	n/a[3]

Bar chart

Okidata ML 320	87
Seikosha SP-1600AI	216
Epson LX-800[1]	295
Star Micronics NX-1000	315
Tandy DMP-132	341
Mannesmann Tally MT85	398
Facit B1100	n/a[2]

seconds 0 500 1000 1500 2000

[1] The Epson LX-800 has Epson emulation only.
[2] The Facit B1100 has IBM Proprinter emulation only.
[3] The Tandy DMP-132 has IBM Graphics printer emulation only.

Methodology
All tests were conducted using a 12-MHz Compaq Deskpro 286 Model 20 equipped with a VGA monitor and 1.2MB of RAM. The output from the various application programs was captured using a file capture program, and during the actual test the output files were copied to the computer's parallel port from a RAM disk using the DOS COPY command. The results are faster than could be expected printing directly from an application program because the overhead from the application program has been eliminated.

Plain draft text
This benchmark times the printing of plain text in draft mode. The test file contained 20 pages of text without enhancements; it was printed with *Microsoft Word* using the TTY driver.

Plain letter quality text
This benchmark times the printing of plain text in letter quality mode. The same procedure used for the plain draft text benchmark was used for this benchmark, except that the printers were set to letter quality mode.

Enhanced letter quality text
This benchmark times the printing of enhanced text, such as boldfacing, underlining, superscripts, and italics, in letter quality mode.

Bar chart
This benchmark measures the time required to print a stacked bar chart created in *1-2-3*, with the program set for high-density printing. Different hatch patterns were used within each bar, and legends and titles were added to the graph. The printers were tested in their IBM emulation modes (using the program's IBM Proprinter driver) and in their Epson modes (using Lotus's Epson FX-80 driver).

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

EXECUTIVE SUMMARY

Seikosha SP-1600AI

Nine-pin dot matrix printer

The SP-1600AI recorded the second fastest overall speed and produced great-looking output. Add a simple, easy-to-use design, and you've got a Best Buy in this printer's price range.

	POOR	FAIR	GOOD	EXCELLENT
Speed			●	
Print quality			●	
Paper handling			●	
Printer control			●	
Typographic features			●	
Overall value				●

Reader service no. 694

Orator). If print features and smart design interest you more than speed, the NX-1000 Multi-Font is worth checking out.

Seikosha SP-1600AI

Seikosha, traditionally a printer OEM, offers a choice 9-pin market entry. The $329 SP-1600AI clocks the second fastest overall print speed, produces sharp NLQ text and high-density graphics, and is the only printer to offer a two-year parts and labor warranty. The Seikosha's speed and easy-to-use print controls rate it a Best Buy for its price class.

Compact and low-slung, the Seikosha handles paper dependably. A pull tractor for fanfold paper and an automatic paper feed come standard. The SP-1600AI offers an optional cut-sheet feeder, but it has no forms parking, and you must remove the tractor mechanism for single-sheet printing.

The Seikosha's biggest limitation is its dearth of typefaces—only draft Sans Serif and NLQ Serif are available. Also, its draft output is fuzzy compared with other printers'. However, if you're looking for a basic 9-pin printer with speed, ease of use, and superior high-density printing, the Seikosha is an excellent choice.

Mannesmann Tally MT85

Although known for its high-quality printers, Mannesmann Tally put more sizzle than steak in the MT85. While its high-density graphics output is adequate, graphics printing speed is snail-like. The MT85 is the only printer tested that accepts font cartridges, but with minimal paper-handling abilities and an obtuse printer control menu, the $499 MT85 is no bargain.

The MT85 arrives with an internal pull tractor and a wire paper guide—nothing more. It offers no automatic paper feed or optional cut-sheet feeder, so single sheets must be rolled in by hand. The printer has two built-in typefaces, draft Prestige Elite and NLQ Sans Serif, and supports two additional font cartridges. Although the MT85 provides the standard print styles, not all of them work in all modes.

Clean in silhouette, the MT85 is awkward in design. The rear-mounted cables block the paper path, and access to all paper-handling levers requires removal of the printer cover. While the MT85 prints well, you can get more for your money elsewhere.

Facit B1100

The Facit B1100 provides good print quality—excellent in draft mode—but has little

EXECUTIVE SUMMARY

Mannesmann-Tally MT85

Nine-pin dot matrix printer

The MT85 compromises reasonable speed, acceptable output, and cartridge font support with hard-to-use features and limited paper-handling capabilities. For its relatively high price, it's not a bargain.

	POOR	FAIR	GOOD	EXCELLENT
Speed			●	
Print quality				●
Paper handling			●	
Printer control			●	
Typographic features				●
Overall value			●	

Reader service no. 692

EXECUTIVE SUMMARY

Facit B1100

Nine-pin dot matrix printer

Terrific-looking output but slow throughput characterize this printer. Meager paper-handling features and limited emulations also reduce the B1100's overall value.

	POOR	FAIR	GOOD	EXCELLENT
Speed			●	
Print quality				●
Paper handling			●	
Printer control			●	
Typographic features			●	
Overall value			●	

Reader service no. 691

else to recommend it. At $325, it can claim few of the features of the similarly priced Star or Seikosha.

The B1100 has minimal paper handling and awkward panel controls. The Facit offers only a pull-tractor feed and a wire paper separator. No cut-sheet feeder is available, and as with the Mannesmann Tally, single sheets must be hand-fed.

The B1100 offers only a single Sans Serif typeface and IBM Proprinter emulation. However, draft and NLQ text are exceptionally clear and legible. Graphics print well but lose some detail at high density. Unfortunately, total throughput is the second slowest of the printers reviewed.

The B1100 prints well in its one font, but lack of speed and meager paper-handling features undermine this printer's value.

Tandy DMP-132

The Tandy DMP-132 bears a striking physical resemblance to the Seikosha SP-1600AI. However, the $379.95 DMP-132 costs more than the Seikosha, has fewer features, and is substantially slower. In fact, the Tandy has the slowest throughput of all the printers in IBM emulation tests. Additionally, the DMP-132 requires a special Tandy parallel cable ($34.95) to work with IBM-compatible computers and operates only in Tandy mode or by emulating an IBM Graphics Printer.

Like the Seikosha, the Tandy's paper-handling skills are good, though limited. The Tandy has automatic paper feed, but for single-sheet operation you must remove the fanfold paper.

The DMP-132's typographic features are adequate for light-duty tasks. It provides two typefaces—a draft and NLQ Sans Serif—and a full complement of print styles. NLQ and high-density graphics output looks fine, but draft modes lack clarity.

If you require a Tandy-compatible printer, the DMP-132 fills the bill. Otherwise, for the $400-plus you'll shell out for the DMP-132 and cable, you can find a better deal.

EXECUTIVE SUMMARY

Tandy DMP-132

Nine-pin dot matrix printer

The DMP-132 is relatively slow and requires special cabling to work with non-Tandy computers. Despite its good output and paper handling, you can find better deals for the money.

	POOR	FAIR	GOOD	EXCELLENT
Speed	●			
Print quality				●
Paper handling				●
Printer control				●
Typographic features				●
Overall value			●	

Reader service no. 696

Epson LX-800

Epson's least expensive printer, the $299 LX-800, is dependable if unexciting. It offers a basic array of features and middle-of-the-road speed. The LX-800 delivers spidery draft text, but its two NLQ typefaces (Roman and Sans Serif) are solid.

The LX-800 features dependable paper handling with automatic paper feed and a pull tractor but no forms parking. The top-mounted three-button control panel makes selecting draft or NLQ print modes easy.

The LX-800 is solid and reliable. It will surely perform in the best yeoman tradition,

6.2 MIPS AND SUPPORT THAT'LL REALLY BLOW YOU AWAY.

Our 386/25 MHz is the fastest in its class.

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CPU 80386-25	CPU and memory speed 10/25MHz
Floating point processor 80387-25/Weitek 3167	I/O expansion bus 8MHz
	I/O ports ..... 1 serial and 1 parallel port
RAM ..... 1 or 4MB on board (8MB max.)	8 expansion slots ... 1 32-bit, 6 16-bit, 1 8-bit
Cache memory ..... 64 or 256KB SRAM	Norton SI (ver 4.0) 30.5
Maximum RAM 16MB	Landmark Speed Test (ver 1.07) 40.8
Wait states ..... zero wait state	MIPS (PM ver 1.2) 6.2

Base 4MB Unit $4,499.00

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EXECUTIVE SUMMARY

Epson LX-800

Nine-pin dot matrix printer

The LX-800 is a basic printer with moderate speed and output quality. Ill-defined draft text and graphics output and a meager array of features limit what is otherwise a steady performer.

	POOR	FAIR	GOOD	EXCELLENT
Speed			●	
Print quality				●
Paper handling				●
Printer control				●
Typographic features				●
Overall value				●

Reader service no. 690

but it lacks the variety of features and the overall speed to make it a real star.

Nine-Pins, No Waiting

Judging the seven 9-pin dot matrix printers—first on speed and print quality and then on paper handling, printer control, and extras—produced clear winners and losers. The Okidata Microline 320 tops every category. Second place goes to the Seikosha SP-1600AI, which offers the second-best speed and an abundance of controls and features at a low price. Both printers earn our Best Buy.

The Star Micronics NX-1000 Multi-Font and the Epson LX-800 are dependable performers and good overall values. The Epson LX-800 offers adequate speed and just enough features to balance out its ho-hum print quality. Despite relatively slow print throughput, the Star's comprehensive panel controls and four fonts make it a safe buy.

The Mannesmann Tally MT85, the Facit B1100, and the Tandy DMP-132 are at best fair values. The B1100's best feature is its print quality, but throughput is too slow. The high-priced and awkward MT85 and the limited DMP-132 are not recommended. ●

Paul Meyers is a San Francisco–based video producer who specializes in high-technology subjects.

WHERE TO BUY

Epson LX-800
Epson America
23530 Hawthorne Blvd.
Torrance, CA 90505
213/539-9140
LIST PRICE: $299
ACCESSORIES: cut-sheet feeder $99, 32K buffer $175, serial port adapter $59
WARRANTY: one year parts and labor
EXTENDED WARRANTY: $39.95 for one year additional parts and labor
TECHNICAL SUPPORT: unlimited phone support, toll-free number, M–F 8–5
Reader service no. 690

Facit B1100
Facit Inc.
9 Executive Park Dr.
#334
Merrimack, NH 03054
603/424-8000
LIST PRICE: $325
ACCESSORIES: none
WARRANTY: one year parts and labor
EXTENDED WARRANTY: service contract available through third parties
TECHNICAL SUPPORT: unlimited phone support, toll-free number, M–F 9–5
Reader service no. 691

Mannesmann Tally MT85
Mannesmann Tally Corp.
8301 S. 180th St.
Kent, WA 98032
206/251-5500
LIST PRICE: $499
ACCESSORIES: plug-in font cartridges $38.50, serial interface card $76.95
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: unlimited phone support, no toll-free number, M–F 7:30–4:30
Reader service no. 692

Okidata Microline 320
Okidata
532 Fellowship Rd.
Mount Laurel, NJ 90404
609/235-2600
LIST PRICE: $499
ACCESSORIES: pull tractar $49, cut-sheet feeder $299, serial interface $89
WARRANTY: one year parts and labor
EXTENDED WARRANTY: available through dealers
TECHNICAL SUPPORT: unlimited phone support, toll-free number, M–F 9–9
Reader service no. 693

Seikosha SP-1600AI
Seikosha America
1111 MacArthur Blvd.
Mahwah, NJ 07430
201/529-4655
LIST PRICE: $329
ACCESSORIES: cut-sheet feeder $149
WARRANTY: one year on printhead, two years parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: unlimited phone support, toll-free number, M, Th 8:45–6, T, W, F 8:45–9
Reader service no. 694

Star Micronics NX-1000 Multi-Font
Star Micronics
200 Park Ave.
New York, NY 10166
212/986-6770
LIST PRICE: $299
ACCESSORIES: cut-sheet feeder $107
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: unlimited phone support, toll-free number, M–F 8–4
Reader service no. 695

Tandy DMP-132
Tandy Corp.
1800 One Tandy Center
Fort Worth, TX 76102
817/390-3700
LIST PRICE: $379.95
ACCESSORIES: IBM PC–compatible parallel cable $34.95
WARRANTY: 90 days parts and labor
EXTENDED WARRANTY: $27.50 for first year, $37 per year thereafter
TECHNICAL SUPPORT: unlimited phone support, no toll-free number, M–F 8–5; walk-in support at Radio Shack Computer Centers
Reader service no. 696

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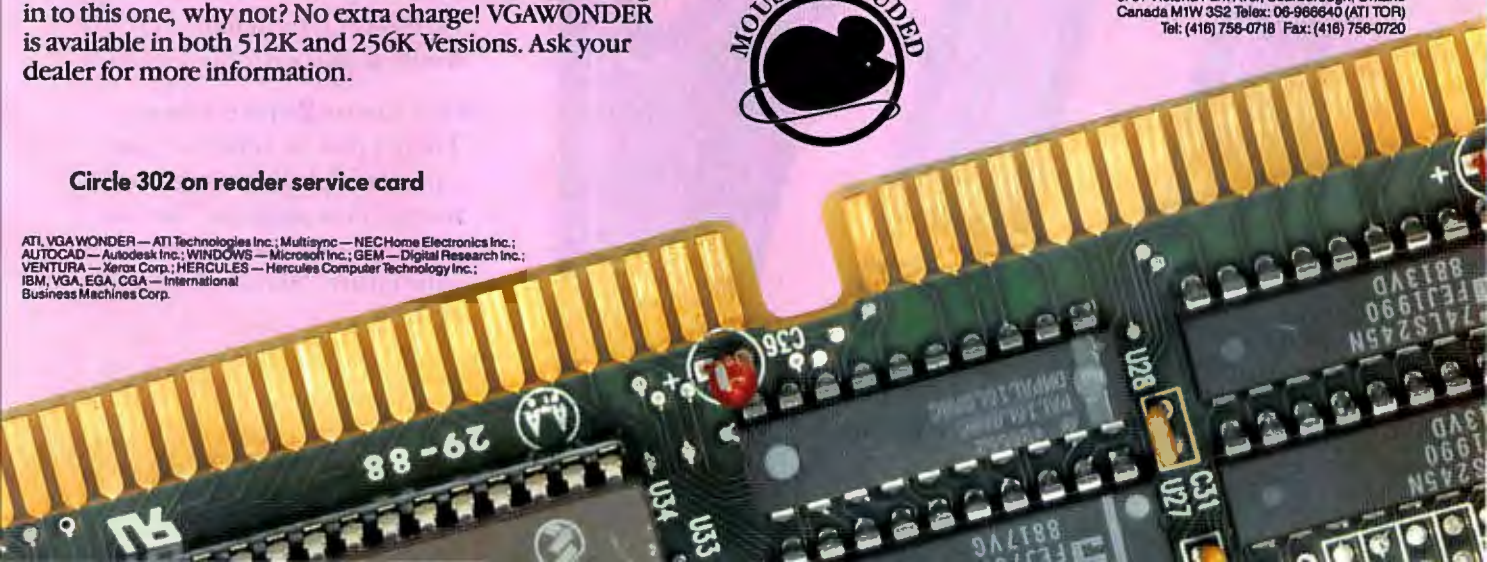
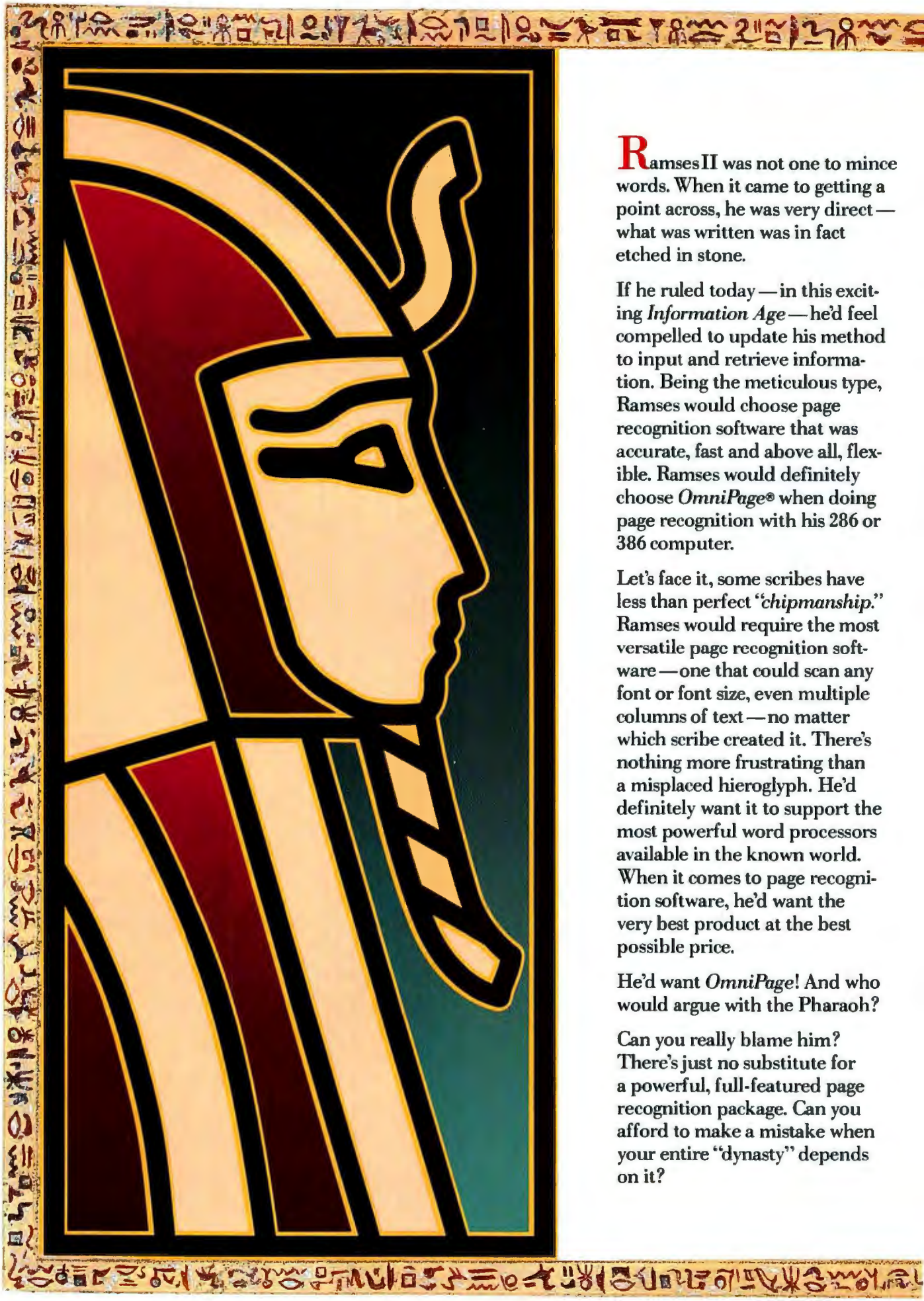
ATI, VGA WONDER — ATI Technologies Inc.; Multisync — NEC Home Electronics Inc.; AUTOCAD — Autodesk Inc.; WINDOWS — Microsoft Inc.; GEM — Digital Research Inc.; VENTURA — Xerox Corp.; HERCULES — Hercules Computer Technology Inc.; IBM, VGA, EGA, CGA — International Business Machines Corp.





Ramses II was not one to mince words. When it came to getting a point across, he was very direct — what was written was in fact etched in stone.

If he ruled today — in this exciting *Information Age* — he'd feel compelled to update his method to input and retrieve information. Being the meticulous type, Ramses would choose page recognition software that was accurate, fast and above all, flexible. Ramses would definitely choose *OmniPage*® when doing page recognition with his 286 or 386 computer.

Let's face it, some scribes have less than perfect "*chipmanship.*" Ramses would require the most versatile page recognition software — one that could scan any font or font size, even multiple columns of text — no matter which scribe created it. There's nothing more frustrating than a misplaced hieroglyph. He'd definitely want it to support the most powerful word processors available in the known world. When it comes to page recognition software, he'd want the very best product at the best possible price.

He'd want *OmniPage*! And who would argue with the Pharaoh?

Can you really blame him? There's just no substitute for a powerful, full-featured page recognition package. Can you afford to make a mistake when your entire "dynasty" depends on it?

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Supports the most popular word processing, spreadsheet and data base programs.

Supports 11 of your favorite Indo-european languages, including French, German and Spanish.

WYSIScan™ interface takes full advantage of the *Windows* environment — an excellent compliment to any AT or 386 machine.

OmniPage/386 has even more features than ever before — which translates into the most comprehensive page recognition software available — anywhere — for any dynasty — at any price.

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Now... *OmniPage/386* software only!

*Egyptian scribes had a real time of it when it came to excessive key strokes. Each letter, or hieroglyph, had to be individually etched into stone. And we complain today about writer's cramp?

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CAERE

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1-800-535-SCAN

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INSIDE THE HARDWARE SHELF

126 **NEC PowerMate SX**
This 16-MHz 80386SX system may not usher you into the next generation, but if you need a compact, affordable, entry-level system with great graphics, it's a solid bet.

128 **Vendex HeadStart III**
A keep-it-simple 12-MHz AT compatible combines effortless setup with a stunning assortment of extras, including a menu-driven DOS shell.

132 **Panasonic LF-5000**
Add Corel's interface kit to this fast, sturdy WORM drive, and you've got a good deal that's easy to set up and use.

132 **Storage Dimensions LaserStor LS800AT-E**
Speedy performance and economical storage make this WORM drive alluring, but managing the system can be a bear.

132 **IBM 3363**
It's got some things going for it—relatively painless installation, low-overhead WORM storage, and competent menu-driven utilities. But it's slow and expensive.

NEC's compact PowerMate SX offers 80386 power (plus outstanding graphics options) at about $1000 less than an SX-based Compaq—but runs more slowly.

NEC PowerMate SX

16-MHz 80386SX computer

PROS: Moderate price, small footprint, superior graphics options

CONS: Unimpressive speed, limited device capacity

Slowly but surely 80386SX PCs are replacing 16-MHz 80386 machines as *the* entry-level 80386. Why? Because SX systems perform nearly as well, they're cheaper to make, and as they say, those cost savings are passed on to you.

If you choose NEC's PowerMate SX over the original SX machine, Compaq's Deskpro 386S, you'll save even more. At $5940 with 2MB of RAM, a 40MB hard disk, and VGA graphics, the PowerMate SX is about $1000 cheaper than a similarly equipped Deskpro 386S; and unlike Compaq, NEC throws in DOS 3.3, *GW BASIC 3.2*, and *Windows/386*. Another plus is that the standard VGA setup is NEC's own VGB and MultiSync II, a board/monitor combo that enables you to display 800 by 600 graphics.

The catch is that the PowerMate SX is slower than the Deskpro 386S. In the processing-intensive *1-2-3* test, it missed by less than 4 percent; in the disk-intensive *Microsoft C* benchmark, however, unimpressive hard disk performance kept the PowerMate SX about 20 percentage points behind its rival.

The PowerMate SX has the same small chassis as NEC's 80286 systems. The similarity doesn't stop there: As with any SX system, the 80386SX CPU accesses memory 16 bits at a time, just like an 80286. The advantage of having an SX machine instead of an equally fast 80286 system is that you can run such 80386-specific packages as *Paradox/386*, *Foxbase/386*, and of course *Windows/386*.

Windows/386 requires at least 2MB of RAM, which is undoubtedly one reason the PowerMate comes standard with 2MB on the motherboard. In addition, the system offers a special CPU-speed memory slot. For $1295, you can fill the slot with a proprietary

FRED STIMSON

board holding 2MB; a 4MB version costs $2995. A snap-on 4MB expansion module ($2795) brings the board to 8MB, yielding a memory bus capacity of 10MB, compared to the Deskpro 386S's 13MB fast-RAM potential.

The PowerMate SX also has a bit less room for drives. It provides three externally accessible bays: one 3½-inch and two half-height 5¼-inch. The Deskpro 386S has three 5¼-inch bays (one half-height and two third-height) open to the outside world and one internal 3½-inch bay. Compaq's arrangement lets you install two types of floppy drives, even if you plan on installing a tape backup.

With one 8-bit and five 8/16-bit slots, the PowerMate SX holds an impressive number of boards for a small-footprint machine. Fill the unit with a hard/floppy disk controller and NEC's VGB board, and you still have four slots open (one parallel and one serial port are built into the motherboard). However, even though the Deskpro 386S motherboard has only four 8/16-bit slots, they're all free; Compaq integrates not only the ports but also the hard/floppy controller, a VGA board, and a mouse port.

Where NEC shines brightest is in graphics. The NEC VGB comes with special drivers that enable you to display *GEM*, *AutoCAD*, *1-2-3*, *Symphony*, *Cadvance*, *Ventura Publisher*, *Framework II*, and (naturally) *Windows* at 800 by 600 resolution. And the MultiSync II monitor is compatible with both analog VGA and digital (EGA, CGA, and so on) boards.

The system software for the PowerMate SX includes a disk-based system-setup routine and complete diagnostics, both of which are menu-driven. There are no DIP switches or jumpers to set during configuration.

The PowerMate SX's excellent graphics options aside, the Deskpro 386S is a better system, with more speed, slightly larger drive and CPU-speed RAM capacities, and a somewhat smaller footprint. But are these advantages worth $1000, especially when you consider the PowerMate SX's generous soft-

FEATURES EVALUATION

Two New Systems: Low Prices and Strong Features

NEC's PowerMate SX lacks the Compaq 386S's integrated motherboard but boasts a lower price. Vendex's compact HeadStart III is almost $2000 cheaper than Compaq's Deskpro 286 and offers higher memory bus capacity.

● Yes
○ No

Standard features	NEC PowerMate SX	Compaq 386S	Vendex HeadStart III	Compaq Deskpro 286
Price	$5940 [1]	$6946 [1]	$3690 [2]	$5617 [3]
CPU	80386SX	80386SX	80286	80286
CPU speed	16 MHz	16 MHz	12 MHz	12 MHz
Coprocessor support	80387SX	80387SX	80287/12	80287/8
Disk caching software	●	●	○	●
Built into motherboard				
Parallel ports	1	1	1	0
Serial ports	1	1	2	0
Floppy disk controller	○	●	●	○
Video adapter	○	●	○	○
Mouse port	○	●	○ [4]	○
Memory bus capacity [5]	10MB	13MB	3MB	2.1MB
Expandability				
8/16-bit expansion slots/ number free	5/3	4/4	6/3	6/4
8-bit expansion slots/ number free	1/1	0/0	0/0	2/2
Half/full-height storage device bays	3/0	4/0 [6]	3/0	4/2
300MB or larger hard disk available from maker	○	○	○	●
Ergonomic design				
Switchless setup	●	●	●	○
Compact footprint	●	●	●	○
Complete documentation	●	●	●	●
Tilt-and-swivel monitor	●	●	●	●
Front-panel reset button	○	○	●	○
Front-panel on/off switch	○	●	●	○

[1] Price includes 2MB RAM, one 1.2MB floppy drive, 40MB hard disk, VGA adapter and color VGA monitor, one parallel and one serial port, 101-key keyboard.
[2] Price includes 1MB RAM, one 1.44MB floppy drive, one 1.2MB floppy drive, 32MB hard drive, one parallel port, two serial ports, mouse and mouse port, VGA board, color monitor, 101-key keyboard, DOS 3.3.
[3] Price includes 640K RAM, 1.2MB floppy drive, 40MB hard drive, one parallel port, one serial port, game port, VGA board, color monitor, 101-key keyboard, DOS 3.2.
[4] Bus mouse adapter supplied with system.
[5] Includes motherboard memory and RAM installable in proprietary slots, accessed at full CPU speed.
[6] Two bays hold only third-height devices.

FRED STIMSON

Vendex's HeadStart III, a low-priced 12-MHz 80286, comes with a tempting bundle of software and a menu shell that runs applications and DOS.

ware bundle? Considering that price means a lot with entry-level systems, the PowerMate SX looks like a better deal. —*Eric Knorr*

WHERE TO BUY

PowerMate SX
NEC Information Systems, Inc.
1414 Massachusetts Ave.
Boxborough, MA 01719
617/264-8000
LIST PRICE: with 2MB RAM, 1.2MB or 1.44MB floppy drive, one parallel and one serial port, 101-key keyboard, MS-DOS 3.3 and GW BASIC 3.2 $3595; with 42MB hard disk $4495; with 80MB hard disk $5595; with 140MB hard disk $5995
ACCESSORIES: memory expansion board with 2MB $1295, with 4MB $2995; 4MB memory exponsion module for board $2795; video grophics board (VGA compatible) $495; PowerMate/MultiSync II monitor $950; 80387SX math coprocessor $799
WARRANTY: one year parts and labor
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: dealer only
OTHER SUPPORT: BBS
Reader service no. 670

Vendex HeadStart III

12-MHz AT-compatible system

BEST BUY

PROS: Compact, goof-proof setup routine and operating environment, generous software package, on-site warranty

CONS: Limited expandability

Like its corporate spokesman, King Kong Bundy, Vendex's HeadStart III is an eye-catching contradiction in terms. The 450-pound pro wrestler is reportedly articulate and soft-spoken; the system, which enters the rough-and-tumble arena of bare-bones clones, comes with setup and configuration software that verges on the eloquent. You also get a heavyweight package of add-ons: a Logitech mouse, a game port, 18 months of on-site warranty service, and an amazing software bundle that includes a menu-driven DOS shell. Moreover, the 12-MHz, one-wait-state system is compact, well designed, and more than acceptably fast.

The HeadStart III runs nearly $2000 less than a similarly configured Compaq Deskpro 286 but about $700 more than a low-end mail-order clone. For $3690 you get 1MB of RAM, a 28ms 32MB hard drive, one 1.44MB 3½-inch and one 1.2MB 5¼-inch floppy drive, a 16-bit VGA board, a 13-inch VGA color monitor, a 101-key keyboard, one parallel and two serial ports, a game port, a Logitech bus mouse, a mouse port, and DOS 3.3. You can save $446 by choosing a 13-inch paper-white monitor in place of the VGA.

In NSTL performance tests, the HeadStart III held its own against a 12-MHz, one-wait-state Compaq Deskpro 286, virtually matching the Deskpro in four out of five applications. Only in the disk-intensive *dBASE* benchmark did the HeadStart fall slightly behind its higher-priced rival. NSTL's Crash Test failed to turn up any incompatibilities.

As with most compact systems, you'll pay a price in expandability. True, the slot count (six 8/16-bit slots) is fairly good, and while three slots are occupied (by a video board, a hard disk controller, and a mouse board), the floppy controller and I/O ports are built into the motherboard, so all three remaining slots are available. But device expansion is more problematic. Two half-height floppy drives and a half-height internal hard disk fill every available bay. CPU-speed RAM is limited to 3MB, socketed on the motherboard; additional memory must be installed via one of the precious 8/16-bit slots and will run only at expansion bus speed (8 MHz).

The HeadStart III gets high marks for ergonomics. The power switch is on the front panel, as is the reset switch. The Fujitsu keyboard is a bit stiff but offers good tactile

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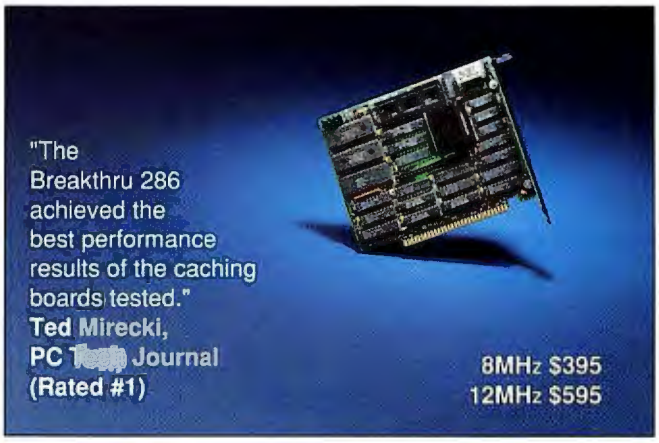

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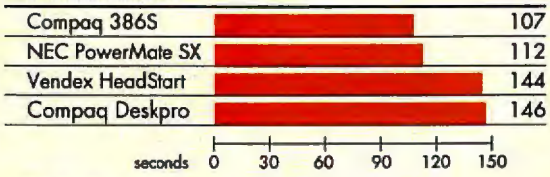
NSTL TEST REPORT

Impressive Price/Performance Value from NEC PowerMate SX, Vendex HeadStart III

NEC's PowerMate SX performs nearly as well as the far more expensive Compaq 386S but is a bit less expandable. Vendex's 12-MHz 286 HeadStart performs on a par with the Compaq Deskpro and offers an outstanding software bundle—for nearly $2000 less.

Microsoft Word



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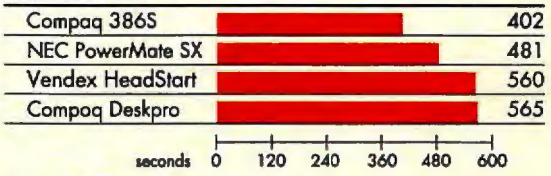
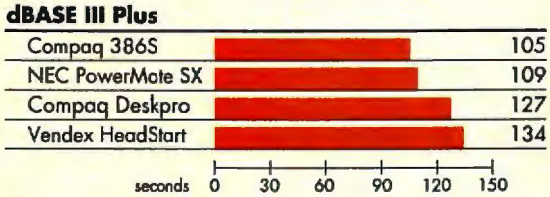


dBASE III Plus



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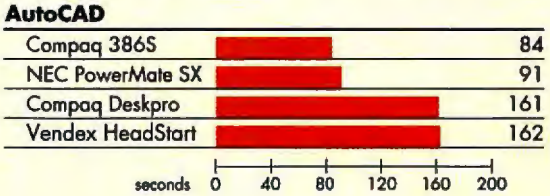
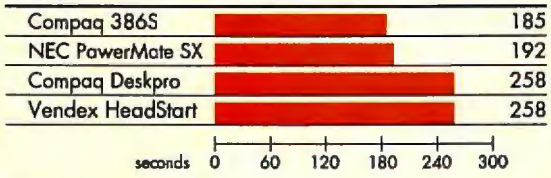


1-2-3



Methodology
All machines were tested with a coprocessor and a 256K extended memory disk cache, except in the *1-2-3* benchmark. The 16-MHz NEC PowerMate SX was configured with a 45MB hard disk and 1MB of RAM. The 16-MHz Compaq Deskpro 386S was configured with a 40MB hard disk and 1MB of RAM. The 12-MHz Vendex HeadStart III was configured with a 32MB hard disk and 1MB of RAM. The 12-MHz Compaq Deskpro 286 was configured with a 42MB hard disk and 2.1MB of RAM.

Microsoft Word 4.0
A *Microsoft Word* macro loads a 35-page, 140-paragraph document and performs search-and-replace and spell-checking operations. The first page of the document is then printed. 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 prepare and print a report of past-due invoices. The report includes calculated fields and is based on three files: a 500-record customer file, a 1000-record invoice file, and a 2000-record item file. When disk caching is not used, the random access speed of the hard disk is, after processor speed, the most significant factor in this benchmark. With disk caching, 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 screen access is required, the results depend almost entirely on processing and memory access speeds.

Microsoft C 5.0
The *Microsoft C* benchmark measures the time required to compile and link *XLISP*, a public-domain program composed of 25 C source code files. The most important factors in this benchmark are processor and memory access speeds. The performance of the hard disk is also a factor; generally, disk caching has little effect.

AutoCAD 9
In this benchmark, a three-dimensional sample drawing is retrieved and displayed using *AutoCAD*'s EGA driver. The zoom function is used to display the drawing from various perspectives; then the full drawing is printed. The results of the benchmark 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 the hard disk also have some effect.

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

feedback. And the 13-inch tilt-and-swivel color monitor that came with the review unit produced a sharp, clear image.

It's the remarkably friendly menu-driven setup routine that sets the HeadStart III apart from the competition. It formats the hard disk; installs the system files, the utilities, and the bundled applications; creates a directory structure; and builds a mouse-

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powered menu shell to run applications and DOS utilities.

What's more, a hefty software bundle covers virtually every conceivable application: Ashton-Tate's *Framework II* offers word processing, a spreadsheet, and a data base; *Publish-It* covers basic DTP; and *Splash* and *Perspective 3d Graphics* take care of drawing and charting. *Xtree 3.0* handles file management chores, and there's even a collection of desktop accessories.

Is the HeadStart III right for you? If you're a sophisticated PC user who needs maximum headroom for device and RAM expansion, probably not. But for the small-business or home user who doesn't care to go ten rounds with DOS and appreciates a keep-it-simple design and operating environment—plus a fabulous software bundle—it's hard to imagine a better choice. Add the fact that Vendex, a humongous European corporation, is likely to be around for a while, and this looks even more like a knockout. —*Ed Bott*

WHERE TO BUY

Vendex HeadStart III
Vendex Technologies Inc.
40 Cutter Mill Rd. #438
Great Neck, NY 11021
516/773-3062
LIST PRICE: with 1MB RAM, 1.44MB floppy drive, 1.2MB flappy drive, 32MB hard disk, VGA card, one parallel and two serial ports, game port, mouse port and Logitech mouse, 101-key keyboard, DOS 3.3, HeadStart Advanced Environment, bundled software $2995
ACCESSORIES: 13-inch VGA analog white monochrome monitor $249, 13-inch VGA color monitor $695
WARRANTY: 18 months on-site service
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll-free number, M–F 9–8
OTHER SUPPORT: none
Reader service no. 671

Panasonic LF-5000

Write-once optical disk drive

PROS: Fast, easiest to install and use, excellent Corel interface kit

CONS: No security features, manual lacks some examples

Storage Dimensions LaserStor LS800AT-E

Write-once optical disk drive

PROS: Fast, cheapest cost per byte stored

CONS: Tricky to manage, drivers soak up hard disk and RAM space, no security features

IBM 3363

Write-once optical disk drive

PROS: Easy to set up and run, user manual lucid

CONS: Slow, expensive, sold with single-sided cartridges, no security features

The benefits of write once, read many (WORM) optical disk drives have been known for years. WORM drives use rugged, removable cartridges that can hold hundreds of megabytes of tamperproof data. And in the last year, WORM drive performance has improved, storage has jumped to as much as 1 gigabyte per cartridge, while prices for 200MB units have dipped to under $2000.

Just keep in mind that WORM drives aren't hard disk replacements; data is literally burned into a disk and is thus immutable. Worse, media isn't interchangeable among different vendors' drives, most units are fragile, and a significant amount of storage space can be eaten up by WORM overhead. Nor are many WORM drives plug-and-play devices. Physically installing a WORM drive is relatively simple, but in most cases using one means fussing with a confusing array of drivers and "mounting" drive volumes before DOS can recognize them.

All three external 5¼-inch units reviewed here can be treated like ordinary hard drives, are compatible with most DOS commands and applications, and allow disk volumes to exceed DOS's 32MB limit. Two come with backup programs, and all three include trace programs that locate and reactivate "deleted" and "overwritten" files.

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FEATURES EVALUATION

WORM Drives: Bottomless Storage, Setup Pains

Storage versus cost is the name of the WORM game, but highest marks go to the Corel-equipped Panasonic drive, which is fast and easy to install.

● Yes
○ No
◒ Deficient

	Panasonic LF-5000	Storage Dimensions LaserStor LS800AT-E	IBM 3363
Capacity			
List price[1]	$2998	$4495	$3095
Cartridge price	$115	$150	$68
Total formatted capacity	384MB	786MB	200MB[2]
Cost per megabyte stored[3]	30 cents	19 cents	34 cents
Logical drives possible	1	1	1
Smallest volume	32MB	n/a	n/a
Largest volume	192MB	393MB	200MB
Setup and installation			
Automatic software installation	○	○	○
Patches DOS	●	○	●
Requires mount/dismount	○	●	○
Supports expanded memory	○	○	○
Controller			
Type	SCSI	SCSI	proprietary
Daisy-chained WORMs possible	14	2	2
Other devices supported	2	7	0
Data transfer rate (megabits per second)	2.5	10	2.5
Requirements			
RAM for drivers	40K	64K	130K
Maximum power (watts)	45	30	30

	Panasonic LF-5000	Storage Dimensions LaserStor LS800AT-E	IBM 3363
Compatibility			
PCs, XTs, and ATs	●	●	●
16-MHz to 25-MHz 386 systems	●	●	●
DOS 4.0	○	○	◒[4]
Xenix	○	○	●
Novell NetWare	●[5]	○	○
3COM 3+	●[6]	○	○
PC LAN	●	●	●
TOPS	●	○	○
Utilities			
Disk cache	○	●[7]	●
Disk diagnostics	●	○	●
Data recovery	●	◒	○
Trace			
User-defined markers	●	○	○
Directly restores individual files	○	○	●
Restores entire cartridge	●	●	○
Permanent volume labels	●	●	●
Password protection	○	○	○
Backup and restore	●	○	●

[1] Includes cost of drive, controller, cable, and software.
[2] Single-sided disk.
[3] Cost of cartridge divided by formatted capacity.
[4] Only with 1.02D version of IBM software.
[5] Separate Corel interface kit required for server.
[6] Custom kit from Corel required.
[7] Hard-disk–based cache.

Panasonic LF-5000

On the basis of ease of use, cost, and performance, Panasonic's LF-5000 is clearly the drive to buy. (However, unlike with the other units reviewed, you must buy the $399 Corel Optical Disk Interface kit separately, which raises the price from $2599 to $2998.) Panasonic's unit is sturdy, gives you a choice between two reasonably priced cartridges (200MB and 400MB), comes in first or second on each NSTL speed test, and is fairly easy to set up and use, thanks to the Corel kit.

All three drives limit you to one disk volume. But Corel's drivers take just 40K of RAM, and the WORM overhead is acceptable: only 22MB to store 20MB of files.

Although setup and configuration aren't menu-driven, they're still quite easy because Corel relies on simple DOS-like commands. Corel's trace program is flexible but difficult to use because the otherwise-lucid user manual lacks pertinent examples. But it's the only trace program that lets you attach

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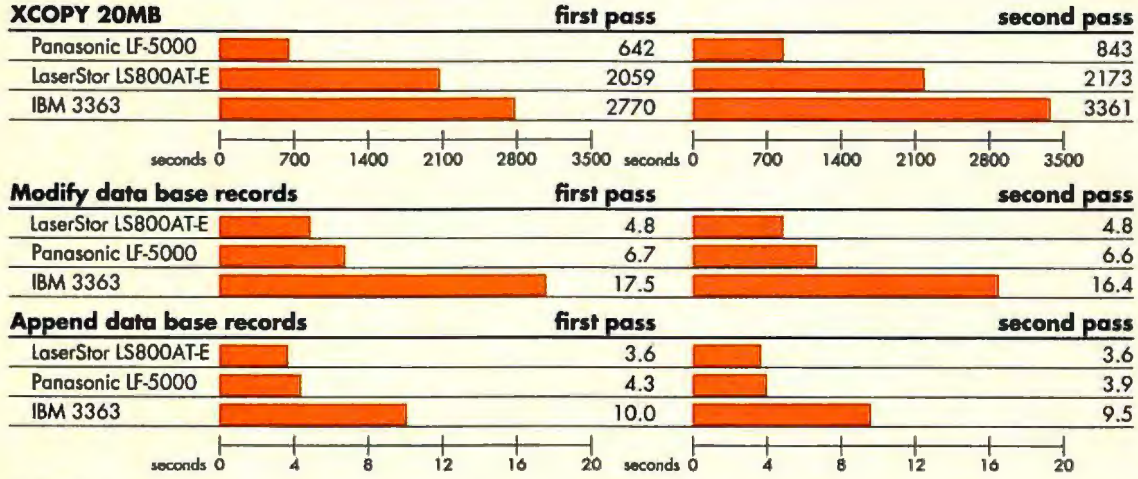
Circle 212 on reader service card

NSTL TEST REPORT

WORM Drives—Approaching Hard Disk Speed

The fastest WORM drives like the LaserStor can almost match a 65ms hard disk's speed—for a while. But performance can plummet when the same files are saved twice.



Methodology
All the WORM drive tests were conducted using a Compaq Deskpro 386/20 Model 130 with a 130MB hard disk and an ESDI hard disk controller. Compaq MS-DOS 3.31 was installed on the hard disk in its own directory, and the benchmark files were stored in the first two partitions (both 20MB) on the hard disk. Compaq DOS was updated with a patch called BIGSECTR to allow device drivers that modify DOS to use sectors larger than 512 bytes. Without the patch from Compaq, some of the device drivers do not function properly with Compaq MS-DOS 3.31.

The test WORM drive was connected to the Deskpro 386/20 using the controller board provided by the manufacturer; its controller was configured according to the manufacturer's instructions to provide optimum performance in the Compaq. The drive was configured to use an entire cartridge as one large partition. The benchmarks were executed using batch files and timed using the DOS time function.

To determine how performance was affected when existing files were replaced, the benchmarks were repeated using the same cartridge. The difference between the first and second passes varies considerably from drive to drive, and sometimes from test to test.

XCOPY 20MB
This test measured the time required to copy 20MB of files from the computer's hard disk to the optical drive using the DOS XCOPY command. The data copied consisted of 840 files in 38 subdirectories; file size ranged from less than 512K to over 1MB. The test is analogous to using the optical drive as a backup device.

Modify data base records
This test measured the time required to modify 40 records in a *dBASE III Plus* data base file stored on the optical drive. The test is analogous to updating an inventory data base.

Append data base records
This test measured the time required to append 40 records to a *dBASE III Plus* file stored on the optical drive. The test is analogous to updating an accounting system in which batches of transactions are added to the transaction file each day.

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

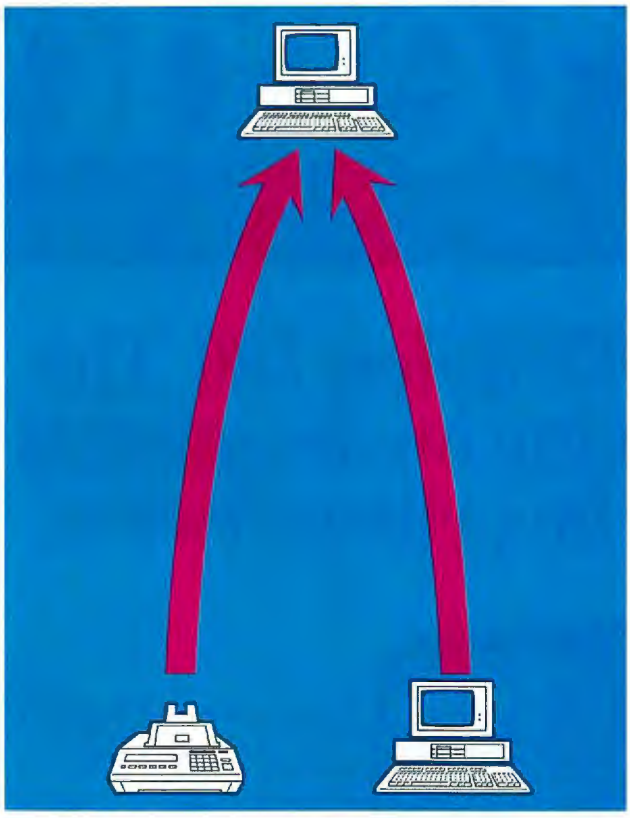
markers to individual deleted files. If you need to find a file later, you simply scan a list of markers instead of the entire disk. Corel's prompt-driven hard disk backup and restore programs are simple, fast, and complete.

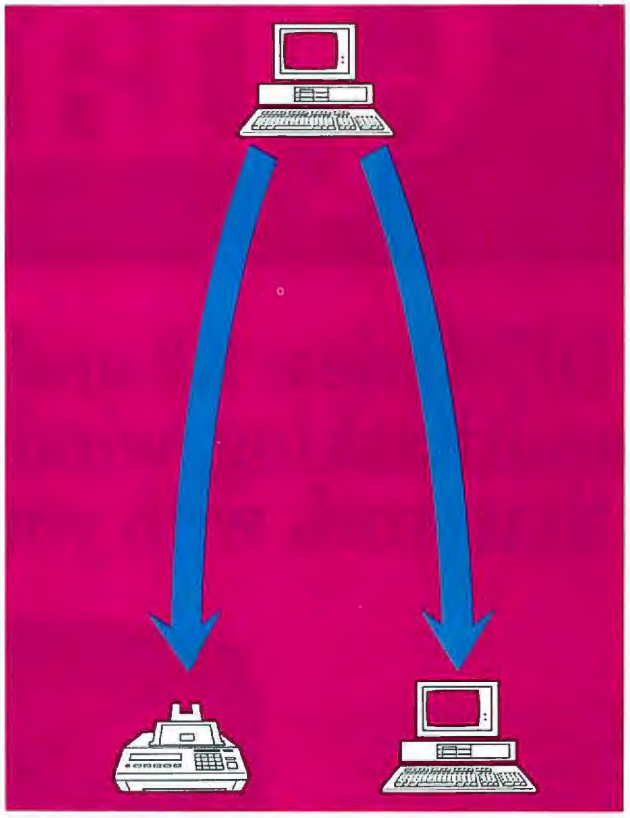
Alas, security features such as password protection for volumes and cartridges are absent, and there's no disk caching program. (The other two drives offer very limited caching.) If you can live without these features, however, the LF-5000/Corel combination is a good deal that presents minimal headaches.

Storage Dimensions LaserStor LS800AT-E

If performance and cost per byte are your alpha and omega, Storage Dimensions' LaserStor is the WORM drive for you. As NSTL tests show, this drive is generally the speediest, and at $4495 for 786MB of on-line storage, it's a good price/performance bargain. If ease of setup and use are paramount, however, think twice.

Easy come. Easy go.





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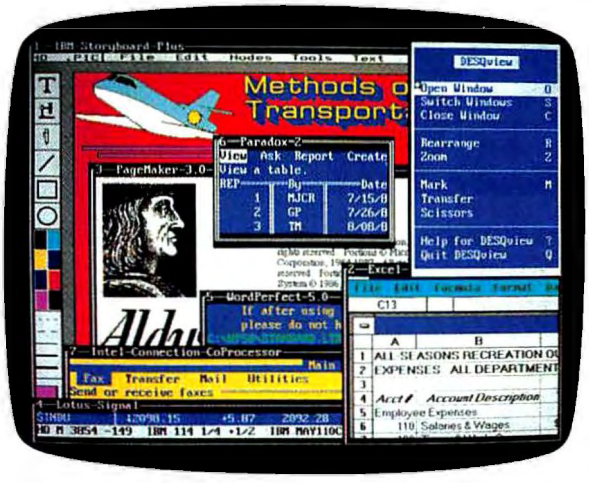

DESQview lets you run your favorite programs in windows side-by-side.

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And now, DESQview 2.2 adds capabilities, performance, and compatibility enhancements you've been asking for:

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Promise and performance

And, of course, both DESQviews have all the features that made prior versions the popular choice in operating environments. The ability to multitask in 640K and beyond. View programs in windows or full screen. Transfer data. Access DOS via menus. Dial your phone. And create keystroke macros within and between programs.

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API Reference Manual

The key to the power of the DESQview API, our Reference Manual contains all you need to know to write Assembly Language programs that take full advantage of DESQview's capabilities. And there's an 'include' file with symbols and macros to aid you in development.

API C Library

Here are C language interfaces for the entire set of API functions. It supports the Lattice™ C, Metaware™ C, Microsoft® C, and Turbo C compilers for all memory models. Included with the C Library package is the API Reference Manual and source code for the library.

API Pascal Library

NEW!

The Pascal library provides interfaces for the entire set of API functions. It supports Turbo Pascal V4.0 and V5.0 compilers. Included are the API Reference Manual, source code for the library, and example programs.

API Debugger

The DESQview API Debugger is an interactive tool enabling the API programmer to trace and single step through API calls from several concurrently running DESQview-specific programs. Trace information is reported symbolically along with the program counter, registers, and stack at the time of the call. Trace conditions can be specified so that only calls of interest are reported.

API Panel Designer

This interactive tool helps you design windows, menus, help screens, error messages, and forms. It includes an editor that lets you construct an image of your panel using simple commands to enter, edit, copy, and move text, as well as draw lines and boxes. You can then define the characteristics of the window that will contain the panel, such as its position, size, and title. Finally, you can specify the locations and types of fields in the panel.

The Panel Designer automatically generates all the DESQview API data streams necessary to display and take input from your panel. These data streams may be grouped into panel libraries and stored on disk or as part of your program.

More Tools are Coming

Quarterdeck is committed to adding tools as needed by our users. To that end we have been working with Ashton Tate and Buzzwords International on dBASE III and dBASEIV translators. And in the works, we have BASIC and DOS Extender libraries.

Quarterdeck

Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405 (213) 392-9851
FAX: (213) 399-3802

Installation is relatively straightforward. The menu-driven software creates a special data cache on your hard disk—which is the secret to the LaserStor's speed. The cache holds data temporarily; then at the end of a session, you can specify what data you want saved to the slower WORM drive.

Sound good? Unfortunately, managing the system is a bear. Before you change cartridges, you must transfer the data from the hard disk cache to the WORM drive, issue the Dismount command, and physically eject the cartridge. If you forget any one of these steps, the WORM drive can't read the data later.

IBM 3363

IBM continues its tradition of being a step behind the competition by selling a 200MB WORM drive for $3095, when $2998 buys a 400MB unit from Panasonic. Although not quite as easy to install and run as the Panasonic, the 3363 is still relatively painless. WORM storage overhead is a mere 2 percent, and the unit comes with competent menu-driven format, backup, and restore programs. IBM's documentation is also the most lucid of the lot.

As NSTL's tests show, however, the 3363 is a foot-dragger. Furthermore, device drivers take up about 130K of RAM, more than any other unit reviewed.

Configuring the 3363 is pretty straightforward, thanks to IBM's fill-in-the-blanks, menu-driven approach, and the file management program makes restoring old files particularly easy. Backup and restore utilities are slow and not as easy to master as Corel's, but you can run a mirror backup, back up files by date or as specified in a list, and store data in compressed format.

IBM deserves kudos for making a somewhat manageable WORM drive. But unless you like paying more for less, pass this drive by.

In fact, waiting out the optical market may be your best bet. If you're a specialized user who must archive warehouses of data, pick the Panasonic LF-5000. But if you can sit out this dance, wait for affordable erasable alternatives. —*Robert Luhn*

WHERE TO BUY

Panasonic LF-5000
Panasonic
2 Panasonic Way
Secaucus, NJ 07094
201/348-7000
LIST PRICE: $2998, including Corel's Optical Disk Interface kit 3.21
REQUIREMENTS: 256K RAM, DOS 3.1 through 3.31
ACCESSORIES: 200MB cartridge $65, 400MB cartridge $115
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: unlimited phone support, toll-free number, M–F 9–5
OTHER SUPPORT: none
Reader service no. 672

Optical Disk Interface Kit 3.21
Corel Systems Corp.
1600 Carling Ave.
Ottowa, Ontario
K1Z 8R7 Canada
613/728-8200
TECHNICAL SUPPORT: unlimited phone support, no toll-free number, M–F 8:30–5:30
OTHER SUPPORT: BBS, bimonthly newsletter
Reader service no. 673

LaserStor LS800AT-E
Storage Dimensions, Inc.
2145 Hamilton Ave.
San Jose, CA 95125
408/879-0330
LIST PRICE: $4495
REQUIREMENTS: DOS 3.0 through 3.31, hard disk
ACCESSORIES: 800MB cartridge $150
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: unlimited phone support, no toll-free number, M–F 7–6
OTHER SUPPORT: none
Reader service no. 674

IBM 3363
IBM Corp.
Old Orchard Rd.
Armonk, NY 10504
914/765-1900
LIST PRICE: $3095
REQUIREMENTS: 512K RAM, DOS 3.2 or later version
ACCESSORIES: 200MB cartridge $68.25
WARRANTY: one year on drive and adapter
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: via dealer
OTHER SUPPORT: none
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Ed Bott is managing editor and Robert Luhn and Eric Knorr are senior editors for PC World. ●

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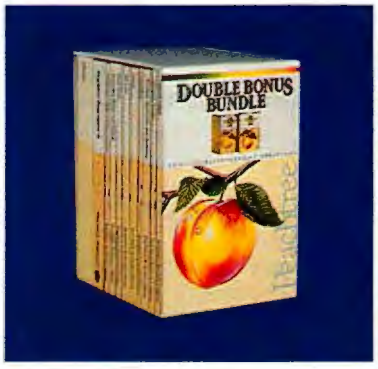

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- ☐ Quick BASIC 4.5 ..... 69.
- ☐ Quick C 2.0 ..... 69.
- ▣ Macro Assembler 5.1 ..... 99.
- ▣ Basic Compiler 6.0 ..... 199.
- ▣ C Compiler 5.1 ..... 299.

Monogram ... NCP
- ▣ Dollars and Sense 3.1 ..... 105.

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- ☐ PC-Kwik Power Pak 1.1 ..... 69.

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- ▣ Clipper *(Summer '87, dB3 Plus compiler)* 429.

New England Software ... NCP
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- ▣ GB Analytic 1.0 ..... 105.

Nolo Press ... NCP
- ☐ WillMaker 3.0 ..... 35.
- ☐ For The Record 1.0 ..... 35.

North Edge Software ... NCP
- ☐ Timeslips III 3.3 ..... 115.

Norton-Lambert ... NCP
- ☐ Close-Up Customer 3.0 ..... 135.
- ☐ Close-Up Support ..... 165.

Owl International ... NCP
- ☐ Guide 2.0 ..... 143.

Paperback Software ... NCP
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- ☐ VP-Expert 2.02 ..... 145.

Paul Mace ... NCP
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- ☐ Mace Utilities 5.0 *(DOS utilities)* ..... 55.
- ☐ Mace Gold 1.0 ..... 79.

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- ☐ Look&Link 1.04 ..... 59.
- ☐ Ultravision 1.1 ..... 79.

Peter Norton ... NCP
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- ▣ Norton Commander 2.0 ..... 45.
- ▣ Standard Utilities 4.5 ..... 55.
- ▣ Advanced Utilities 4.5 ..... 79.
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- ▣ PFS:First Choice 3.01 ..... 99.
- ▣ Professional Write 2.1 ..... 139.
- ▣ Professional File 2.0 ..... 189.
- ▣ Office Writer 6.1 ..... 259.
- ▣ Harvard Graphics 2.12 ..... 289.
- ▣ Harvard Graphics Accessories Pk 1.0 ... 289.
- ▣ Harvard Project Manager 3.0 ..... 409.

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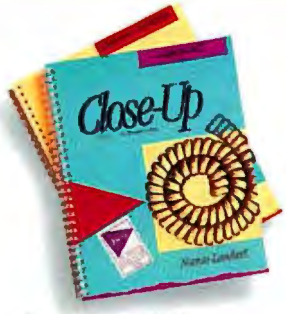

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☐DBXL 1.2..... 119.
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☐XyWrite III Plus 3.54 w/A-la-Carte Menus . 229.

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▣Memory Master *(ages 2 to 6)*..... 22.
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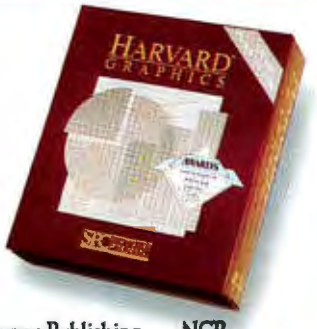
☐Up Periscope ..... 25.
☐Jet *(requires CGA or EGA)*..... 33.
True BASIC, Inc. ... NCP
▣Kemeny/Kurtz Math Series . each module 32.



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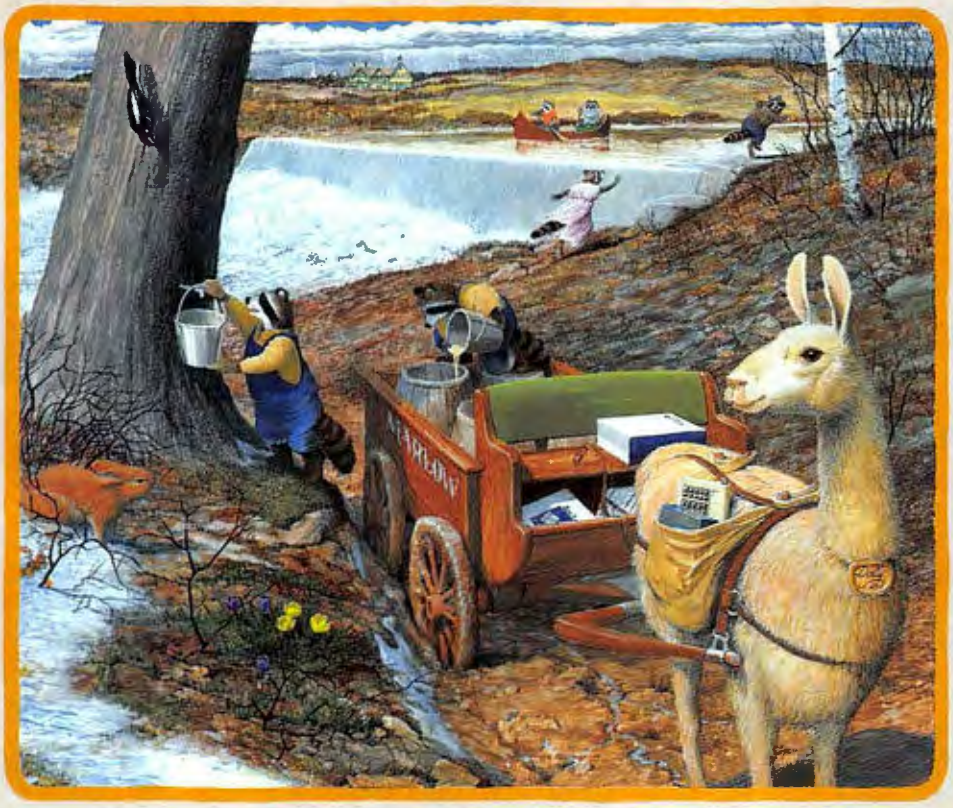

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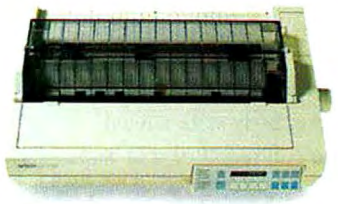

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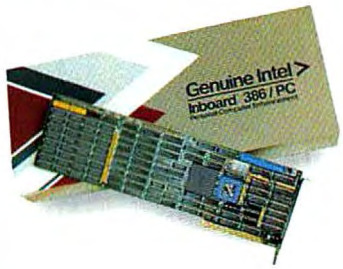

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INSIDE THE SOFTWARE SHELF

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A brand-new kind of file manager, *ViewLink* groups files and cuts and pastes across applications. But for now it's a diamond in the rough.

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In a long-awaited upgrade, *Crosstalk* polishes its communications act and moves to the background.

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The best C compiler available for one bill. It has a solid source-level debugger, supports most memory models, and compiles and links incrementally.

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158 **Project Workbench Advanced 3.0**
Workbench excels at juggling resources for numerous projects, with enough flexibility to accommodate the unexpected.

ViewLink 1.0

File manager

PROS: Combines file management with search and retrieve and cut and paste across applications

CONS: Slow file search and display, requires repeated loading and exiting of applications

The first time you run Traveling Software's *ViewLink*, you'll wonder why it took so long for someone to think of it. A DOS shell gone to college, *ViewLink* searches a disk for files with common text strings or other shared attributes, links the resulting file groups so you can easily scan their contents, and enables you to cut and paste ASCII text between linked files. Anybody with a hard disk and two files to rub together will want to try it.

But if *ViewLink* is a great program that's been waiting to happen, the wait should have been a few months longer. In the rush to beat Lotus's *Magellan* (see *Preview, PCW,* March 1989), Traveling Software has released a version that doesn't live up to the product's potential. The company claims that a free upgrade scheduled for release in July will correct *ViewLink*'s initial shortcomings.

At first glance, *ViewLink* looks like a simple, clean-cut file manager. When you install it, the program automatically reads the data files on your disk and displays the directory names in a window on the left dubbed "views." As you scroll through the list of views, a list of "items"—the files contained in the individual views—appears in a window on the right.

As with other file managers, you can tag, copy, move, or delete files—but the comparison ends there. *ViewLink* begins to strut its stuff when you decide to create new views, rounding up files that share a common text string, date, or file name. Want to find all files that mention IBM? A few keystrokes produce an ad hoc subdirectory of the appropriate files, including not only your corre-

BUD PEEN

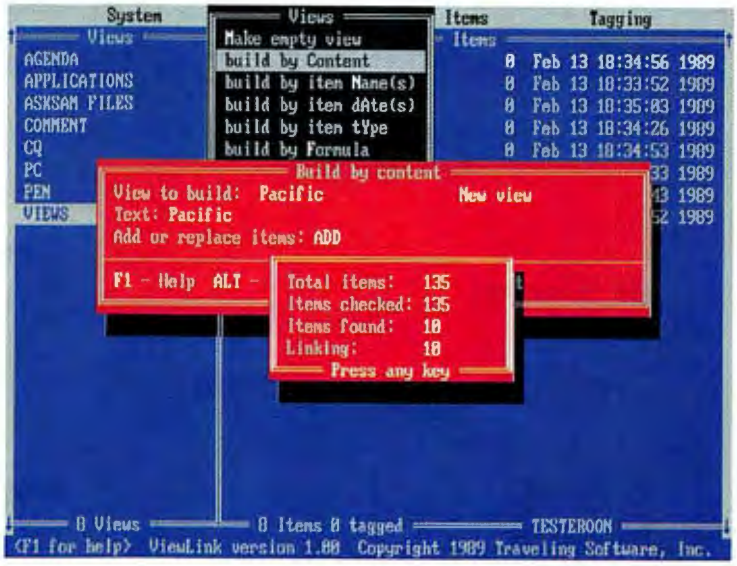
spondence with Big Blue and the *1-2-3* worksheet that tracks your IBM stock, but also any data base, graphics, or even project management file that contains the string *IBM*. Move the highlight to the name of the file you want to look at, press <Enter>, and *ViewLink* loads the proper application and then the file.

But *ViewLink*'s file-grabbing feature has some unfortunate limitations. For one thing, it's quite slow: On an AT running at 12 MHz, the program took a minute and a half to search through 170 files totaling about 3MB of data. And while search terms can be 52 characters long, you can't use logical operators; you can combine search terms only by wrestling with *ViewLink*'s awkward command language.

A particularly annoying problem is *ViewLink*'s insistence on loading the relevant application every time you select a file. Even if all the files you need are, say, *WordPerfect* documents, you're left staring helplessly at the screen while *ViewLink* repeatedly quits *WordPerfect*, only to load it again for the next file. As a partial work-around, the program includes an option that lets you peek into a file without launching the application. But anyone who uses a utility like Executive Systems' zippy *Xtree Pro* will find *ViewLink*'s file-peeker very slow. And you can't edit the file or cut and paste.

You're also limited in how you can link files. You can link in series—A to B to C—but then you can't go from item C back to item A. Or you can link many to one—B and C both linked to A—but then you can't go from B to C. It would be a lot simpler if you could link all items in a "pool," so you could move between any two files.

Basically, *ViewLink 1.0* is a terrific idea that hasn't been fully implemented. Traveling Software claims that version 1.1 will run faster, let users inspect and cut and paste files without opening them, link files in a pool, and offer expanded and extended memory, plus mouse support. If *ViewLink 1.1* can plug the gaps in version 1.0, your hard disk files may never look the same. —*Patrick Marshall*



ViewLink groups files into "views," displayed on the left, and displays their contents as "items," shown on the right. You can create new views by searching for a text string, creation date, or other file attribute.

WHERE TO BUY

ViewLink 1.0
Traveling Software
18702 N. Creek Pkwy.
Bothell, WA 98011-9006
206/483-8088, 206/485-1736 (BBS)
LIST PRICE: $149.95
REQUIREMENTS: 384K (hard disk recommended), DOS 2.0 or later version
TECHNICAL SUPPORT: unlimited, no toll-free number, M–F 8–5
OTHER SUPPORT: BBS
Reader service no. 610

Crosstalk XVI 3.7

Communications program

PROS: Background operation, fast file transfers, good tech support

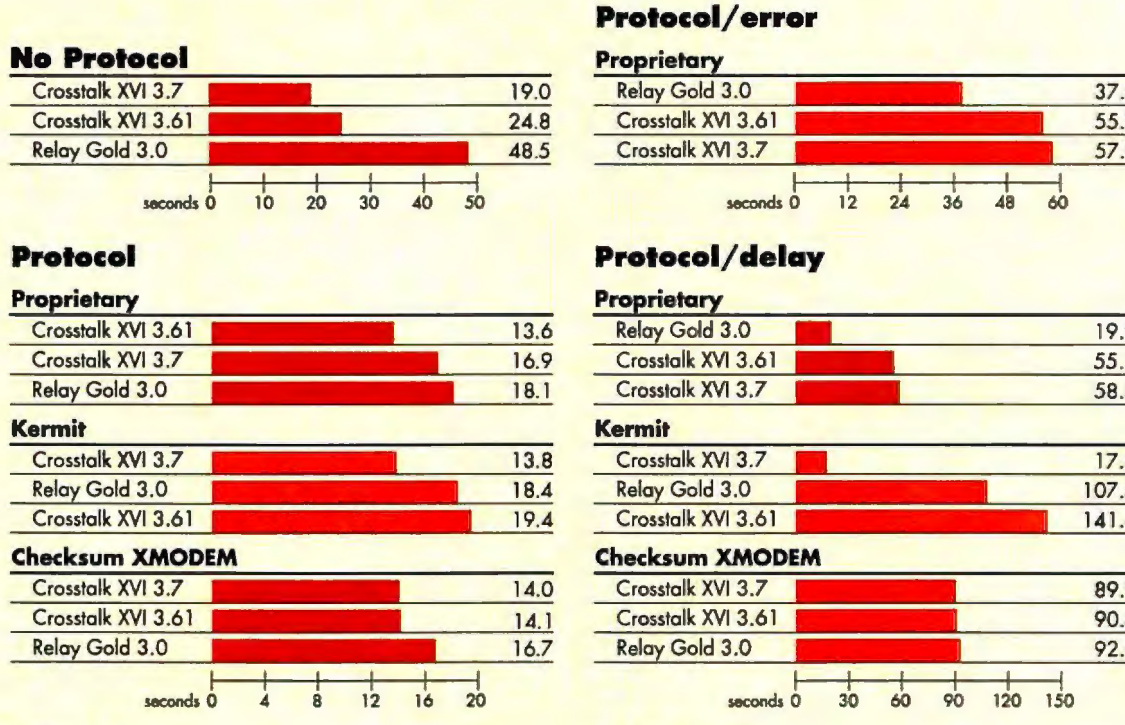
CONS: Limited selection of error-checking protocols

When it comes to delivering great value to users, upgrades of popular products don't necessarily hold an advantage over upstart competitors. Version 3.7 of the venerable *Crosstalk XVI* is a bit faster than its predecessor and adds several features the communications program has long lacked: background operation, full path support, and a

NSTL TEST REPORT

Crosstalk XVI 3.7: New Life in an Old Favorite

In version 3.7, file transfers are faster than before, especially with the Kermit protocol.



Methodology
All tests were performed on a pair of IBM PC XTs connected by null modem cables to an IBM AT running Combench, a transmission emulation program. Tests consisted of the transmission of a 10K file at 9600 bps. Prior to testing, each hard disk was formatted and DOS 3.2 was installed in its own directory. A CONFIG.SYS file was then created in the root directory, specifying FILES=20 and BUFFERS=25. Finally, the communications program was installed in its own directory according to the manufacturer's instructions. The identical program and version number were used on each computer, but to maintain the integrity of our tests, the program serial numbers were different. In tests using protocols, each program was run with Kermit and Checksum XMODEM. Although these protocols are not universal standards, most communications programs support them. The proprietary protocol included with each program was also tested.

No Protocol
The program was set to display each character as it was echoed from the host (remote echo).

Protocol
The program transmitted a 10K text file at 9600 bps with Checksum XMODEM and Kermit.

Protocol/error
A 10K text file was transmitted, and errors were inserted in the transfer at the rate of 1 character dropout and 1 changed byte per 1500 characters.

Protocol/delay
For this test, characters were delayed approximately .5 second between computers.

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

new call-logging feature. But while version 3.7 is a worthwhile upgrade, at $195 it won't lure new buyers who can get a package like Datastorm's popular *ProComm Plus* for $89.

Version 3.7's most noteworthy enhancement is the addition of a background-operation mode. While *Crosstalk XVI* is chugging away on a file transfer, you can tabulate *1-2-3* worksheets, reorganize *Reflex* data bases, edit *WordPerfect* documents, or execute DOS commands without any noticeable slowdown in the foreground application. *Crosstalk XVI* uses 64K of memory when it works in the background but can be set to require as little as 32K with the /B*xx* command-line option.

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1987 PC MAGAZINE Editor's Choice

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1989 PC MAGAZINE Editor's Choice

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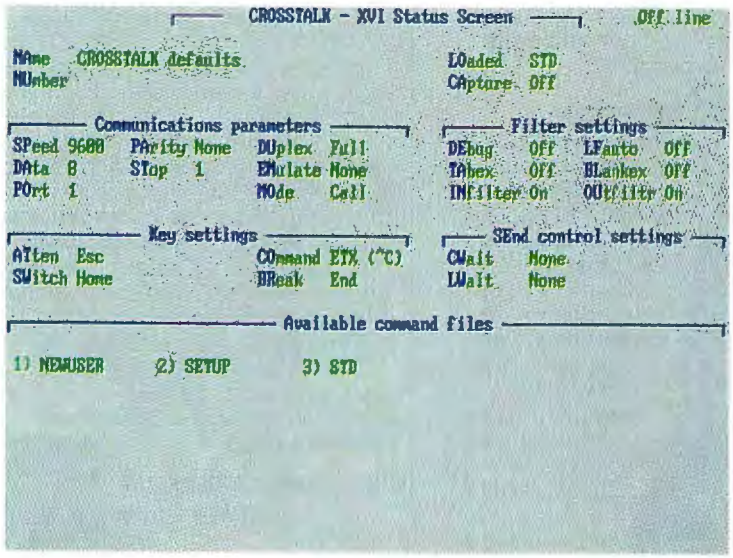
If you're frustrated with *Crosstalk XVI*'s antiquated command-line interface, you'll appreciate the new editing keys that let you jump the cursor around and delete and insert characters. Full path support is another notable, if overdue, addition; in the previous version of *Crosstalk XVI*, you had to use the DIR command to change the directory that files were uploaded or downloaded into. Finally, version 3.7 now logs the date, time, and length of modem calls.

Version 3.7 is a tad faster than its predecessor at file transfers, and the addition of extended packet size and sliding windows has considerably boosted the speed of the Kermit protocol. The biggest disappointment in this new version is that *Crosstalk XVI*'s menu of error-checking protocols hasn't been expanded.

DCA/Crosstalk has added a few enhancements to *Crosstalk XVI*'s script language, none of them major. For example, a troubleshooting enhancement lets you run scripts one line at a time for debugging.

Though it may look old-fashioned to menu mavens, *Crosstalk XVI* is still a very good package, and version 3.7 will please its many loyal fans. The package's file transfers are swift, and its script language sound. But until *Crosstalk XVI* offers something to distinguish itself from every other communications software package, new buyers will prefer lower-cost, more modern competitors.
—*Judy Getts*



Familiar to legions of communicators, Crosstalk XVI's data-rich command-line interface is largely unchanged in version 3.7.

WHERE TO BUY

Crosstalk XVI 3.7
DCA/Crosstalk Communications
1000 Holcomb Woods Pkwy.
Roswell, GA 30076
404/998-3998, 404/998-8048 (BBS)
LIST PRICE: $195, upgrade $30
REQUIREMENTS: 192K, two disk drives, DOS 2.0 or later version
TECHNICAL SUPPORT: unlimited, no toll-free number, M–F 9–6
OTHER SUPPORT: BBS
Reader service no. 611

QuickC 2.0

C compiler

BEST BUY

PROS: Improved source-level debugger, incremental compiling and linking, built-in assembler for in-line assembly code, supports most memory models

CONS: No longer compiles and links to memory, doesn't support the "tiny" memory model

Simply put, Microsoft's new version of *QuickC* is your best buy in a C compiler for the PC. *QuickC 2.0* offers incremental compiling and linking, excellent graphics support, an improved debugger, and support for all except the "tiny" memory model. Its source-level debugger now lets you inspect CPU registers and formatted variables, including arrays and structures, and even execute your program backward if you want. *QuickC 2.0* is slower than Borland's *Turbo C*, but at $99, costs $50 less (see *The Software Shelf*, *PCW*, May 1989).

In version 2.0, each element of the *QuickC* programming environment has been enhanced. For instance, you can now customize the editor to mimic your favorite program editor more closely. *WordStar* conventions are the default, but you can add features of editors such as *Brief* and *Epsilon*. Unlike *Turbo C*, *QuickC 2.0* lets you use a mouse within the programming environment.

QuickC 2.0's debugger is slightly better than *Turbo C*'s. It displays the CPU registers and the contents of structures and arrays, and you get a full view of code or data that would normally fall beyond the edge of the watch window.

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Norton SI Rating v 4.0	2.1	11.2	17.6	22.0
Wait State	0	0	0	0
Standard Memory	640K	512K	1MB	1MB
Shadow BIOS	—	—	—	384K
Memory Upgrades	—	1MB	1/2/3/5/6/8MB	2/4/8/10/16MB
Coprocessor Support	8087	80287	80387SX	80287 or 80387
Expansion Slots: 32-bit	—	—	—	1
Expansion Slots: 16-bit	—	6	6	4
Expansion Slots: 8-bit	8	2	2	3
Dual HD/FD Controller	w/HD systems	Yes	Yes	Yes
Device Bays (Exposed/Internal)	2 Exp./2 Int.	3 Exp./2 Int.	3 Exp./1 Int.	3 Exp./2 Int.
Serial Ports	1	1	1	2
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— Computer Shopper, April 1989

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w/80MB (28ms) & 1:1 Interleave	$3049	$3098	$3248	$3548
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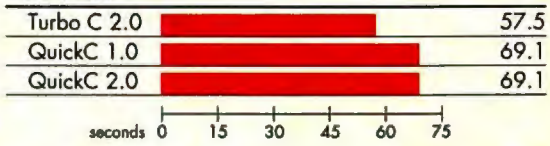
NSTL TEST REPORT

QuickC 2.0: Classy Compiler

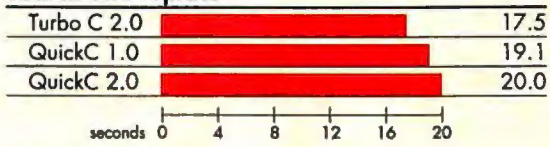
QuickC 2.0 runs a bit slower than Turbo C 2.0, but a bargain price, mouse support, and mixed-memory models make it the better choice.

.EXE Performance

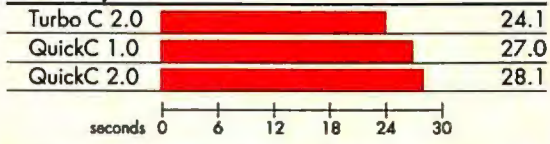
Scroll text



Search and replace

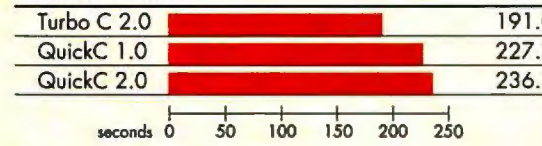


Cut and paste

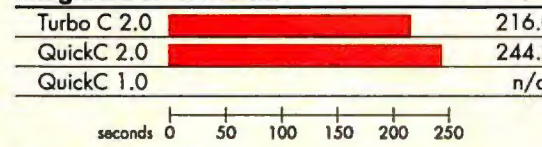


Compile Time

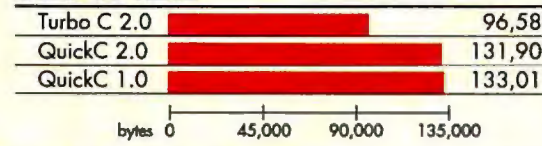
Command line



Integrated environment



Size of .EXE



[1] QuickC 1.0 allows the use of the Medium library only in the integrated environment; EMACS requires the Large library.

Methodology
All tests were performed on a 12-MHz Compaq Deskpro 286 with a 20MB hard disk and 1.1MB of RAM. MicroEMACS 3.9, a public domain text editor written in C, was used to test the C compilers. The execution speed of a set of MicroEMACS's macros was used to compare the quality of code generated by the compilers. Compilations were optimized for speed. There was no significant difference between the source code used for the compilers.

.EXE Performance
Three macros were used to test the execution speed of each compiler's resultant .EXE (executable) file. The first macro, Scroll text, loaded MicroEMACS's 1472-line source code file (MAIN.C) and scrolled from the top line down to the end of the file. Explicit calls to the "update-screen" macro command were made to reflect each scrolling operation on the screen. The second macro, Search and replace, replaced all occurrences of *if* with *nstl*. Screen I/O was minimized for this test. The last macro, Cut and paste, performed several "kill-region" operations; kill-region deleted a block of text while copying the block to the scrap buffer.

Compile Time
The amount of time that it took to compile MicroEMACS from the command line and from within the integrated environment.

Size of .EXE
The size of the executable file produced by a compiler.

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

Compiling and linking from within the programming environment works differently in this version. You can no longer compile and link to memory; all compiling and linking is done to disk. The biggest benefit of this change is that you no longer have to bother with preparing "quick libraries" if you want to call library functions that aren't included in *QuickC*'s in-memory library; nor do the library functions have to fit in active memory. *QuickC* now works transparently with the entire *Microsoft C* run-time library, and you can specify from within the programming environment the path names of any additional libraries you want to use.

Although compiling and linking to disk is generally an improvement, it's not without some cost. First, you need enough disk space to store the .OBJ and .EXE files, plus several additional files that are generated if you select incremental compiling and linking. Second, so much disk access is required that

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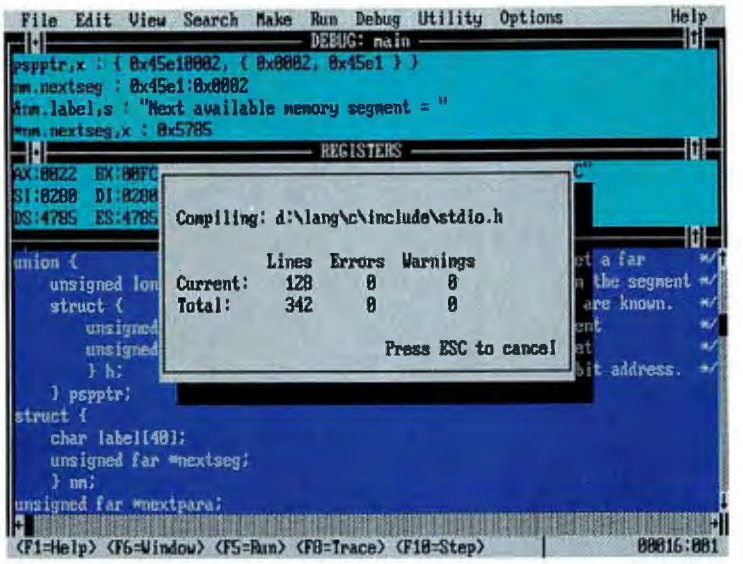


When QuickC's interactive compiler generates an error or a warning, it opens a special window to display an error message and can place the cursor on the line of source code where the first error occurred.

the compile-and-link process is considerably slower than with *QuickC* version 1.0, even though the 2.0 compiler itself is about 30 percent faster.

QuickC 2.0 supports all memory models except the "tiny" model (in which both executable code and data fit within one 64K segment), as well as mixed-memory models, which *Turbo C* doesn't. Version 2.0 also supports in-line assembly code, something entirely new in a Microsoft product. This means the critical procedures you code in assembly language are assembled directly by *QuickC. Turbo C* also debugs in-line assembly at the source-code level, but only if you buy Borland's $150 *Turbo Assembler and Turbo Debugger.*

QuickC 2.0 comes with the full *Microsoft C 5.1* run-time library, plus a special library of graphics functions that let you easily create charts and graphs and use *Windows*-compatible fonts in your programs. To top it off, a hypertext-based help system will have many people writing programs without ever cracking a manual. So unless you absolutely crave *Turbo C*'s raw speed, *QuickC 2.0* is simply the best there is. —*Dennis Dykstra*

WHERE TO BUY

QuickC 2.0
Microsoft Corp.
Box 97017
Redmond, WA 98073-9717
800/541-1261
LIST PRICE: $99, upgrade $50
REQUIREMENTS: 512K, two disk drives (hard disk recommended), DOS 2.1 or later version
TECHNICAL SUPPORT: unlimited, no toll-free number, M–F 8–5
OTHER SUPPORT: extensive developer support available
Reader service no. 612

Lucid 3-D 2.0

Memory-resident spreadsheet

BEST BUY

PROS: Adraitly manipulates multiple worksheets, large maximum file size, excellent macro features

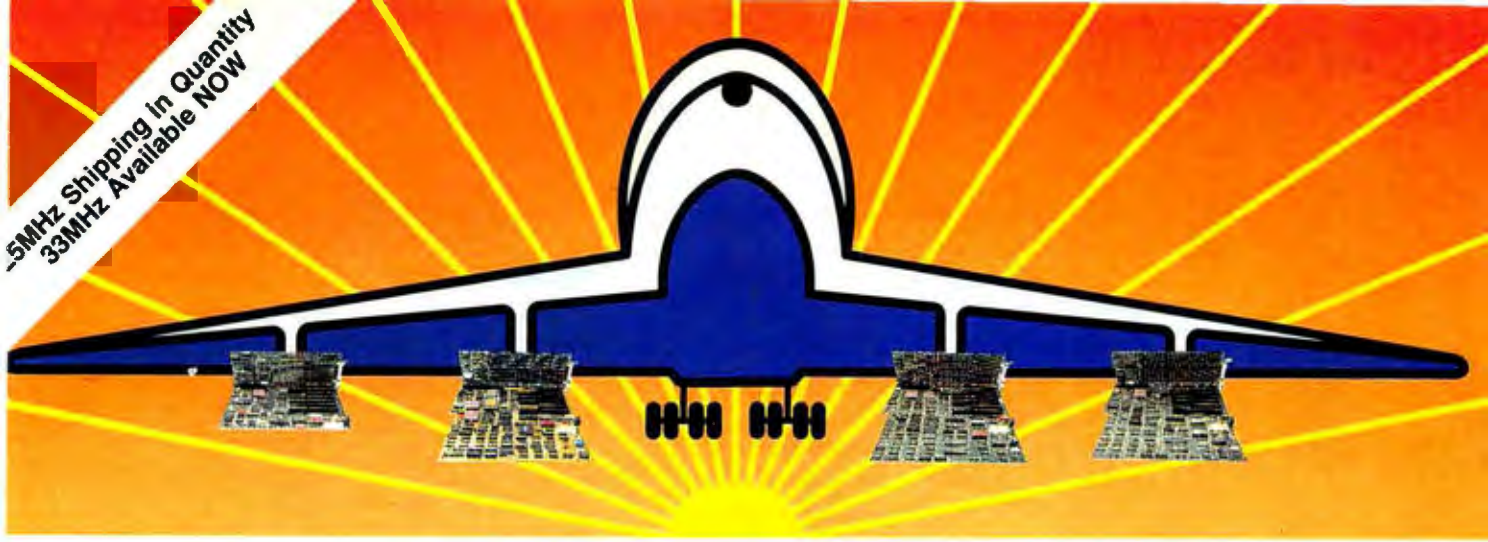
CONS: Poor graphics, limited data base tools

Buying *Lucid 3-D 2.0* takes pioneering spirit, but the venture is worthwhile. This speedy, memory-resident spreadsheet easily juggles hot links between multiple worksheets and offers a powerful macro generator, a mouse interface, and expanded memory support. When you hit the *Lucid* trail, you leave data base tools and *1-2-3*'s familiar menu interface behind, but for $99, who's complaining?

Personal Computer Support Group's original *Lucid 3-D* was a brave try at a pop-up spreadsheet but was faulted for its 64K file-size limit, imperfect cut-and-paste feature, and lack of graphics (see "Spreadsheet Add-Ins," *PCW*, July 1988). So PCSG teamed with Dac Software to revamp the program completely, increasing maximum file size considerably and adding graphics, range linking, and greater file compatibility. The result is a creditable, low-cost alternative to *1-2-3*, *Excel*, and *VP-Planner Plus*.

As before, *Lucid 3-D* offers both minimal and background recalculation, a worksheet matrix of 254 columns by 9999 rows, and nine data formats. But its 50 built-in mathematical functions pale beside *Excel*'s 132 and *1-2-3*'s 90, and *Lucid 3-D*'s data base commands are limited to Sort and Find.

Besides graphics, other new features abound in version 2.0. You can now link ranges between worksheets and automatically display up to nine worksheets from a linked series in windows. *Lucid 3-D* now reads and writes .WKS, *dBASE*, and *DacEasy Accounting* files. It supports up to



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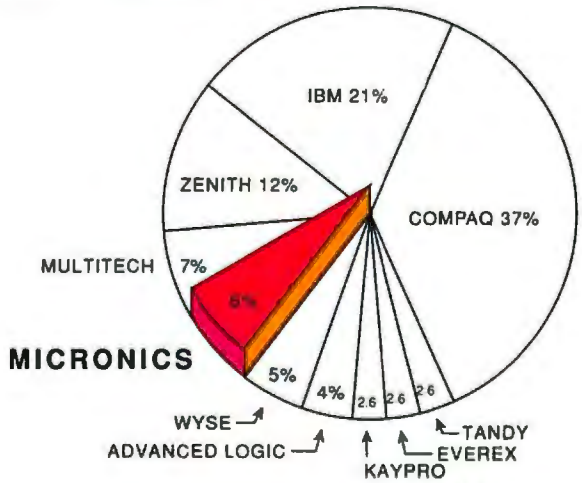


% of 80386 based PC's shipped by top ten companies in the U.S. *

* Source data available upon request.

Circle 198 on reader service card

8MB of expanded memory, and its files are limited only by available RAM.

Lucid 3-D 2.0 can cut and paste data and ASCII text between co-resident applications via its easy-to-use Clipboard commands. It worked well with a variety of applications, including *SideKick*.

Though it uses pulldown horizontal menus instead of a standard *1-2-3* command menu, *Lucid 3-D*'s interface is generally intuitive.

In linking data between worksheets, *Lucid 3-D* takes a simple but powerful approach: It addresses a target worksheet by its DOS directory path and file name, plus a specific cell or range reference. The beauty of this scheme is that secondary files need not be in memory, just in the specified directory.

Where such 3-D spreadsheets as *Surpass* and *VP-Planner Plus* have a one-to-many relationship with other worksheets, *Lucid 3-D*'s is one to one. This means that you can't directly address a range of cells layered through a hierarchy of worksheets; but you can pluck ranges from any individual worksheet, as well as create a staging area (in the primary worksheet or in a secondary one) for your own multiple-range, multiple-worksheet references. What's more, *Lucid 3-D* can display an audit trail of all such references.

Lucid 3-D's smoothly integrated notepad lets you merge note files, attach up to 14K of text to a cell, and append larger disk-based text files. The program also deserves praise for its range-color option. Besides the obvious benefit of setting off ranges, it gives you a way to create snazzy-looking templates.

Graphics are such a welcome addition to version 2.0, it's a pity they're relatively lackluster. You get 13 kinds of charts, including 3-D bar charts, but no control over type styles and sizes, data labels, range scaling, default color, or shading. Moreover, you can't create a .PIC file or enhance the charts in another software package.

Still, release 2.0 clearly propels *Lucid 3-D* from spreadsheet lightweight to serious contender at a very affordable price. If you're willing to overlook weak graphics and paltry data base talents, *Lucid 3-D* offers speed, capacity, and an elegant approach to linking worksheets. In cutting *Lucid 3-D*'s price from $150 to $99.95, PCSG and Dac Software have launched one of the true spreadsheet bargains. —*Alan Southerton*

WHERE TO BUY

Lucid 3-D 2.0
Dac Software, Inc.
17950 Preston Rd. #800
Dallas, TX 75252
215/248-0205
LIST PRICE: $99.95
REQUIREMENTS: 256K (347K when graphics module is loaded), hard disk, DOS 2.0 or later version
TECHNICAL SUPPORT: 10 free minutes for installation; extended support $45 for 30 minutes or $75 for 60 minutes; toll-free number, M–F 8–6
OTHER SUPPORT: quarterly newsletter free to support-plan subscribers
Reader service no. 613

Project Workbench Advanced 3.0

Project management program

PROS: Excellent at resource management, handles multiple projects well

CONS: Crowded, text-based screens; limited tabular reports; can't calculate negative float

Project Workbench Advanced 3.0 from Applied Business Technology (ABT) combines a midrange price ($1275) with high-end capabilities found in more expensive project managers like Primavera's *Primavera Project Planner* and CAM's *Viewpoint*. With a network version that supports up to 40 users simultaneously, *Project Workbench* is ideal for managers who plan many small projects in a dynamic environment with a large staff.

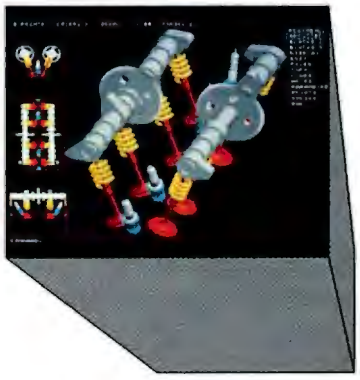
Project Workbench isn't for rookies, however. Even with its new context-sensitive help and rewritten documentation, the program takes getting used to, as do its crowded screen graphics and eccentric reports.

Many of the improvements in version 3.0 involve resource management. Calendars for each resource are new, as are flexible histograms, resource leveling across multiple projects, and a jump in the number of resources per task from 6 to 200. Alas, ABT

Aw . . . What the Heck!

EXTREMELY POWERFUL

DesignCAD 3-D version 2.0 is as powerful as most CAD systems costing $5000 - $10,000! Features like: Complex Extrusions-linear, scaler, and circular, Blending of Surfaces, Shading, Cross Sectioning, Complex Sweeps and Translations, and Boolean operations make DesignCAD 3-D one of the most powerful 3-D CAD systems available . . . at any price! Engineers, Architects and Consultants constantly tell us that they use CAD systems costing thousands of dollars which are not as powerful as DesignCAD 3-D.



VERY EASY TO USE

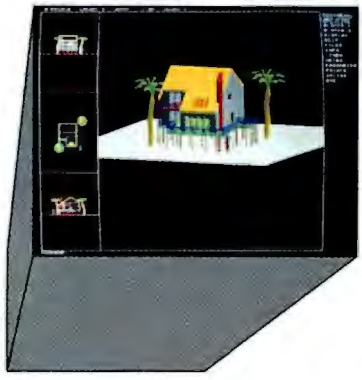
Just because DesignCAD 3-D is powerful doesn't mean it is difficult to use. Single keystroke commands and side-bar menus which give short directions on how to proceed make DesignCAD 3-D a snap to use! While not required, DesignCAD 3-D supports all popular digitizers and mice.

Many of the older, more cumbersome CAD systems require weeks of training before a user can be productive. DesignCAD 3-D users find they can be producing useful drawings in a matter of minutes! In a recent CAD contest only one contestant was able to match our drawing time. The package sold for $3000.00. The other CAD packages took up to twice as long to perform the same drawing and cost up to $5000.00!

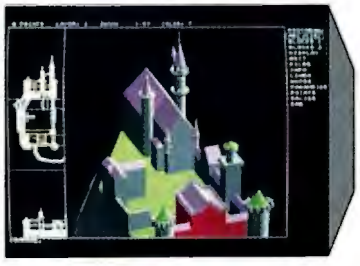
Still don't believe us? The goblet pictured below required only 16 keystrokes and 3 commands to create! The top, front, side, and isometric views were created simultaneously . . . in less than one minute!

VERY LOW PRICED

The first question asked by many people is, "Why is DesignCAD 3-D priced so low?" The answer? After developing DesignCAD 3-D version 2.0, we were unable to decide how the product should be priced. We consulted experts. We used the finest spreadsheets on the market. We took employee polls. Finally, in the great American Tradition, we said, *"Aw . . . What the Heck! Let's see the other guys beat this price!"* DesignCAD 3-D version 2.0 sells for $399.

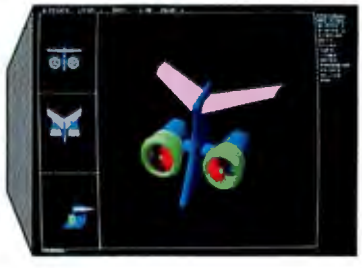


DesignCAD 3-D only $399!



WHY BUY THIS ONE?

There is a very important reason to buy DesignCAD 3-D. PERFORMANCE. No other CAD system can match our price/performance ratio. Many people make the serious mistake of thinking that it is necessary to spend thousands of dollars to obtain "a good 3-D CAD system." This is not true! We talk to people everyday that are sadly disappointed with their "expensive" CAD systems. Don't be one of them! Call us and we will send you a complete set of literature and a free slide show demo disk. Once you compare DesignCAD 3-D version 2.0 with other CAD systems we know you will choose DesignCAD 3-D.



DON'T TAKE OUR WORD FOR IT

Here is what other people have to say about DesignCAD 3-D:

"After you've worked with DesignCAD, the single keystroke commands are simple to remember and it becomes easy to "flick one key" to execute a command. An extremely ergonomically designed program."

HENRY LEVET, Levet & Daigle Architects - New Orleans, LA
Designed a 65,000 sq. ft. nursing home using DesignCAD

"Recently I worked with a firm that builds decks. They purchased your product on my recommendation. I sat down with them and in two hours they were very proficient in DesignCAD. Now they are more effective; and we can communicate . . . it's wonderful to be able to do a block repeat 42 times and there are 42 2x4's to make the deck!"

J. TURNER, Architect, TAO Ltd. - The Woodlands, Texas

"Allows scientists and engineers to expend minimum time learning and using CAD software so that their time can be expended on the project at hand. It also allows scientists and engineers to quickly present to management all views of a subject. (3-D)."

DR. STEVENS, NASA Space Scientist/Engineer

HOW DO I GET ONE?

DesignCAD 3-D version 2.0 is available from most retail computer stores, or you may order directly from us. DesignCAD 3-D is available in a number of foreign languages from distributors throughout the world. All you need to run DesignCAD 3-D is an IBM PC Compatible and 640K RAM. DesignCAD 3-D supports most graphics cards, printers, plotters and digitizers. Free information and a demo diskette are available by contacting us at:

American
Small Business Computers, Inc.
327 South Mill Street
Pryor, OK 74361
918/825-4844
FAX: 01-918-825-6359
TELEX: 9102400302

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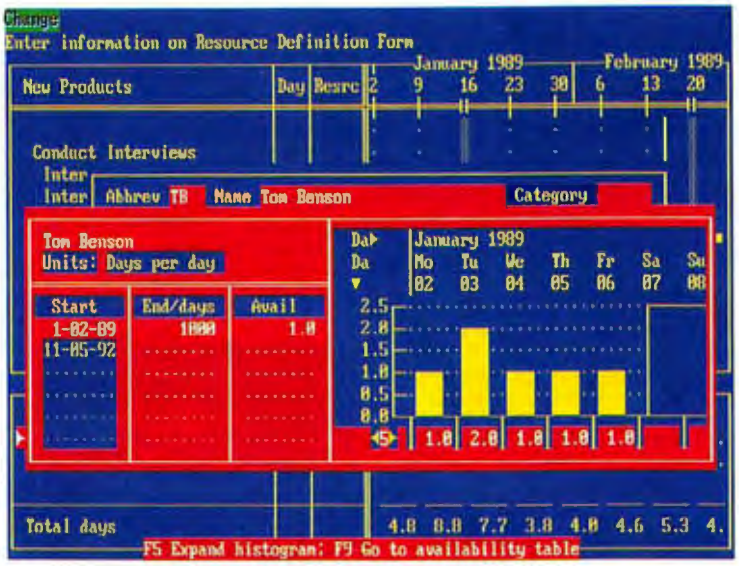


Project Workbench 3.0 displays this busy screen when you create and modify dependency relationships between activities. The built-in Gantt chart has the same capability and graphically displays the resulting connections.

hasn't done much to strengthen the program's indifferent reporting.

Project Workbench shines in multiproject resource management: It supports a virtually unlimited number of tasks within a three-level work breakdown structure divided into phases, activities, and tasks. You can easily assign cost, material quantity, and personnel across subprojects that "roll up" to summary levels for the top brass.

Where a project manager like Symantec's *Time Line* requires you to update a table with changes in task dates and durations, *Project Workbench* lets you drag a whole range of activity lines on an interactive Gantt chart to reschedule their dates. You can then use the program's powerful resource-adjusting features to establish a new overall project plan.

Project Workbench arranges projects hierarchically, in an approach similar to outlining. You start assembling a multiproject schedule at the Phase level, then build subschedules separately. A *1-2-3*–style menu bar and pop-up windows make the program fast to use, and the ability to capture actuals across multiple tasks and projects keeps you working quickly.

On the downside, *Project Workbench*'s text-based interface isn't as pleasing as those of such packages as Micro Planning's *Micro Planner, Microsoft Project,* or Software Publishing's *Harvard Total Project Manager* (see "Project Management—For Professionals Only," *PCW,* November 1988). *Project Workbench* gives you a limited stable of reports, and they're sometimes confusing: Units of measurement don't appear on the same page as the amounts, for example.

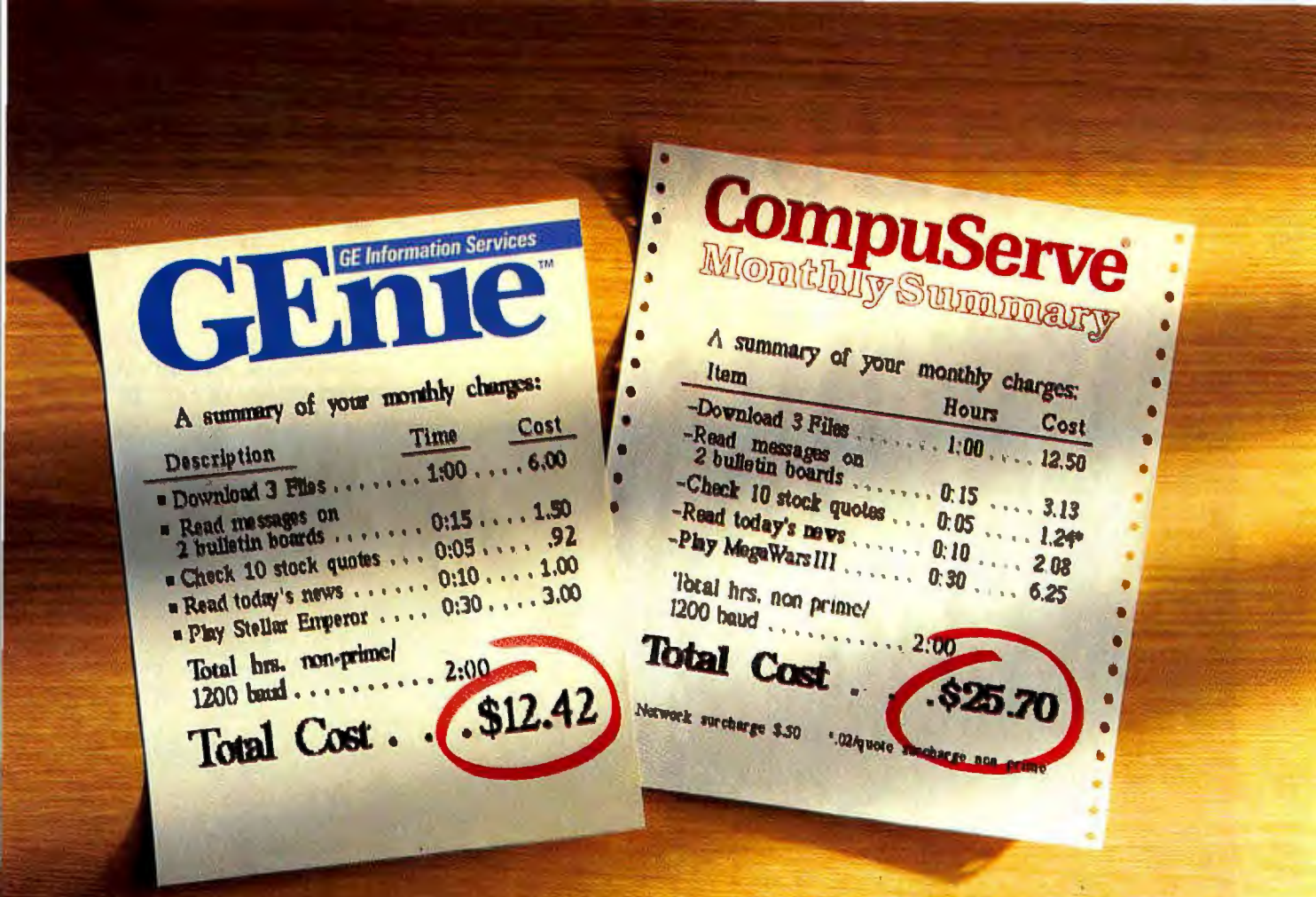
Finally, parts of *Project Workbench* may restrict its usefulness for some industries—construction, for example. Like *Time Line, Project Workbench* doesn't generate negative float time.

Despite its quirks, *Project Workbench* is a powerful, flexible program. If you're willing to trade a spiffy interface for easy control over a myriad of tasks and resources, *Project Workbench* can give you what a project manager is paid to possess: a range of vision beyond this week's work. —*Mark S. Burgess*

WHERE TO BUY

Project Workbench Advanced 3.0
Applied Business Technology Corp.
361 Broadway
New York, NY 10013
212/219-8945, 212/219-3925 (fax)
LIST PRICE: $1275, upgrade $350 but free to those who purchased release 2.2 during 1988 but prior to December 15, 1988, or who purchase Client Support Program
TECHNICAL SUPPORT: unlimited, no toll-free number, M–F 8:30–5:30
OTHER SUPPORT: 90-day limited warranty; Client Support Program (includes upgrade from 2.2, technical support, 12-month extended warranty, newsletter, media exchanges, shareware Applications Guide program with templates and special applications) $250 per year if purchased within 30 days of Project Workbench, otherwise $350 per year; user group support; regional classes
Reader service no. 614

Patrick Marshall writes for Congressional Quarterly's *Editorial Research Reports in Washington, D.C. Judy Getts is a contributing editor for* PC World. *Dennis Dykstra, also a contributing editor for* PC World, *is a professor at Northern Arizona University in Flagstaff. Alan Southerton wrote* Programmer's Guide to the OS/2 Presentation Manager *(Addison-Wesley, Redding, Massachusetts, 1989); he is currently working on an advanced OS/2 programming book. Mark S. Burgess is president of the San Diego chapter of the Project Management Institute, and a certified project management professional; he runs a software consulting and development company in San Diego.* ●



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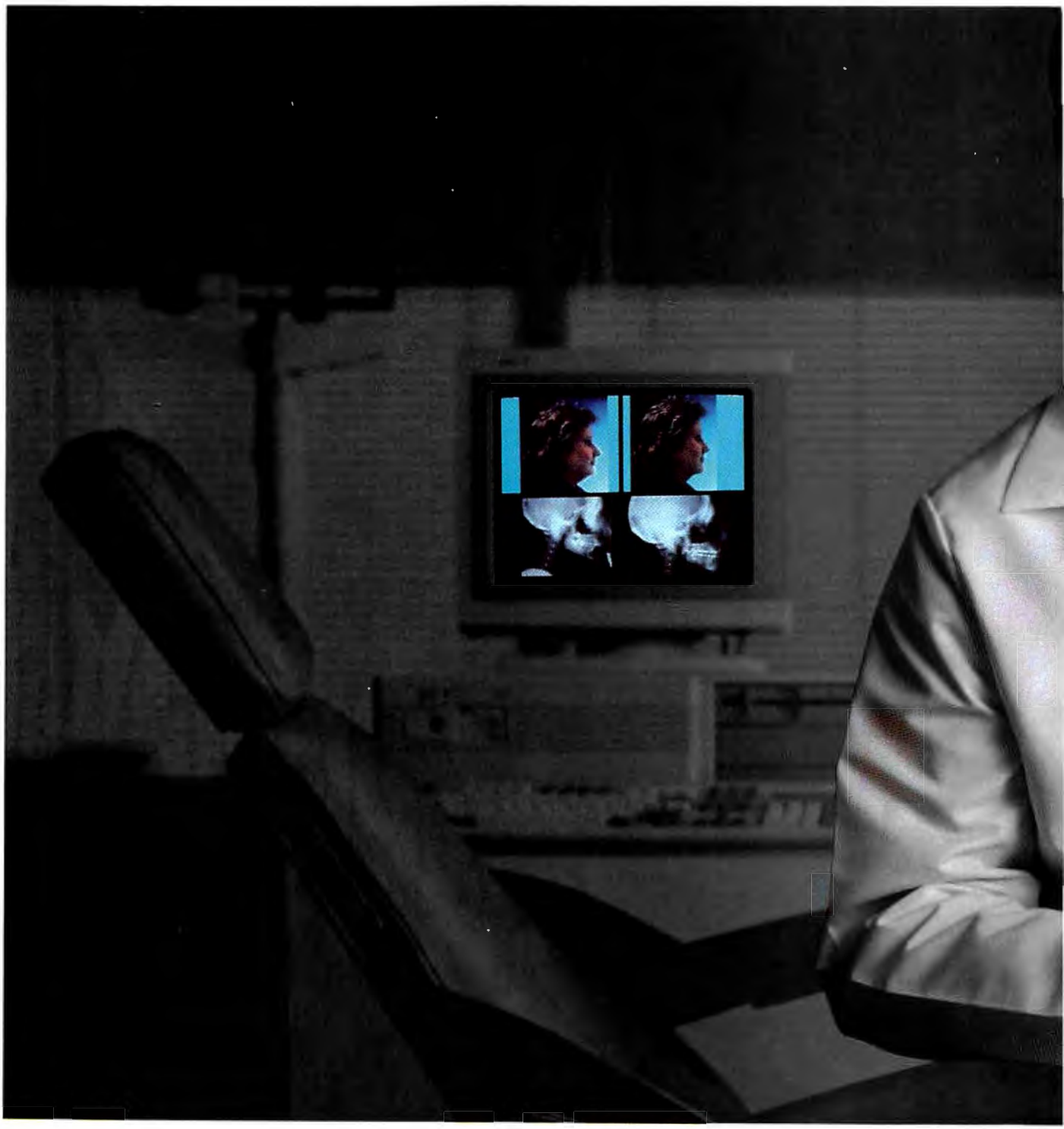
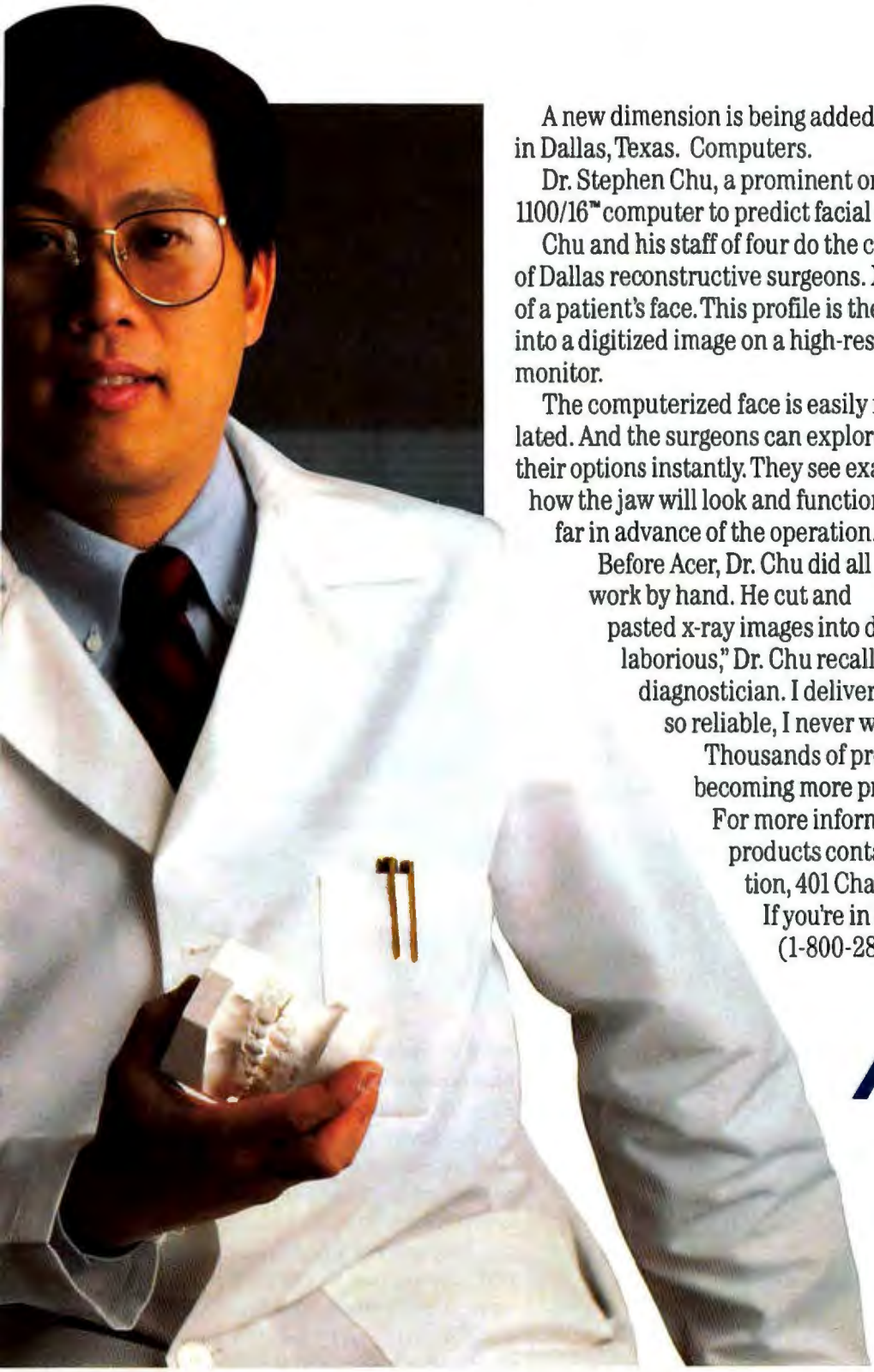
Acer and Dr. Chu. The hottest

Dr. Stephen Chu, Dallas orthodontist, and his staff use an Acer computer to predict reconstructive surgery results.



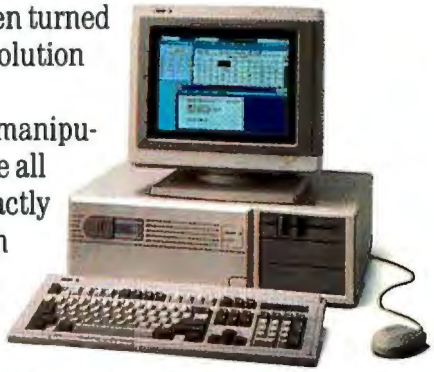
reconstructive team in Texas.



A new dimension is being added to reconstructive surgery in Dallas, Texas. Computers.

Dr. Stephen Chu, a prominent orthodontist, is using an Acer 1100/16™ computer to predict facial surgery results ahead of time.

Chu and his staff of four do the critical advance work for a team of Dallas reconstructive surgeons. X-rays and videos are taken of a patient's face. This profile is then turned into a digitized image on a high-resolution monitor.



The computerized face is easily manipulated. And the surgeons can explore all their options instantly. They see exactly how the jaw will look and function far in advance of the operation.

Before Acer, Dr. Chu did all work by hand. He cut and pasted x-ray images into different combinations. "It was laborious," Dr. Chu recalls. "With Acer, I'm a better diagnostician. I deliver what I promise. And my Acer's so reliable, I never worry about downtime."

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Acer

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Circle 49 on reader service card

Second Look

Tape Drives—A Closer Finish

PC World backs up for a moment —new test figures shed a different light on tape performance.

Scott Spanbauer

In the February 1989 review "Tape Backup on a Budget," *PC World* evaluated five QIC-40–format, internal tape drives. We considered a variety of factors, chief among them price, performance, data security, and the usability of backup and restore options. Secondary factors included warranty and support.

Based on all these factors, *PC World* declared the ArchiveXL 5540 a Best Buy. We ranked the remaining drives in descending order of preference: Tallgrass TG-1140, Franklin Jumbo, Mountain TD4440, and Alloy Retriever/40.

Unfortunately, errors in two performance tests, selective file backup and selective file restore, made all the reviewed drives except for the ArchiveXL 5540 look much slower than they actually are. A second round of NSTL testing (see the NSTL Test Report) corrects those errors. The ArchiveXL 5540 is still fastest—but by a much narrower margin than reported in February.

EXECUTIVE SUMMARY

ArchiveXL 5540

Tape drive

BEST BUY

	POOR	FAIR	GOOD	EXCELLENT
Performance				●
Security			●	
Backup/restore capabilities			●	
Overall value				●

Reader service no. 700

EXECUTIVE SUMMARY

Franklin Jumbo

Tape drive

BEST BUY

	POOR	FAIR	GOOD	EXCELLENT
Performance				●
Security				●
Backup/restore capabilities			●	
Overall value				●

Reader service no. 701

EXECUTIVE SUMMARY

Tallgrass TG-1140

Tape drive

	POOR	FAIR	GOOD	EXCELLENT
Performance				●
Security				●
Backup/restore capabilities			●	
Overall value				●

Reader service no. 702

If you factor the new test results into the review's Executive Summary performance ratings, Tallgrass, Franklin, and Mountain all move up a notch from Good to Excellent, while Alloy climbs two notches from Poor to Good. Looking at the bottom line—overall value—both Tallgrass and Franklin drives deserve an Excellent rating. Mountain and Alloy rank as Good overall values.

The ArchiveXL 5540's low price, velocity, and top-notch features still earn it Best Buy distinction. However, the Archive drive now shares this honor with the Franklin Jumbo. Both these drives give you polished features and performance at list prices under $450. *PC World* sincerely regrets the errors. ●

Scott Spanbauer is an assistant editor for PC World.

EXECUTIVE SUMMARY

Mountain TD4440

Tape drive

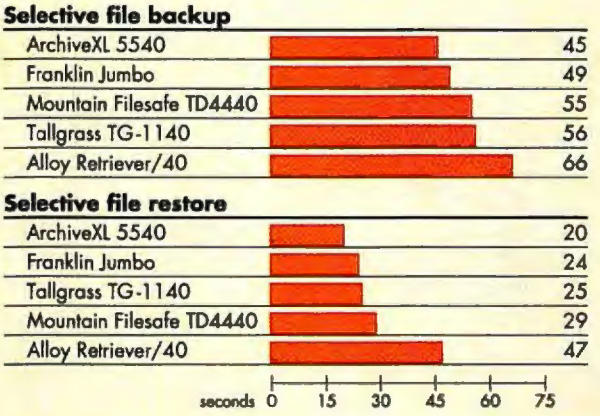
	POOR	FAIR	GOOD	EXCELLENT
Performance				●
Security			●	
Backup/restore capabilities				●
Overall value			●	

Reader service no. 703

NSTL TEST REPORT

QIC-40 Tape Drives: A Field of Strong Contenders

New tests show a tighter race than February's flawed results, but Archive is still swiftest.



Methodology
All tape backup units were tested on an IBM PC AT Model 339 equipped with a 32MB, type 20 hard disk.

Selective file backup
This test measured the time required by each system to back up only those files that were modified or newly created since the last backup; it includes the time to rewind the tape to the beginning.

Selective file restore
This test measured the time required by each system to restore a specific set of files after a group of files was deleted, simulating a situation where a subset of files becomes unintentionally deleted. The test includes the time to rewind the tape to the beginning.

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

EXECUTIVE SUMMARY

Alloy Retriever/40

Tape drive

	POOR	FAIR	GOOD	EXCELLENT
Performance				●
Security				●
Backup/restore capabilities			●	
Overall value				●

Reader service no. 704

DISCOVER COMPLETE

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– Eric Shogren – Stonington, CT

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1.44 Meg 3.5" Drive
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101 Key Keyboard
MS DOS 4.01

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16 Mhz $2395.00
20 Mhz $2495.00

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1.2 Meg 5¼" Drive
1.44 Meg 3.5" Drive
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10 Mbits/Sec DTR
16 Bit Board
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VARIABLE BUS SPEEDS (6, 8, 10, [illegible] MHz)
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1.44 MEG 3.5" FLOPPY DRIVE
150 MEG ESDI HARD DRIVE 16 MS
1 PARALLEL/2 SERIAL PORTS
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NEC 3-D MONITOR
1024 X 768 RESOLUTION W/16 COLORS
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1 YEAR WARRANTY
2 YEAR WARRANTY ON MOTHERBOARD

$[illegible]995.00

BENCHMARK RESULTS

Norton Utilities Ver. 4.0 SI	42.2
Power Meter MIPS	7.748
Landmark Software LANDMARK	54.1
PC Mag 80386 INSTRUCTION MIX	1.71

Gateway 2000
P. O. Box 2000
Sgt. Bluff, IA 51054
800-233-8472
712-943-2000

GATEWAY 2000

Circle 227 on reader service card

THE E-MAIL ROUTE TO FAX

PAIRING FAX AND ELECTRONIC MAIL EXTENDS THE REACH OF YOUR E-MAIL MESSAGES. HERE'S HOW FIVE E-MAIL SERVICES DO IT.

DANIEL J. ROSENBAUM

At this very minute, some 5 million facsimile machines worldwide are busily shuffling pieces of paper. How can PC users exploit this vast fax infrastructure? Most people believe that unless you line up at the office fax machine, the only entrée into the facsimile world is to spend $400 plus for a fax board (see "Fax Times Seven," *PCW*, October 1988). Fortunately, there's an alternative route: your tried-and-true electronic mail service.

This article looks at fax services available now from AT&T, CompuServe, MCI, and Western Union, and soon from The Source. The five services basically work the same way: You access fax through an on-line menu, and you're limited to sending text. You can't receive faxes, nor can you transmit graphics. But the cost—and difficulty—of sending a message varies widely from service to service.

Fax charges are tacked on to your E-mail rates. The accompanying table shows the fax surcharges for two sample messages to destinations in the United States, the United Kingdom, and Japan. Beware, though: The figures can be deceptive. MCI bills by the number of lines, for example, so a double-spaced letter will cost a lot more than the chart suggests. As with telephone service, check your bills to get an accurate picture.

The high cost of E-mail fax makes it suitable for occasional use only. Those who send faxes daily will find a fax board (or simply enough fax machines to handle the workload) more economical; for sending *and* receiving faxes or transmitting graphics, a board or machine is a must. But if you fax once in a while—especially if your service treats a fax machine like any other E-mail address, enabling you to include fax numbers in E-mail broadcasts—E-mail faxing could be your most convenient, cost-effective solution.

AT&T Mail

AT&T Mail's fax service automatically creates a cover sheet with the service's logo, the name of the sender, the name and number of the addressee, and the number of pages in the transmission. If the transmission fails for some reason, AT&T will advise you by E-mail.

AT&T Mail treats a fax address like any other address, so it's easy to send the same message to several fax machines, a couple of telex addresses, and a bunch of AT&T Mail addresses at the same time. In our informal test, a sample fax showed up about a minute after being posted; the print quality was quite good, with large print in a highly readable serif typeface.

CompuServe

Using CompuServe's fax service is fairly straightforward, and the printed results are handsome. CompuServe's E-mail and fax charges are steep, however, so the total cost for a fax is very high. Moreover, you can send a message to only one addressee at a time.

Our test fax appeared about 15 minutes after it was sent. The system generates a cover sheet and places an identifying footer at the bottom of each page.

MCI Mail

Using MCI Mail for fax is a bit unwieldy, but it can be done. First, you must tell MCI that you're sending the message to an EMS—Electronic Mail Service. You then go through a finicky procedure to tell the system the phone number and how long to keep trying if the destination fax machine happens to be busy. If you make a mistake entering any of this data, the fax won't go out.

MCI Mail automatically provides a glitzy cover sheet, sends you a delivery receipt, and provides a detailed error report if the transmission fails. You can send the same message to several fax machines and mailboxes simultaneously. Our test fax took about 15 minutes to arrive, and its print quality was marginal, with poorly formed, sans serif type.

Western Union

Alone among the systems here, Western Union's EasyLink lets you send legal-size and wide (132-column) documents, but you have to wrestle with its cryptic user interface. You may send the same message to multiple fax machines, EasyLink mailboxes, and Telex machines simultaneously.

EasyLink doesn't send a cover sheet as such, but it lets you specify hard page breaks so you can create your own. The system also lets you suppress header information, if you wish. If the receiving fax machine doesn't support wide paper, EasyLink will send compressed text. Print quality is good in normal mode but a bit cramped in compressed.

If you send faxes only once in a while, E-mail fax can be very convenient.

PHILIP ANDERSON

Fax Charges: All Over the Map

On fax fees alone, AT&T and MCI Mail charge a lot less than CompuServe, but no two services bill the same way. E-mail charges are extra.

3K fax message [1]	AT&T Mail	CompuServe	MCI Mail	Western Union
Within U.S.	$1.00	$1.25	$0.80	$1.25
To U.K.	$2.65	$5.30	$2.90	$3.44
To Japan	$4.90	$9.60	$5.10	$6.38
10K fax message				
Within U.S.	$3.25	$3.00	$1.70	$3.00
To U.K.	$6.40	$12.30	$7.30	$6.89
To Japan	$9.90	$18.00	$8.40	$11.13

[1] Figures are calculated according to the services' billing strategies, which vary widely. Most charge by half-page blocks, ranging from MCI's 28 lines to Western Union's 1250 characters. (When The Source's fax service goes public, it will charge by connect time.) International fax rates are typically higher than domestic.

The Source

Still under development at press time, The Source's fax service is scheduled to be running by the time this article appears. Fax is separate from SourceMail; you access it by typing *fax* at the command-level prompt.

To send messages to both fax and E-mail numbers, you must recompose or reload the text file. The service generates a cover sheet with addressee, sender, subject, and reference numbers to identify the transmission. Beta service delivery times were running 45 minutes but should drop to about 15. Though the typeface in our test fax was somewhat small, print quality and readability were excellent.

FACING FAX

These days law firms are using fax to exchange documents, radio stations to take requests, and purchasing agents to issue orders. If using electronic mail makes you feel connected with some people but isolated from many others, try E-mail fax. It's a fast, easy way to spread the word. ●

Daniel J. Rosenbaum is the author of Using WordPerfect for the Macintosh *(Osborne/McGraw-Hill, Berkeley, California, 1988).*

WHERE TO BUY

AT&T Mail
AT&T Customer Assistance Center
P.O. Box 3505
New Brunswick, NJ 08903
800/367-7225, 800/624-5672
E-MAIL COSTS: subscription $30/year, 20¢ or 45¢ charge for each on-line message created (waived for AT&T Access users)
FAX COSTS: first 1500 characters 55¢, subsequent blocks 45¢ each
Reader service no. 601

CompuServe
5000 Arlington Centre Blvd.
P.O. Box 20212
Columbus, OH 43220
800/848-8199, 614/457-0802
E-MAIL COSTS: subscription $39.95/year; on-line charge at 1200 or 2400 bps $12.50/hour; CompuServe network access 30¢/hour; Tymnet access $12/hour prime time 8–6, $2/hour evening
FAX COSTS: first 1000 characters 75¢, subsequent blocks 25¢ each
Reader service no. 602

MCI Mail
1150 17th St. NW
Washington, DC 20036
800/444-6245, 202/833-8484
E-MAIL COSTS: $25/year (Preferred Service at $10/month covers some fax charges), Tymnet access 25¢/minute
FAX COSTS: first 28 lines 50¢, subsequent blocks 30¢ each
Reader service no. 603

The Source Telecomputing Co.
1616 Anderson Rd.
McLean, VA 22102
800/368-3549, 703/734-7500, 703/734-0586 (fax)
E-MAIL COSTS: one-time registration fee $29.95, $10/month membership fee credited toward usage; on-line charges: prime time (M–F 7 a.m.–6 p.m.) at 1200 bps 43¢/minute, at 2400 bps 46¢/minute; nonprime time (M–F 6 p.m.–7 a.m., all day Sat., Sun., holidays) at 1200 bps 18¢/minute, at 2400 bps 20¢/minute
FAX COSTS: first 28 lines 95¢, subsequent blocks 50¢; additional recipients 95¢ each; delivery report charge 45¢
Reader service no. 604

Western Union Corp.
1 Loke St.
Upper Saddle River, NJ 07458
800/527-5184
E-MAIL COSTS: $25 monthly minimum (applied to usage, including fax), on-line charges: prime time (M–F 7 a.m.–midnight) at 1200 bps 50¢/minute, at 2400 bps 84¢/minute, nonprime time 40% less
FAX COSTS: first 1250 characters 55¢, subsequent blocks 35¢ each
Reader service no. 605

PHILIP ANDERSON

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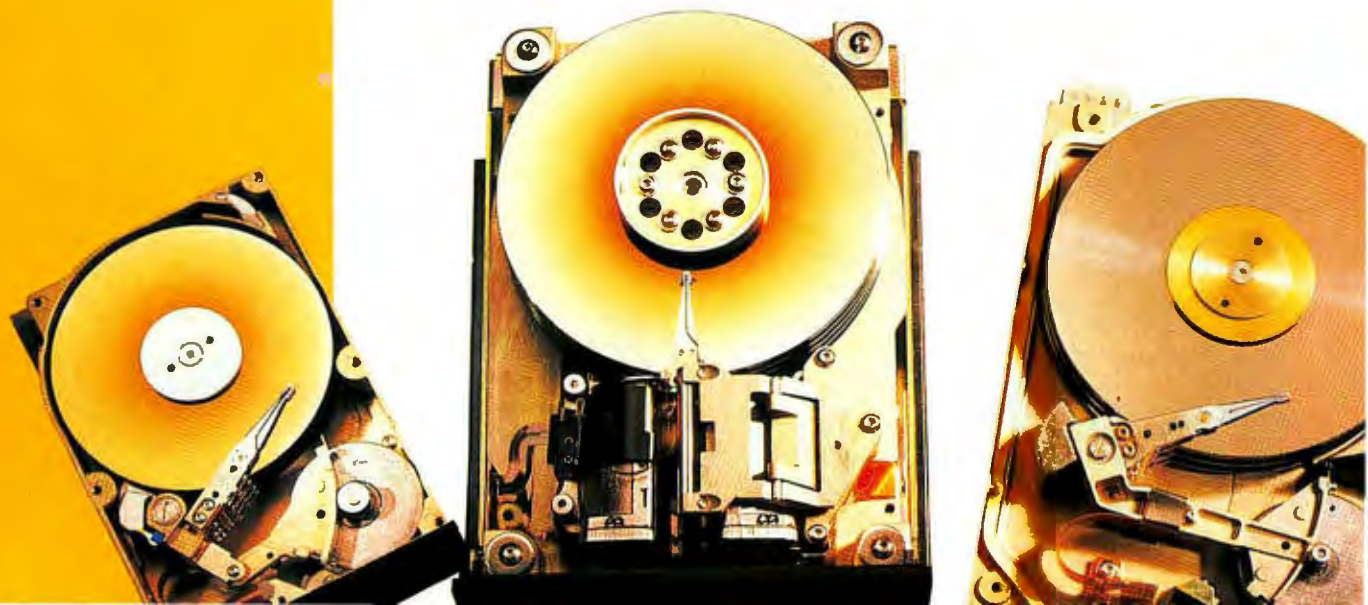

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All Systems include DOS 3.3 for $35 additional

Complete System Features:

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$1595

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- 4-16 bit and 1-8 bit expansion slots available
- 2-Serial, 1-Parallel and 1-Game port
- 101 keyboard fully AT-compatible
- DOS, OS/2, XENIX-compatible

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- CPU 80C286 running at 16/20MHZ
- 0/1/0.5 Wait State selectable
- High speed RAM 1MB expandable to 4MB on board (16MB total) memory above 640K is configurable
- Award BIOS with built-in setup
- 40MB hard drive ST251-1, 28ms access time
- 1.2MB floppy drive
- Ultra high speed floppy/hard disk controller 1:1 interleave, 800KB/sec
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- Real time clock calendar with battery back-up
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- 20MHZ CPU upgrade — $99 only
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- Additional 3MB memory — $599
- EGA upgrade — $395
- VGA upgrade — $495
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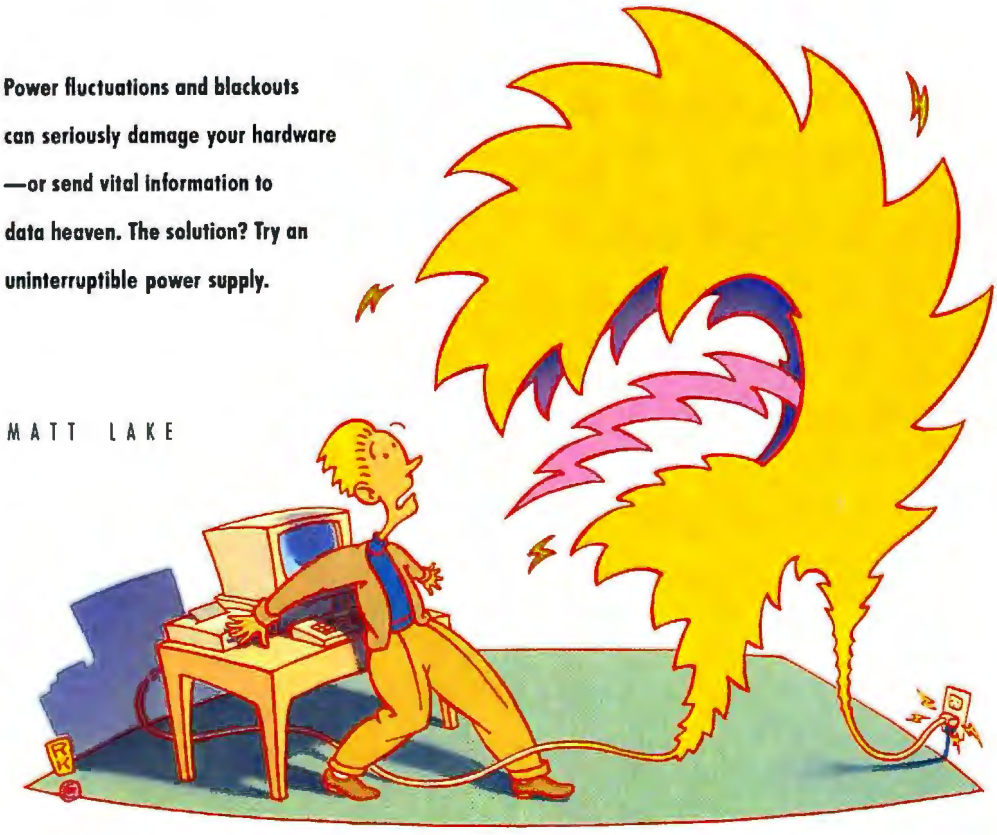
Circle 310 on reader service card

SAFE POWER FOR PCs

Power fluctuations and blackouts can seriously damage your hardware —or send vital information to data heaven. The solution? Try an uninterruptible power supply.

MATT LAKE



ROBERT KOPECKY

In the PC world, power not only corrupts—it can fry your machine. Power spikes, sags, surges, brownouts, and blackouts caused by everything from lightning to plugging a laser printer into your PC's power strip can not only garble data, they can wreck hard disks, monitors, and other circuitry.

Many PC users can make do with cheap surge suppressors or somewhat more expensive line conditioners. But for systems where a power glitch could be fatal—such as the PC that stores the company accounts, a pricey data base server at the hub of a local area network, or the LAN itself—you'll need an uninterruptible power supply (UPS). A UPS not only provides surge suppression and line conditioning, it can power your system through blackouts and brownouts. Some even close applications properly when the UPS's batteries run low, reopening them when normal power resumes. Just note that the price for such omnibus protection typically starts at more than $1000. The UPSs listed here provide between 1 and 2 kilovolt-amps (kva) of power—enough for three or more PCs and a file server. They all provide sine-wave or quasi–sine-wave output—changing voltage gradually and thus minimizing wear on printheads, transformers, and other sensitive components. Cheaper

square-wave devices are not included.

UPS's come in different flavors, so check these features before you buy:

On-line versus off-line. As the name implies, an on-line UPS constantly filters power and can immediately respond to a power outage. Off-line UPSs, which kick in standby power a few milliseconds after a blackout, typically cost less but offer minimal line conditioning.

Standby power duration. When the power dies, how long will your UPS keep things going? It depends on what systems and peripherals are attached. A UPS that supports intense data base searches on a network for 5 minutes could support data entry on two PCs for 20 minutes. When in doubt, ask the UPS vendor for the unit's standby power at maximum output.

Surge suppression and line conditioning. Any UPS should dissipate surges, dampen line noise, and compensate for brownouts. Most of the listed units cover the waterfront, but it's worth checking just how big a surge a UPS can handle (measured in joules) and how much noise it suppresses (in decibels). Protection against prolonged undervoltages is also a must. (Note: All the listed units protect the UPS circuitry itself from surges.)

Peace of mind. Is your UPS safe? And does it flag you when it's running out of gas? Look for a UPS that offers outage alarms, shutdown warnings, and the ability to close files automatically. An Underwriters Laboratories certification, although not required by law, verifies safe construction. If a unit passes the FCC's 15J tests, its RF emissions are within acceptable limits for commercial use; a Class B rating is even more stringent and means the unit is recommended for home use (see *Consumer Watch, PCW,* March 1989). ●

Matt Lake is PC World's *Andrew Fluegelman intern.*
(See chart on following pages.)

WHERE TO BUY

Advanced Electronics Systems
2005 Lincoln Way E
Chambersburg, PA 17201
800/345-1280, 717/263-5681

Alpha Technologies
3767 Alpha Way
Bellingham, WA 98225
206/647-2360, 206/671-4936

American Power Conversion
350 Columbia St.
Peace Dale, RI 02883
401/789-5735

Best Power Technology
P.O. Box 280
Necedah, WI 54646
800/356-5794

Clary
320 W. Clary Ave.
San Gabriel, CA 91776
818/287-6111

Computer Accessories
6610 Nancy Ridge Dr.
San Diego, CA 91776
619/457-5500

Computer Power, Inc.
124 W. Main St.
High Bridge, NJ 08829
201/638-8000

Controlled Power Co.
1955 Stephenson Hwy.
Troy, MI 48083
800/521-4792, 800/EASYUPS

Decision Data Computer Corp.
100 Whitmer Rd.
Horshim, PA 19044
215/956-5728

Deltron
P.O. Box 1369
Wissahickon Ave.
North Wales, PA 19454
215/699-9261

Dynatech Computer Power
5800 Butler Ln.
Scotts Valley, CA 95066
408/438-5760, 800/638-9098

Elgar
9250 Brown Deer Rd.
San Diego, CA 92121
800/854-2213, 800/44-ELGAR California, 619/450-0085

Emerson Computer Power
P.O. Box 1679
3300 S. Standard St.
Santa Ana, CA 92702
800/222-5877, 714/545-5581

Exide Electronics
3201 Spring Forest Rd.
Raleigh, NC 27604
919/872-3020

Fiskars Electronics
10325 Brockwood Rd.
Dallas, TX 75238
800/972-3333, 214/341-8700

IEPS
11391 Meadowglen, Ste. F
Houston, TX 77082
713/558-0010

Isoreg
410 Great Rd.
Littleton, MA 01460
508/486-9483

Kensington Microware
251 Park Ave. S
New York, NY 10010
212/475-5200

Lucky Goldstar Int'l
1050 Wall St. W
Lyndhurst, NJ 07071
201/460-8010

Panamax
150 Mitchell Blvd.
San Rafael, CA 94903
800/472-5555, 415/499-3900

Para Systems
1455 LeMay Dr.
Carrollton, TX 75007
800/238-7272, 214/446-7363

PTI Industries
269 Mt. Herman Rd.
Scotts Valley, CA 95066
408/438-0946

Siltron Illumination
7915 Center Ave.
Cucamonga, CA 91730
800/874-3392, 714/980-4484

Sola Electric
1717 Busse Rd.
Elk Grove, IL 60007
312/439-2800

Sutton Designs
300 N. Tioga
Ithaca, NY 14850
607/277-4301

Topaz
9192 Topaz Way
San Diego, CA 92123
619/279-0831

UPSystems
16530 Garfield Ave.
Paramount, CA 90723-1440
213/634-0621

Viteq
1000 Aerospace Rd.
Lanham, MD 20706
301/731-0400

UNINTERRUPTIBLE POWER SUPPLIES

		UPS FUNCTIONS							SURGE SUPPRESSION AND LINE CONDITIONING		
MANUFACTURER Model	List price	On-line	Max. power output (kva)	Duration at max. output (minutes)	Response time (ms)	MTBF[1] (in 1000s of hrs.)	Built-in diagnostics	Additional batteries	Max. surge dissipation (joules)	Line noise suppression[2] (db)	For all AC lines
ADVANCED ELECTRONICS SYSTEMS Steady Watt 1250	$1495	no	1.25	12	3	n/a	yes	no	740	40	yes
ALPHA TECHNOLOGIES Alpha 1500	$3960	yes	1.5	40	0	80	yes	yes	30	60	yes
AMERICAN POWER CONVERSION AP 1200	$1399	no	1.2	15	2	50	yes	no	480	35	yes
BEST POWER TECHNOLOGY MD 1KVA	$1895	yes	1	9	0	60	yes	yes	n/a	60	yes
CLARY Onguard PC-1.2K	$2390	yes	1.2	12	0	52	yes	yes	n/a	60	yes
COMPUTER ACCESSORIES Power Saver U1200	$1295	no	1.2	11	1–3	n/a	yes	no	405	60	yes
COMPUTER POWER Computersave Mk II 1000	$2354	yes	1	12	0	80	yes	yes	320	80	yes
CONTROLLED POWER Series 110	$1650	no	1.2	15	1	125	no	no	n/a	60	yes
DECISION DATA COMPUTER 5921	$2495	yes	1	8	0	n/a	yes	no	n/a	80	yes
DELTRON TP 10 S12A	$2628	yes	1	12	0	n/a	yes	no	200	60	no
DYNATECH COMPUTER POWER Powerhouse 1000	$1395	no	1.25	6	8	n/a	no	no	n/a	60	yes
ELGAR IPS 1100 FerroIPS 1000	$1295 $1795	no yes	1.1 1	15 15	<4 0	25 25	yes yes	no[4] no[4]	130 130	55 55	yes yes
EMERSON COMPUTER POWER UPS 1500	$1798	no	1.5	15	4	22	yes	no	100	25	yes
EXIDE ELECTRONICS Micro UPS 1200	$1539	no	1.2	15	<1	50	yes	no	450	60	yes
FISKARS ELECTRONICS UPS 1.5	$3895	yes	1.5	12	0	122.5	yes	no	n/a	90	yes
IEPS UPS 1000	$2600	yes	1	10	0	n/a	no	yes	80	110	yes
ISOREG Isogard FRO UPS	$2450	yes	1	10	0	20	yes	no	80	65	yes
KENSINGTON MICROWARE Power Backer 1200	$1399	no	1.2	15	1–4	50	yes	no	270	60	yes
LUCKY GOLDSTAR INT'L UX/210	$1995	yes	1	5	0	n/a	yes	no	250	60	yes
PANAMAX Powermax 1200VA	$1399	no	1.2	15	2	n/a	yes	no	480	70	yes
PARA SYSTEMS MM 1200SS/1	$1499	no	1.5	9	<1	25	yes	yes	100	20	yes
PTI INDUSTRIES AT800-01A	$999	no	1	5	4–8	20	no	yes	100	40	yes
SILTRON ILLUMINATION SPS-1000 UPS-1000	$1050 $2655	no yes	1 1	10 10	2–3 0	n/a n/a	yes yes	yes yes	320 320	80 80	no no
SOLA ELECTRIC SPS/R 1000 Mini-UPS II	$2331 $3712	no yes	1 1	8 8	<1 0	40 40	yes yes	yes yes	280 280	75 75	yes yes
SUTTON DESIGNS MM Series 1200	$1599	no	1.5	12	1	84	yes	yes	200	20	yes
TOPAZ Powermaker Micro UPS	$1300	no	1	9	4	80	no	no	n/a	40	no
UPSYSTEMS EDP 10	$2400	yes	1	10	0	60	yes	no	n/a	all	yes
VITEQ Benchmark UPS 15A	$3195	yes	1.5	10	0	45	yes	yes	n/a	80	yes

[1]Mean time between failures. [2]Transverse mode. [3]Available as an option. [4]Internal extended-life batteries available.

PROTECTION FROM		INDICATORS				NETWORK SERVER SUPPORT			MISCELLANEOUS FEATURES								
Overvoltage	Frequency variation	Audible alarm	Low battery	Battery time left	Impending shutdown	Novell SFT (II)	3Com 3S/400	Automatically closes files	Serial ports	Power outlets	Circuit breaker	FCC 15J certified (A,B)	UL certified	Free-replacement policy	Warranty (years)	Extended warranty	Reader service no.
yes	no	yes	yes	no	yes	yes	no	yes	1	6	yes	P	P	yes	1	no	640
yes	yes	yes	yes	yes	yes	yes	no	yes	1	6	yes	A	yes	no	1	no	641
yes	yes	yes	yes	no	yes	yes	yes	yes	1	6	yes	A	yes	yes	1	yes	642
yes	yes	yes	yes	yes	yes	yes	yes	yes	1	4	no	A	yes	yes	1	yes	643
yes	yes	yes	yes	no	yes	yes	no	yes	1	4	yes	A	yes	yes	1	yes	644
yes	yes	yes	yes	no	yes	yes	yes	yes	1	4	yes	B	yes	no	1	no	645
yes	yes	yes[3]	yes[3]	yes[3]	yes[3]	yes	no	yes[3]	1	4	no	no	yes	no	1	yes	646
yes	no	yes	no	no	yes	yes	no	yes	1	4	yes	A	no	yes	1	yes	647
yes	yes	yes	yes	no	no	no	no	no	1	4	yes	B	yes	no	1	no	648
yes	yes	yes	yes	no	yes	no	no	no	0	4	no	no	yes	no	1	no	649
yes	yes	yes	yes	no	yes	no	no	no	0	4	no	A	P	no	1	no	650
yes	yes	yes	yes	no	yes	yes	yes	yes	1	4	no	A	yes	yes	1.5	yes	651
yes	yes	yes	yes	no	yes	yes	yes	yes	1	4	no	A	yes	yes	1.5	yes	651
no	no	yes	yes	no	yes	yes	no	yes	1	4	yes	no	yes	yes	1	no	652
yes	yes	yes	yes	no	yes	yes	yes	yes	1	6	no	A	yes	yes	2	no	653
yes	yes	yes	yes	no	yes	no	no	yes	1	2	no	A	yes	yes	1	no	654
yes	yes	yes	yes	yes	yes	no	no	no	1	4	yes	P	P	yes	1	yes	655
yes	yes	yes	yes	no	yes	no	no	no	1	0	yes	no	no	no	1	yes	656
yes	yes	yes	yes	no	yes	yes	yes	yes	1	6	no	A	yes	yes	1	no	657
yes	yes	yes	yes	yes	yes	yes	no	yes	1	4	yes	A	P	yes	1	no	658
yes	yes	yes	yes	no	yes	yes	yes	no	1	6	yes	A	yes	yes	1	no	659
yes	no	yes	yes	yes	yes	yes	yes	yes	1	4	yes	B	no	yes	1	yes	660
no	no	yes	yes	yes	yes	yes[3]	yes[3]	yes[3]	1[3]	4	no	no	yes	no	1	no	661
yes	yes	yes	no	no	yes	no	no	no	0	4	yes	no	no	no	1	yes	663
yes	yes	yes	no	no	yes	no	no	no	0	4	yes	no	no	no	1	yes	663
yes	yes	yes	yes	yes	yes	yes	no	yes	1	4	yes	A	yes	yes	1	yes	664
yes	yes	yes	yes	yes	yes	yes	no	yes	1	4	yes	A	yes	yes	1	yes	664
yes	no	yes	yes	yes	yes	yes[3]	yes[3]	yes[3]	1[3]	4	yes	B	yes	yes	1	yes	665
no	yes	yes	no	no	no	no	no	no	0	4	no	no	yes	yes	1	no	666
yes	yes	yes	yes	no	yes	no	no	no	0	4	yes	no	yes	yes	1	yes	667
yes	yes	yes	yes	yes	yes	yes	yes	yes	1	4	yes	A	yes	yes	1	yes	668

n/a = manufacturer could not provide information P = certification is pending

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1. Computers on Wall Street
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3. Software 1990
4. OSI Standards
5. Macintosh as a Workstation
6. CASE Tools and Micro/Network Systems Development
7. Desktop Publishing from Soup to Nuts
8. OS/2: 10 Reasons to Switch, 10 Reasons Not To
9. A LAN Primer
10. Operating Systems: Beyond Multi-Finder
11. Alternate Bus Routes: A Discussion of Bus Options
12. Network Design
13. Mission-Critical Applications
14. Introduction to Telecom and Wide Area Networks
15. Installing, Training and Support for the Macintosh

Wednesday, June 21

16. Resource Sharing without Local Area Networks
17. The '486 Shockwave: What the Future Holds
18. Supporting Multiple Environments
19. Making Connections with LAN Bridges and Gateways
20. Application Development for the MacIntosh
21. Manufacturers' Dealer Incentives Programs
22. Alternatives to Portions of OS/2 EE
23. Softline: Candid Comments from Industry Leaders
24. Workgroup Software: Are We There Yet?
25. Making Mac Connection in Corporate Environments
26. OS/2 Contenders: A Look at Other Operating Systems
27. Migrating Applications: Downsizing and Upsizing
28. Keeping Up with End-User Computing Demands
29. Making Connections with Micros and Minis
30. Desktop Publishing: DOS and Mac-Based Systems
31. Expert Systems: Tools and Applications
32. Project Management
33. Will dBase IV Revive the dBase Standard?
34. Network Management
35. Hypercard and the Macintosh: Fact or Fancy

Thursday, June 22

36. EISA Implementation: What It Will and Won't Do
37. Document Processing Instead of Desktop Publishing
38. PC Security: Protecting Real Assets
39. Making Connections from Micros to Mainframes
40. Macintosh Presentation Technology
41. The Proper Role of Systems Integrators
42. Wide Area Spreadsheets
43. Computer Languages and Utilities
44. OS/2 and Networking
45. Optical Storage: Available, Affordable and Erasable
46. Taking Graphics for Granted
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48. Network Diagnostics—Tools and Techniques

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- ☐ 2 or 3 Day Exhibits $60
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Note: This form must be used in advance. It may not be used on-site.

Circle appropriate seminar numbers you wish to attend. All sessions are first-come, first-seated.

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

NAME _____

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Check only your main job function from box below.

III

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- DD ___ Corporate Officer
- EE ___ Creative Arts (All)
- FF ___ Designer (All)
- GG ___ DP/WP Manager Operator
- HH ___ Engineer (All)
- II ___ MIS Director/Manager
- JJ ___ Programmer
- KK ___ Purchasing
- LL ___ Sales/Marketing
- MM ___ Scientist
- NN ___ Securities/Financial Analyst
- OO ___ Service Technician
- PP ___ Systems Analyst
- WW ___ Systems/Application Mgr.
- RR ___ Systems/Architect
- SS ___ Systems/Maintenance
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- VV ___ Systems/Prototyper
- QQ ___ Other (specify) _____

Check your co.'s main activity from section I or II.

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- 5 ___ Service Vendor
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- 8 ___ Turnkey Vendor
- 9 ___ Value Adder
- 10 ___ Computer Distributor
- 11 ___ Other (specify) _____

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- G ___ Education
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- I ___ Government/Military
- J ___ Hospital
- K ___ Hotel
- L ___ Industrial Design
- M ___ Insurance
- N ___ Law Office
- O ___ Management Consit.
- P ___ Manufacturing
- Q ___ Publishing
- R ___ Real Estate
- S ___ Research Development
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BADGE ORDERS FOR PC EXPO received by May 30 will be mailed by June 13. Late orders will be processed and held for arrival at the "Pre-Registered Attendee Counter" in the registration area. All registrations will be confirmed by PC EXPO. Registration fees must be in U.S. funds. Foreign mail orders (except Canada) must be received no later than May 23 and will be held at the "Pre-Registered Attendee Counter" for pick-up upon arrival. All registrations are non-refundable.

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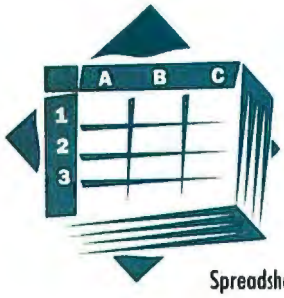
Incomplete or improperly completed forms will be returned. Minors under the age of 18 may not register.

PD69

Spreadsheet Traps and How to Avoid Them

Sometimes the most obvious mistakes are the easiest to make. Two spreadsheet experts point out common pitfalls and suggest detours.



Spreadsheets

Doug Cobb and Steve Cobb

INSIDE HOW TO

TIPS & TECHNIQUES

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Telecommunications wizard Alfred Glossbrenner tells you how to cut costs and boost productivity on MCI Mail.

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Tips on getting better results when scanning black-and-white line art, from a pro.

190 **Create Smaller, Smarter QuickBASIC Programs**
Tom Swan, *PC World* programming guru and *Star-Dot-Star* editor, shares some valuable *QuickBASIC* tricks of the trade.

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• Use COPY Carefully With Damaged Disks
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• Changing WordPerfect Paired Codes Via Macros

Today's electronic spreadsheets are powerful tools, but they harbor traps that can nab the unsuspecting user. In this article, we present four traps common to *1-2-3*, *Quattro*, and *Excel* and show you how to beat them.

Trap #1: Moving Entries Into Referenced Cells

Moving an entry from one cell to another is a routine task, but problems arise when you move an entry into a cell that is referenced by a formula or function. *1-2-3* and *Quattro* replace references to that cell with ERR; *Excel* replaces them with #REF!.

Here's why. *1-2-3*'s /Move command, *Quattro*'s /Block Move command, and *Excel*'s Cut and Paste commands don't just move the contents and formats of a cell—they move the cell itself. Consequently, references to the destination cell become invalid.

Fortunately, there's an easy way around this problem. Copy the entry instead of moving it, then erase the source cell. In *1-2-3* use the /Copy command; in *Quattro* use the /Block Copy command; in *Excel* use Edit Copy and Edit Paste. Unlike moving an entry, copying it doesn't replace the destination cell; it simply replaces the cell's contents and format. Any formulas or functions that reference that cell remain valid.

One important note: Copying formulas and functions alters any relative references. To prevent this, just convert the formula or

function into a label before you copy it; then remove the label prefix.

Trap #2: Extracting Records From a Data Base

1-2-3, *Quattro*, and *Excel* all can extract criterion-matching records from a data base. Before you use a data extract command, you can specify either a single-row or a multiple-row output range.

But there's a hidden hazard. Before the programs copy the records to the output range, they erase all the cells in that range, except the row of field names at the top. If you specify a multiple-row output range, *1-2-3*, *Quattro*, and *Excel* erase only the cells within that defined range. If you specify the single row of field names, however, the programs erase all the cells below that row—all the way to the bottom of the worksheet.

There are two ways to avoid accidental erasures. If you specify a single-row output range, make sure that all the cells below the row you specify are blank. Alternatively, you can specify a multiple-row range. Just make sure the range is large enough to accommodate all the criterion-matching records in the data base. Otherwise, the programs will warn you with a beep and a message and then perform an incomplete extraction.

Trap #3: Incorrect Averaging

1-2-3 and *Quattro*'s @AVG function and *Excel*'s AVERAGE() function calculate the mean of the values in a range. But unlike most other functions, averaging

```
A11: @IF(@VLOOKUP(4,A3..B7,0)=4,@VLOOKUP(4,A3..B7,1),@ERR)                READY

     A          B          C          D          E          F          G
1    Part # Description
2    ------ -----------
3         1 Widget
4         3 Gizmo
5         5 Doodad
6         7 Gadget
7         9 Thingumajig
8
9  Doodad    <==@VLOOKUP(5,A3..B7,1)
10 Gizmo     <==@VLOOKUP(4,A3..B7,1)
11       ERR <==@IF(@VLOOKUP(4,A3..B7,0)=4,@VLOOKUP(4,A3..B7,1),@ERR)
12 Doodad    <==@IF(@VLOOKUP(5,A3..B7,0)=5,@VLOOKUP(5,A3..B7,1),@ERR)
13
```

FIGURE 1: 1-2-3's lookup functions don't always return an exact match. But the function shown here corrects this problem. In cell A11, it returns a value of ERR because none of the values in the lookup table match 4, the key entry.

differentiates between blank cells and cells that contain the value 0.

If you average five cells that contain the values 1, 2, 3, 4, and a blank, the spreadsheet divides by 4, and the result is 2.5. If the blank cell contains a 0 instead, the spreadsheet divides by 5 and returns the value 2. So when you want to include a value of 0 in an average, you must use that value—don't leave the cell blank.

Trap #4: Inexact Matches With Lookup Functions

Most spreadsheets feature functions that look up text or values, such as an inventory number, in vertical or horizontal tables and then return results, such as a corresponding price. But those functions don't always give you an exact match. The @VLOOKUP and @HLOOKUP functions in *1-2-3* and *Quattro*, and VLOOKUP() and HLOOKUP() in *Excel*, won't produce an exact match when the lookup entry (the entry specified by the first argument of the function) is a value.

Instead, vertical lookup functions search down the far left column of the lookup table (or, in the case of the @HLOOKUP and HLOOKUP(), across the top row of the table) for the first value that meets or exceeds the key value. If they find a value that meets the key value before they find one that exceeds it, then they "match" on that value. Otherwise, when they find a value that exceeds the key value, they back up and match on the value that's closest to, but not greater than, the key value.

Here's a solution that allows you to make *1-2-3*'s, *Quattro*'s, and *Excel*'s lookup functions match values exactly. For vertical lookups in *1-2-3* or *Quattro*,

use @IF(@VLOOKUP(*key*, *table*,0)=*key*,@VLOOKUP (*key*,*table*,*n*),@ERR) where *key* is the value you want to look up, *table* is the lookup table, and *n* is the position of the column that contains the result (see **FIGURE 1**). In *Excel*, use =IF(VLOOKUP-(*key*,*table*,1)=*key*,VLOOKUP-(*key*,*table*,*n*),NA()) instead.

The IF statement checks whether the far left column of the lookup table contains an exact match for the key value. If it does, the functions return an entry that corresponds to that value. If it doesn't, *1-2-3* and *Quattro* return the value ERR; *Excel* returns the value #N/A!.

So there you have it. Sometimes a little attention to spreadsheet perils can help shake out a mistake before it happens. ●

Doug Cobb is president of The Cobb Group, a publisher of books and journals about business software. Steve Cobb is a senior author at The Cobb Group who writes extensively about spreadsheets.

POWER TIP NO. 54

Smartcom's Bookmarks

Smartcom III's edit buffer holds up to 100K of data; that's a lot, so sometimes you might want to mark your place when you're examining a lengthy file. Just press <F9> to set a bookmark. To quickly return to that spot, press <F10>.

Toru Tanaka
Los Angeles, California

TIPS & TECHNIQUES

Communications

An Insider's Guide to MCI Mail

A telecommunications guru shares some guidelines for cutting costs and increasing productivity on MCI Mail.

What you need: an MCI Mail subscription

Nothing beats electronic mail as a money and time saver. E-mail is nearly as fast as a phone call, banishes the telephone tag demon, and lets you keep a record of your correspondence. And since MCI Mail has over 100,000 subscribers, chances are the computer literates you need to contact are among them. The challenge is making the most of MCI without dropping a bundle.

This article assembles some of my favorite tips and commands for saving time and money on MCI Mail, plus a few advanced features you may not be aware of.

Pick the Best Pricing Scheme

Last February, MCI Mail introduced Preferred Pricing, a discount rate no doubt intended to lure new users to the service.

Under Preferred Pricing, MCI waives its annual $25 fee and charges a flat monthly rate of $10 for the first 40 messages (up to 7500 characters per message) or fax pages—a substantial discount. Starting with the 41st message, standard rates apply: 45 cents for the first 500 characters, 75 cents for 501 to 2500 characters, $1 for 2501 to 7500 characters, and $1 for each additional 7500 characters.

Naturally, MCI is hoping you'll send more than 40 messages a month. But a little arithmetic shows that if you send at least one short MCI message a day, Preferred Pricing can save you money. If you find you're sending less, switch your account to the other scheme with a quick call to MCI Mail customer service at 800/444-MAIL.

Dial Smart...

Until last February, you had to access MCI via a network of local toll numbers or Tymnet. However, three new nationwide 800 numbers now make MCI connect time absolutely free. For 300- and 1200-bps access, dial 800/234-MAIL; for 2400-bps access, dial 800/456-MAIL; and *Lotus Express*, *Desktop Express*, and *ProComm Plus* users dialing at any rate up to 2400 bps should call 800/825-1515. (With *ProComm Plus*, set parameters to E-7-1, rather than the usual N-8-1.)

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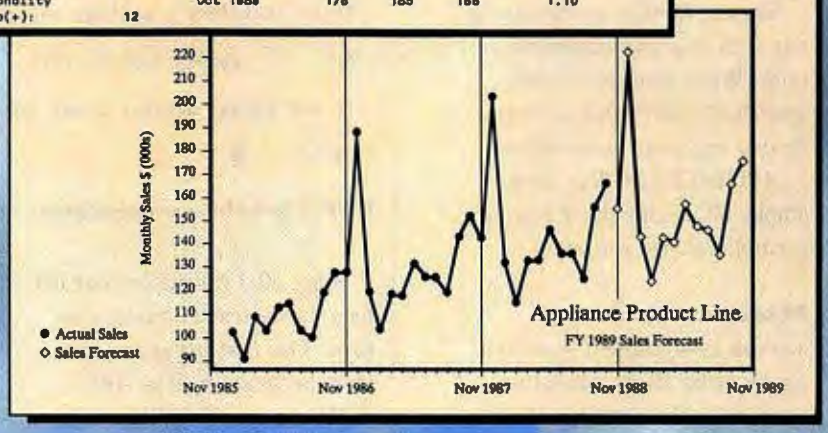
Confidence		Dec 1988	221	225	217	1.46
Level:	95.0%	Jan 1989	143	148	139	0.95
Interval:	3	Feb 1989	124	130	118	0.82
Mean:	129	Mar 1989	143	149	137	0.94
Std Deviation:	24	Apr 1989	141	148	135	0.92
Minimum:	91	May 1989	157	164	150	1.01
Maximum:	203	Jun 1989	147	155	140	0.94
Trend Line Slopes		Jul 1989	148	154	138	0.93
Entire Range:	1.26	Aug 1989	135	144	127	0.88
Last Half:	0.98	Sep 1989	168	174	157	1.04
Seasonality		Oct 1989	178	185	168	1.10
Auto(+):	12					



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and a little-known, free MCI bulletin board supplies setup information and scripts tailored to many popular packages. Type VIEW, followed at the next prompt by PC GUIDELINES. To view script selections, type SCAN.

You can further accelerate logons with this undocumented trick: When prompted, enter your user name followed by two slashes and your password—JSMITH//XERFGTIQ, for example. MCI skips the 'Password:' prompt and logs you on.

Abbreviate Commands

You can save yourself some typing by using MCI's two-letter command abbreviations. For example, use SC instead of SCAN, and DE instead of DESK. To accelerate multistep operations, type command sequences on a single line. SC DE FR JSMITH AF MAR 01, for example, lists all messages received from JSMITH after March 1.

Transfer Binary Files

MCI Mail wasn't designed for binary file transfers, but two techniques let you send .COM, .EXE, and non-ASCII data files through the system. The first transforms the binary file into hexadecimal text format using a conversion program such as HC.COM, obtainable through a user group or on-line resource like CompuServe.

The second technique requires that each party have a copy of *Lotus Express*, *CMSLink*, or some other program that supports the X.PC or MCI Mail Link protocols. This method is preferable to the conversion-program technique because the protocols correct any transmission errors automatically.

```
    There are no messages waiting

Command: cr

TO:       James Smith (EMS)

Enter name of mail system.

EMS:      fax
    EMS    354-8235 FAX

Enter recipient's mailbox informat

MBX:      phone: 415-442-1891

If additional mailbox lines are no

MBX:
```

```
TO:       Bob Smith (telex)

Enter country name or country code
United States.

Country:    France
Destination is FRANCE/MONACO (842)

Telex No:   842-12345678
Answerback:

TO:       Bob Smith
          TLX: 84212345678

Is this address correct (Yes or No

TO:       Next Person (telex)
```

FIGURE 1: On the left, a properly addressed MCI Mail fax; on the right, a telex address.

Since MCI calculates your bill on a per-character basis, compress files first using a shareware program such as ARC.EXE or a similar utility.

Fax It

MCI Mail was one of the first E-mail vendors to offer PC-to-fax service. Faxing via MCI Mail has some advantages over dedicated fax hardware—and some drawbacks. You can fax messages right from your desk, bypassing your printer and the nosy fax machine operator. But you can fax only ASCII text, and of course, you can't receive faxes. For MCI fax instructions, type HELP FAX SEND, and see **FIGURE 1.**

Lotus Express users fax the following way: After typing the addressee's name at *Express*'s 'To:' prompt—but before pressing <Enter>—press <F9>, then select the REMS option. The rest of the procedure is identical to MCI's.

Telex or TWX It

MCI also lets you correspond with over 1.8 million telex and TWX machines worldwide. All you need to know is the recipient's telex or TWX number, and the carrier or network group. (Canada-bound telexes require your answerback number as well.) Telex messages are limited to 100,000 characters, with no more than 69 characters per line.

To send a telex, type the recipient's name at the 'To:' prompt, followed by a space and (TELEX) (see **FIGURE 1**). At the 'Country:' prompt, enter the country name (or number, if you know it), or press <Enter> for the United States. For U.S. telexes, MCI asks for the correspondent's carrier and presents a list of choices. (If you don't know the carrier, MCI Mail customer service can deduce it from the target telex/TWX number.) Finally, MCI asks for the telex number itself and prefaces it with the carrier/country code you've already supplied.

You can receive telexes (unlike faxes) through MCI Mail. Your telex number is simply 650 followed by your MCI Mail account number; the answerback is your telex number followed by MCI UW. MCI transmits this information with telexes, so your correspondents will know how to reply.

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Armed with a few tricks, you can get more done, and pay less for it, on MCI Mail. After all, that's what E-mail is all about.
—*Alfred Glossbrenner*

Desktop Publishing

Scanner ABCs

A desktop publishing graphics expert covers the ground rules

What you need: a scanner, scanning software

Scanned images can look great, amateurish, or dreadful, depending on a combination of factors, including the quality of the source material and the versatility of the scanning software. This article presents tips on how to get better results when scanning black-and-white line art, such as drawings, charts, logos, or any graphic that consists of lines and shapes but lacks the continuous tones characteristic of photographs. A tutorial on more advanced scanning techniques, including working with gray-scale images, will appear in an upcoming *Tips & Techniques*.

The illustrations in this article were produced using a Hewlett-Packard ScanJet and Z-Soft's *Publisher's Paintbrush*. However, most of the tips also apply to other scanners and scanner software.

Prepare the Original

Even using the best software, fixing up a scanned image electronically can take hours—or you can save time by cleaning up the original material the old-fashioned way. Use a pen or pencil to repair broken lines, and blot out unwanted spots with correction fluid.

If you can't edit the original, try working on a photocopy, or better, a Photostat. Scanning a copy rather than the original gives you additional control over image size and density. Although most scanning software lets you adjust image size and contrast, closely matching the size of the original to that of the final illustration produces the best results. For instance, if you scan the company logo on a sheet of business stationery and then enlarge it in a program like *Publisher's Paintbrush*, the resulting image may contain gaps and glitches you'll have to correct pixel by pixel. Try retouching an enlarged photocopy with a pen first.

Watch Your Alignment

If your original material contains any horizontal or vertical lines, the slightest misalignment will produce ragged, stepped results called jaggies. With a flatbed scanner like the HP ScanJet, alignment problems are easy to avoid: Simply tape the original to the glass platen. Test scan the image, then adjust the material as necessary to obtain the proper alignment. The problem is harder to correct with scanners that pull the original through with rollers. If the original is small, mount it on a larger sheet of paper; if it's fragile, tape it inside a clear acetate page protector.

Choose the Right Scanning Mode

Virtually all scanners offer at least two modes of operation: line art and halftone. The line art option is usually best for material that contains just two colors; the halftone option is best for material that contains more than two colors or shades of gray, such as a photograph.

Even when scanning line art, however, selecting the line art option isn't always the best way to go (see **FIGURE 1**). If the contrast of the original material is too high, you may find that one of the dithering patterns offered by your software's halftone feature produces more detail and a softer tone.

Dithering groups the black-and-white dots that make up a scanned image into patterns that simulate shades of gray. Because most scanning software provides several dithering patterns—Press, Bayer, Spiral, and Fatting are common choices—you may need to test a few before you find the best setting.

A word of caution about halftones: You may encounter interference patterns when you resize a dithered image in a page make-up program. You can overcome the effects of interference by adjusting scanned image size slightly until the patterns disappear. But the best way to avoid the problem is to scan the image at the size you want and maintain that size when you use the image in other programs.

Choose the Right Resolution

Most scanner software gives you a choice of resolution settings, typically ranging from 75 to 300 dots per inch. The best setting

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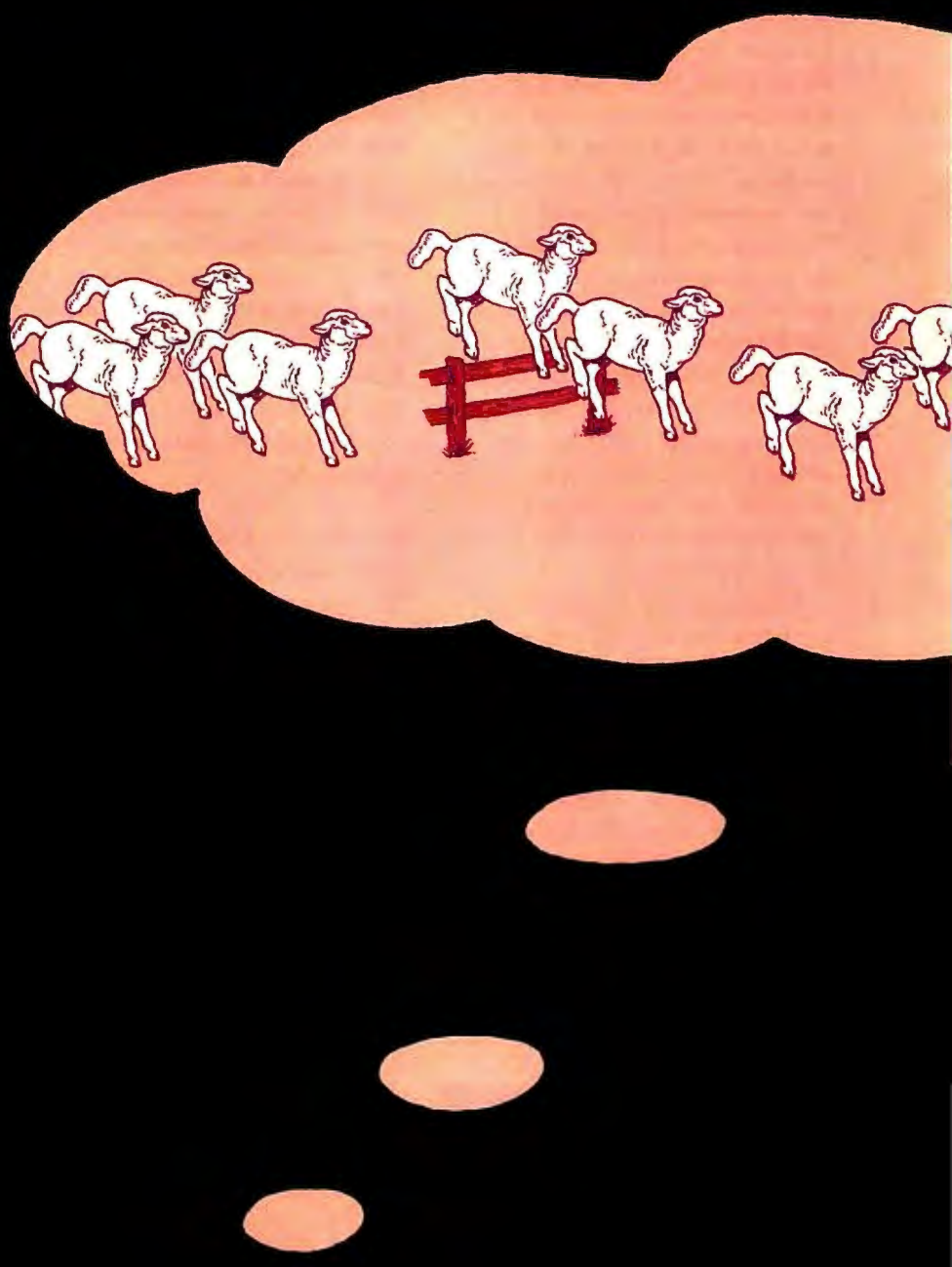

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depends on a number of factors, including the type of printer you expect to use, the amount of available memory and storage space, the type of image you're scanning, and how you plan to use the image in a document.

As a general rule, you should set the scanner resolution to match your printer's. With a 120-dpi color ink jet printer like the Xerox 4020, a scanning resolution of 150 dpi will yield about the same results as 300 dpi—and use up a lot less storage space. Of course, with laser printers you should match the 300-dpi output resolution.

Scanning at 300 dpi can be hardware intensive. To scan an entire 300-dpi, 8½-by-11-inch image with *Publisher's Paintbrush*, you need at least 1MB of expanded memory and an equal amount of free disk space. And printing may take a few minutes; if you resize the image, it will take even longer.

Some publications, such as in-house newsletters, may not warrant the additional memory and print time 300-dpi images require, even when laser printed. And high-contrast material that's not too detailed often looks fine at settings of less than 300 dpi. In addition, scanning an image at the highest possible resolution is unnecessary if you plan to reduce it later. At 200 dpi, an image reduced to half its original size has virtually the same apparent resolution as the full-size, 300-dpi image—and a 200-dpi image uses half the memory and disk space, and prints faster.

Use Preview Scans

Some scanner programs, like HP's *Scanning Gallery*, provide a handy preview mode for quickly scanning and displaying a low-resolution likeness of the image. A quick-and-dirty 150-dpi scan allows you to select the portion of the image you want in the final higher-resolution scan and to check such basics as alignment, margin settings, and contrast. *Publisher's Paintbrush* and some other scanning programs don't provide a preview mode, but you can obtain the same effect manually merely by reducing the resolution setting. After you're satisfied with all the basic settings, switch the resolution to 300 dpi and scan away.

—Richard Jantz

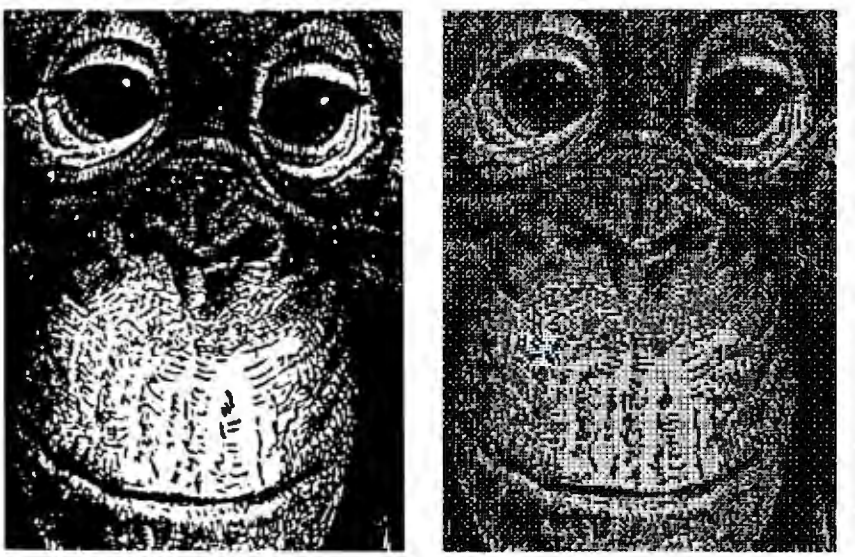
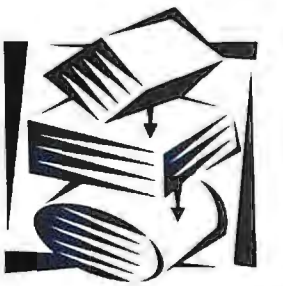


FIGURE 1: The orangutan on the left was scanned using the Publisher's Paintbrush line art option; the one on the right, using the halftone option.



Programming

Create Smaller, Smarter QuickBASIC Programs

PC World's programming whiz and editor of Star-Dot-Star demonstrates some state-of-the-art tricks with QuickBASIC.

What you need: QuickBASIC 4.5

PC users have long relied on BASIC's straightforward syntax to obtain quick results. But basic BASIC is short on structured programming capabilities, which can conserve memory and make program logic easy to follow. Enter Microsoft *QuickBASIC 4.5*.

QuickBASIC's structured programming aids and built-in intelligence form a software development tool that rivals the powers of C and Pascal. To highlight some of these new abilities, let's explore a sample utility that reformats text into newsletter-style columns.

Text In, Software Out

First, enter COLUMNS.BAS (see **LISTING 1**) into *QuickBASIC*'s syntax-checking editor. As you

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type in the function and submodules, *QuickBASIC* automatically opens a new window and generates the DECLARE statements at the top of the program listing, so you can skip typing them in. Press <F2> to move between program modules.

Next, compile the program using the Run menu's Make EXE File command, exit *QuickBASIC*, then run the program from the DOS prompt. Or, simply run the program from within *QuickBASIC* by pressing <Shift>-<F5>. Once running, COLUMNS prompts you to enter the name of a text file to process (for the purposes of this tutorial, an unformatted ASCII file of several 20-character lines is best). At the subsequent prompts, press <Enter> to display output on the screen, then specify 3 columns, 15 lines per column, 25 characters per column, and 4 blank lines between pages. You should see your formatted text zip by at breakneck speed. To save the output to disk, rerun COLUMNS and supply an output file name (or LPT1:, to print the listing) at the second prompt.

COLUMNS.BAS imposes no limits on file length, number of columns, or spacing. Be prepared to experiment, though, as some values can produce strange results. For example, a column width narrower than the longest text-file line creates gibberish. To be safe, always keep a backup copy of your original text.

Inside COLUMNS.BAS

COLUMNS.BAS exploits four advanced *QuickBASIC* features: the CALL statement used with SUB procedures, structured DO loops, local variables, and FUNCTION procedures.

```
DECLARE SUB ReadLines (MaxLines%, NumLines%)
DECLARE SUB WriteLines (NumLines%)
DECLARE FUNCTION GetOptions% ()
DECLARE SUB OpenFiles ()

COMMON SHARED NumColumns AS INTEGER
COMMON SHARED LinesPerColumn AS INTEGER
COMMON SHARED ColumnWidth AS INTEGER
COMMON SHARED BlankLines AS INTEGER

CALL OpenFiles
MaxLines% = GetOptions%

DIM SHARED TextLines$(1 TO MaxLines%)

DO UNTIL EOF(1)
   CALL ReadLines(MaxLines%, NumLines%)
   CALL WriteLines(NumLines%)
LOOP

CLOSE #1          ' Close input file
CLOSE #2          ' Close output file
END               ' End of main module

FUNCTION GetOptions%
   INPUT "Number of columns"; NumColumns
   INPUT "Number of lines per column"; LinesPerColumn
   INPUT "Number of characters per column"; ColumnWidth
   INPUT "Number of blank lines between pages"; BlankLines
   GetOptions% = NumColumns * LinesPerColumn
END FUNCTION

SUB OpenFiles
   INPUT "Read from what file"; InFileName$
   IF InFileName$ = "" THEN END
   OPEN InFileName$ FOR INPUT AS #1
   INPUT "Write to what file (Enter=screen)"; OutFileName$
   IF OutFileName$ = "" THEN OutFileName$ = "scrn:"
   OPEN OutFileName$ FOR OUTPUT AS #2
END SUB

SUB ReadLines (MaxLines%, NumLines%)
' Read up to MaxLines strings or to end of file
   NumLines% = 0
   DO UNTIL EOF(1) OR NumLines% = MaxLines%
      NumLines% = NumLines% + 1
      LINE INPUT #1, TextLines$(NumLines%)
```

(continues)

LISTING 1: COLUMNS.BAS, a text-formatting utility, demonstrates many structured programming techniques now available to QuickBASIC programmers.

The program's 18-line main module (from the first DECLARE SUB statement to the 'End of main module' comment) contains CALLs to three subprograms—OpenFiles, ReadLines, and WriteLines. CALL statements transfer control to subprograms, optionally passing parameter values (in parentheses, as shown in the calls to ReadLines and WriteLines). This ability to pass variables to subprograms is one reason for *QuickBASIC*'s newfound popularity among developers.

Structured loops make program logic easier to understand

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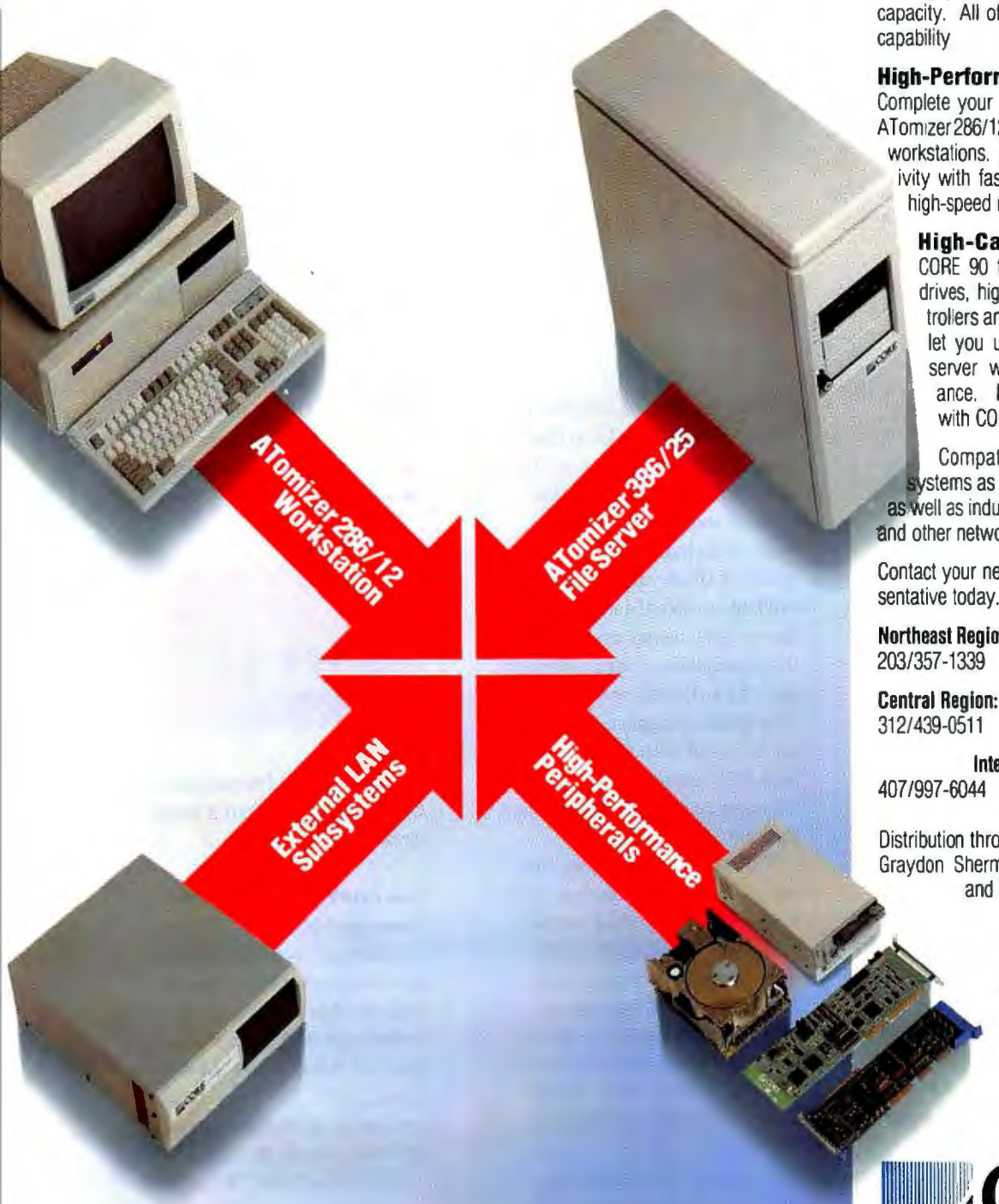

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```
    LOOP
' Erase any left over strings in TextLines$()
    FOR i% = NumLines% + 1 TO MaxLines%
        TextLines$(i%) = ""
    NEXT i%
END SUB

SUB WriteLines (NumLines%)
' Write multiple-column text
    FOR i% = 1 TO LinesPerColumn
        FOR j% = 0 TO NumColumns - 1
            s$ = TextLines$(i% + j% * LinesPerColumn)
            PRINT #2, s$;
            IF j% < NumColumns - 1 THEN
                PRINT #2, SPC(ColumnWidth - LEN(s$));
            END IF
        NEXT j%
        PRINT #2, ' Start new output line
    NEXT i%
' Add blank lines between pages
    FOR i% = 1 TO BlankLines
        PRINT #2,
    NEXT i%
END SUB
```

LISTING 1: ***(continued)***

by moving the bulk of the code into subprograms. For instance, the DO loop in the main module repeatedly calls ReadLines and WriteLines until it reaches the end of the input text file. The DO loop in ReadLines loads up to the specified maximum number of strings (MaxLines%) into an array. Such statements are far simpler to understand than non-structured, GOTO-ridden BASIC code.

QuickBASIC's use of local variables helps eliminate bugs, including those caused by variable-name conflict, a common logic error. Because local variables are "visible" only to statements within the subprogram where the variables are defined, conflicts with identically named variables elsewhere can't occur. And local variables conserve memory because values in multiple modules can share the same RAM locations.

The variables i% and j% in WriteLines are local and therefore invisible to the rest of COLUMNS.BAS. Similarly, MaxLines% and NumLines% are local to the main module. The values of these variables are available to ReadLines because the variable names are passed to the submodule as parameters by the CALL ReadLines statement. Only global variables, which are declared with COMMON SHARED statements, are visible to every program module and function.

FUNCTION procedures are subprograms that return a value when called; they work similarly to the way variables do in BASIC expressions. For example, the GetOptions% function returns the number of strings required for one output page, a value the program's main module uses to dimension string array TextLines$.

Of course, there's more to *QuickBASIC* than one article can cover. But even a few highlights should convince anyone who wants quick, clean code to give *QuickBASIC* a closer look. —*Tom Swan*

Alfred Glossbrenner's many books cover communications and personal computing. His latest is Alfred Glossbrenner's Master Guide to Free Software for IBMs and Compatibles *(St. Martin's Press, New York, 1989). Richard Jantz wrote* Ventura Publisher 2.0 for the IBM PC: Mastering Desktop Publishing *(John Wiley & Sons, New York, 1989) and* The Complete Scanner Handbook *(Peachpit Press, Berkeley, California, 1989). Tom Swan is a contributing editor for* PC World *and the author of* Mastering Turbo Pascal 4.0 *(Howard W. Sams & Co., Indianapolis, Indiana, 1988) and* Mastering Turbo Assembler *(Howard W. Sams & Co., 1989).* ●

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Helpful hints from members of the nation's user groups

Use COPY Carefully With Damaged Disks

If you try to copy files from one drive to another containing a disk that has problems or is write-protected, DOS displays an error message like 'Abort, Retry, Fail?'. The worst thing you can do at this time is put a different disk in the target drive and hit R for Retry. When DOS

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Circle 268 on reader service card

prepares to copy one or more files, it first reads the directory from the target disk into memory. If you switch disks, it will write the disk directory that's in memory onto the new target disk. The new disk will have the wrong directory listing—and no corresponding files. And any files that were on it will no longer be accessible.

The safest response to the DOS error message is pressing A to abort the copy, rectifying the problem with the target disk, and starting over. The Retry option should be reserved for safe operations like DIR that do not move data from one disk to another.

Dick Page
PC-HUG
Houston, Texas

Changing Case in Paradox Fields

Paradox has no problem reading records that mix capital and lowercase letters, but what if you inherit a data base file that's been entered in all uppercase letters? Having a client's name in capital letters isn't ideal for sales reports and other documents. Luckily, *Paradox*'s application language has a FORMAT command that can convert this kind of record so only the initial letter is capped.

The following routine, Names.sc, does exactly that for the LastName field in a file called Persnl:

```
;Names.sc, Change all UPPER-
   CASE names to Initial
   Capitals
EDIT "Persnl"
SCAN FOR NOT ISBLANK
   ([LastName])
[LastName] = FORMAT("cc",
   LOWER([LastName]))
ENDSCAN
DO_IT!
```

The EDIT command and the file name following it tell *Paradox* which file to edit. SCAN tells the software to read and process every record except those with a blank LastName field. The FORMAT command line first converts every entry in the LastName field to lowercase characters, then capitalizes the initial letter of each group of letters.

Names.sc will correctly capitalize most names, even irregular ones such as Guillam-Jones or O'Brien. However, a few names such as MacDonald or de la Costa will require manual adjustment. You can also use the script to modify first name, city name, and street name fields.

R. Bruce McCormick
Southern California Paradox Users Group (LAPALS)

Changing WordPerfect Paired Codes Via Macros

If you produce a *WordPerfect 5.0* report that contains italicized text and then decide that underlining would look better, you're faced with a time-consuming search-and-replace task. *WordPerfect* requires two codes—one at the beginning and one at the end of a text block—to toggle enhancements; for example, [ITALC] and [italc] produce italicized text. You can see these codes by pressing <Alt>-<F3> (Reveal Codes), but search and replace can find only one format code at a time. Here's a macro that will find and replace both codes. (Note that the macro won't work correctly if you're in Reveal Codes mode.)

This example produces a macro called Ital that searches for italics codes and replaces them with underline codes. You can modify the macro to change any pair of *WordPerfect* codes.

1. Position the cursor at the top of a document, press **<Ctrl>-<F10>** to record a macro, name the macro **Ital** and enter a description.

2. Now press **<F2>** (Search) to begin a search. Press **<Ctrl>-<F8>AI** to select italics, then hit **<F2>** to search for the first italics code, [ITALC].

3. Press **<Alt>-<F4>** (Block) to turn on the block function and **<F2>** to begin a search for the second code.

4. Press **<Ctrl>-<F8>AI** twice. This displays a message 'Srch: [ITALC][italc]' at the bottom left corner of the screen. Press **<Cursor Left> <Backspace>** to delete the [ITALC] code, leaving [italc] in place. Now press **<F2>** to search for the [italc] code. At this point the text you want to change will be highlighted.

5. Press **<F8>** (Underline) to underline the block, then press **<Cursor Left> <Backspace>Y** to delete the [italc] code. Finally, press **<Cursor Right>** to move past the underline code, and end the macro by pressing **<Ctrl>-<F10>**.

Rick Hellewell
Sacramento PC Users Group

Chip in! If you're a member of a user group and have tips to share, send them to PC World. *We pay $25 for each published tip. Or if you have a business problem that requires a PC solution, get in touch with our experts. See How to Contact PC World, page 4.* ●

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[1]Monitors are 14" diagonal; VGA monitor is IBM VGA compatible; VGA-Plus monitor is NEC Multisync-compatible. [2]Mono/graphics adaptor is Hercules-compatible and includes one parallel printer port. [3]Hard disks have high-speed voice-coil actuators and auto-park heads.

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CONSUMER WATCH

Advice and information for the computer consumer

What do you do when a business refuses to resolve a complaint? This user's guide to small claims court describes when to sue—and when not to bother.

Anita Amirrezvani

Having Your Day in Court

If you need a quick, effective method for resolving a dispute about a computer purchase of a few thousand dollars or less, small claims court may be the answer.

Intended to provide direct access to the judicial system, the small claims process makes it possible for an individual to bring a monetary dispute to court without a lawyer.

The maximum amount you can sue for varies by state and averages only about $2000. However, the small claims process is quick, cheap, and equitable. "The wonderful thing about it is that both sides stand on equal footing," says Ralph Warner, a lawyer and the author of *Everybody's Guide to Small Claims Court* (Nolo Press, Berkeley, California, 1988). "You can sue a big corporation that, in regular court, would hire lawyers to wear you down before you actually got to the substance of the case."

But court should always be seen as a last resort. Before filing a claim, try to resolve the dispute directly. Apply pressure by sending a documented complaint to the business itself, the Better Business Bureau, the state attorney general, and local consumer affairs groups and action lines. Some of these organizations, including *Consumer Watch*, will attempt to mediate the dispute.

If that doesn't work, a small claims suit may be in order. The first task is to gauge your chances of collecting the money if the judge rules in your favor. "People get frustrated when they win a small claims suit but they don't get paid," says Warner. "They think the court is going to collect the money for them." In fact, collecting the cash is up to the claimant.

"Presumably, a reputable business will pay its bills," Warner says. "If the business doesn't pay, you can get a judgment called a *till tap*—a sheriff will go and collect the money right out of their cash register. But if a business is about to file for bankruptcy or has already gone belly up, you're not going to be able to collect."

As a result, small claims court is ineffective against scams or fly-by-night companies. Moreover, since most states require that you file the complaint in a court that's local to the business in question, it's difficult and often uneconomical to sue distant firms—such as mail-order companies.

Filing a claim is generally a straightforward process, although procedures vary by state. You fill out a complaint form stating the problem and the amount you feel is due; you also pay a small filing fee. It may be important to research the legal business name of the company you're suing since many businesses use a different name on their storefront than on legal documents.

Another point to check is whether the statute of limitations has run out on the claim. Allen Wilkinson, an attorney and coauthor of *Everybody's Guide to the Law* (Harper & Row, New York, 1987), says the statute of limitations varies according to the type of case but usually lasts at least a year.

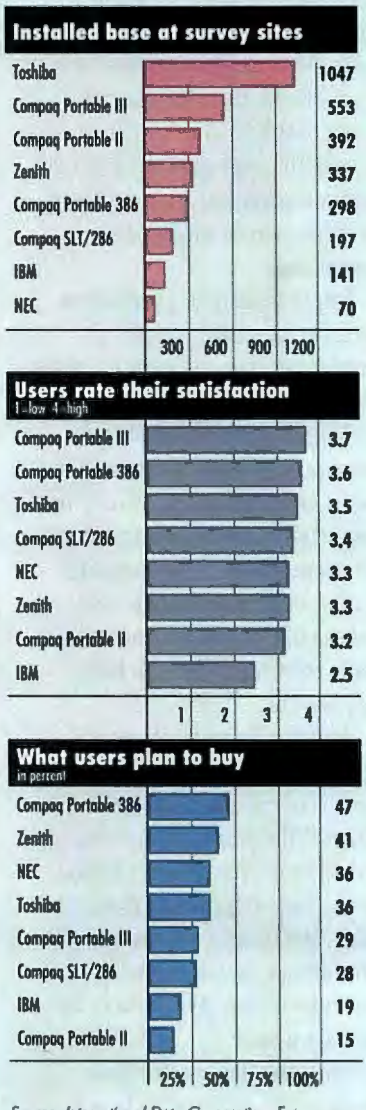
Once the papers are filed, many small claims courts will serve the papers on the business *(continues)*

ANTHONY RUSSO

RATE YOUR SATISFACTION: Portables

In this look at luggables and laptops, Compaq and Toshiba lead the market, according to a survey of large PC sites. Both companies also get high marks for user satisfaction. IBM, on the other hand, gets low marks.

Although NEC ranks relatively low in installed base and user satisfaction, more than one-third of survey participants plan to buy NEC portables. No paradox here: NEC has a flashy new offering in its notebook-size UltraLite.



Source: International Data Corporation. From a survey conducted in December 1988 of 180 sites, each with at least 50 PCs.

by registered mail. Otherwise, you can hire a law enforcement officer or any person over 18 to serve the papers.

The court sets a trial date for the case, at which time you can expect to present your side of the dispute. In some states you can have an attorney present at the hearing, although that's not necessary. You can also request advice on the best way to present a case from local legal clinics or from small claims court advisers. "I strongly suggest that people make liberal use of the clerks at the small claims court—these people are usually very willing to help," says Wilkinson.

One of the advantages of small claims court over regular hearings is that you can bring in all kinds of evidence to support your case. "None of the formal rules of evidence are followed," says Warner. For example, "you can bring written evidence that supports your claim instead of having a witness testify in person." Consumer affairs experts suggest that you present anything that bolsters your case—a broken keyboard, for example.

Small claims hearings are informal and move quickly. According to Jeanne Stott, small claims legal adviser for the San Francisco Municipal Court, "an average trial in California lasts about 8 minutes." That's why it's important to be well organized and brief during the hearing. Stott recommends advance preparation: "Outline your case, organize your evidence and witnesses, practice your presentation, and leave your Perry Mason imitation at home." And sit in on a small claims trial so that the process is familiar when it's your turn.

Judgments on small claims cases are usually made in writing in a matter of days. Generally, if you're the plaintiff and you lose, you can't appeal the claim. But if you've got a good case and present it well, small claims court can provide quick, effective access to justice.

SHOP TALK

In May *Consumer Watch* reported that we had received seven complaints about Micro 1, a company in San Francisco that makes systems, and that all the complaints had been resolved. Since then we've received many more heated complaints. Although *Consumer Watch* has forwarded these complaints to Micro 1 and repeatedly left phone messages, we have not had our messages returned. We feel it's only fair to warn readers about these latest problems.

Bad News From Stanford

After reading a favorable review in your magazine in the July 1988 *Hardware Shelf*, I purchased an AT from Stanford Systems [also known as 786 Computer Company]. The machine had several problems in the first few weeks that required three trips to the factory. The amount of memory I ordered wasn't installed; a card had to be replaced; the red light stayed on all the time; the tape backup wouldn't work; and finally the motherboard and BIOS had to be replaced! The PC still has a problem (the internal clock doesn't work), but when I

(continues)

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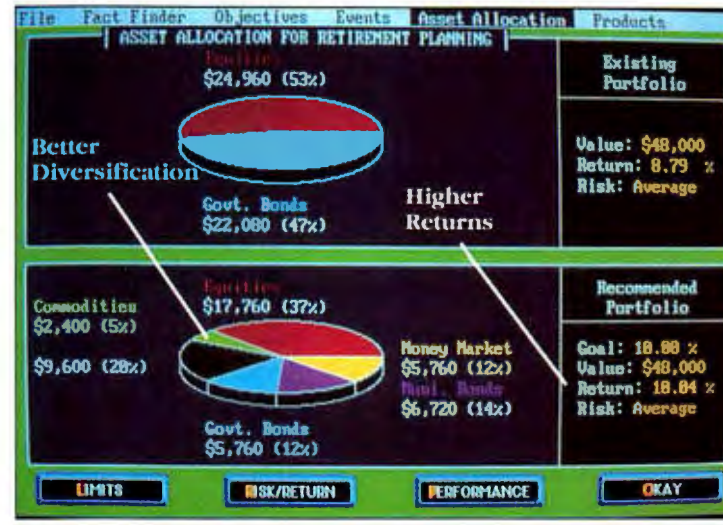

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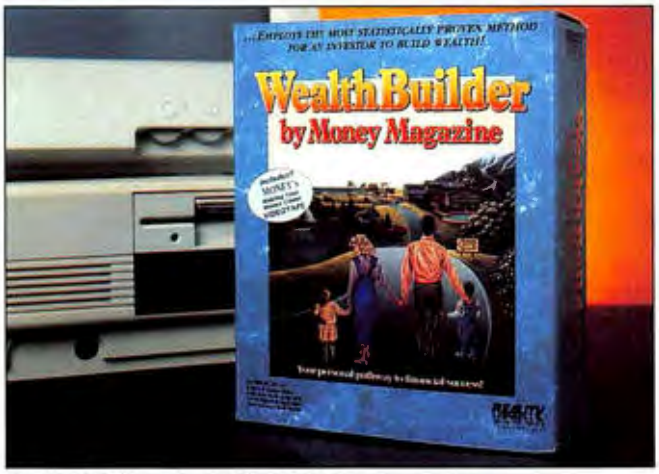

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phoned the company in December I found out the phones had been disconnected. I thought you'd want to know what happened to a computer rated "sizzling" just six months ago.

Bernard Hilberman
Santa Cruz, California

Editor's note: A PC World *representative checked Stanford Systems' offices and found no sign of life.*

Is What You See What You Get?

After reading a NEC brochure, I purchased a NEC PowerMate Portable from a mail-order company. The brochure shows a picture of the LCD screen with a 3-D bar graph depicted in two shades of blue.

After I received the computer I discovered that it wouldn't display any shading. This limitation means that a bar graph appears as a uniform blue blob.

NEC ships the PowerMate with a display enhancement utility. But when installed, the utility prevents *PFS: Professional Plan* from functioning—the program loads and runs, but there is no display at all.

As a result, I returned the system to the mail-order company and was credited the purchase price less $79—the shipping and handling charge. I paid $19 to return the PC, so I'm out almost $100 with nothing to show for it.

Maj. Leon A. Goldstein
MacDill AFB, Florida

NEC Information Systems responds: The PowerMate Portable performs as stated in the brochure. The photograph is not retouched; the graphic displayed on the screen was created using a popular software package, Three D Graphics' *Perspective.* Other vendors use the same package in their advertisements.

While the product does not support the shading capability for *PFS: Professional Plan,* Maj. Goldstein's complaint of deceptive advertising is completely inaccurate.

NEC has recently completed an aggressive program to reauthorize our resellers in order to ensure that only firms that adequately support our products are authorized to sell them. In our opinion, mail-order companies do not meet those qualifications.

Richard Bochenek
Vice President of Marketing

SOS 707

707 Computer Wholesalers advertised an Everex 386/20 in your January 1989 issue. I ordered it, only to receive a Club AT 386/20. I assumed it was a shipping error, so I called 707. The person I spoke with claimed that the Club AT and the Everex are the same computer.

I contacted Club AT and asked them if Everex manufactures Club AT's 386/20; the company stated that it purchases some parts from Everex but manufactures its own system. I then contacted Everex, which confirmed that the Club AT is not an Everex.

I contacted 707 again to arrange for a refund, and I was told I would be required to pay a 20 percent restocking fee.

Richard Suriani
Westfield, New Jersey

707 Computer Wholesalers responds: Mr. Suriani's credit card account has been credited. Although I was not a member of this company during the mishandling of Mr. Suriani's refund request, I would be remiss were I not to offer my personal apology to him on behalf of 707 Computer Wholesalers.

Alan J. Huard
President

An Unsupportable Problem

After reading *PC World*'s review of Quarterdeck Office Systems' *Desqview* ["Multitasking Without OS/2," November 1988], I decided to try it as a multitasking environment. But I have been unable to make it work with my existing applications. It is hard to believe that you would recommend a program from a company that has such shoddy service.

Richard Gebhart
Omaha, Nebraska

Quarterdeck Office Systems responds: Recently, we've had a number of complaints about the quality of service we have been providing. These problems are not the result of indifference. We are trying to provide a high degree of service and support while growing at a pace that takes our breath away.

As for Mr. Gebhart, four of our employees told him that his computer was incompatible with *Desqview.* We did fall down in responding to his request for a refund; his letter was misdirected. Since then we have contacted him and will be issuing him a refund.

Therese E. Myers
President

To send correspondence or to submit material for publication in this column, please see How To Contact PC World, page 4. ●

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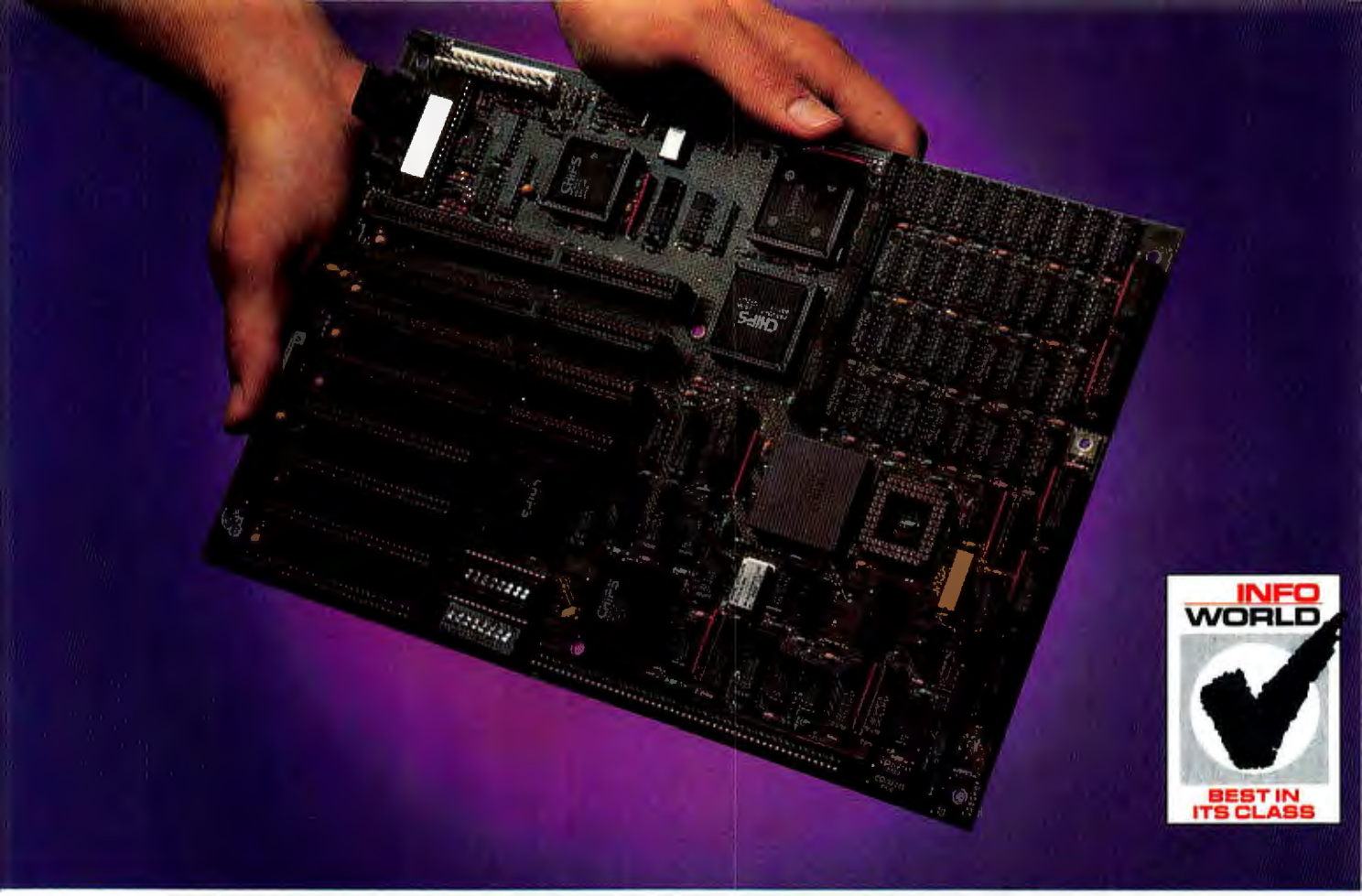

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Circle 35 on reader service card

THE UPGRADE PATH

Hands-on advice for upgrading PCs, compatibles, and peripherals

Faster graphics and more fonts for the LaserJet, and new life for old keyboards

Edited by Robert Luhn

LaserMasterful LaserJet

Intel's Visual Edge board for the LaserJet Series II grabbed the headlines recently and for good reason. That clever controller lets a Series II print high-resolution gray-scale images at warp speed (see "The LaserJet's Sharper Image," *PCW*, February 1989). But it's not much help if you own a LaserJet Plus—or if you need not only lightning-fast 300-dot-per-inch graphics output, but a passel of scalable fonts and PostScript-like typographic effects such as rotated text. If you do, LaserMaster's LC2 Controller, which packs a dedicated graphics processor and as much as 2MB of RAM, is the ticket.

Like the Visual Edge, the LC2 speeds output only for supported applications, among them *Microsoft Word*, *Ventura Publisher*, *PageMaker*, *AutoCAD*, *VersaCAD*, *Microsoft Chart*, and applications written for *Microsoft Windows* and *GEM 3.0*. But unlike Intel's board, getting the LC2 up and running takes an experienced, patient hand.

Hardware installation is mercifully simple: Slip a tiny interface board into the Optional I/O slot at the rear of the Series II, pop the LC2 into a free slot in your PC, and connect the printer and the board with a supplied twisted-pair cable. (The Series II hookup is standard; interfaces for the LaserJet Plus, QMS Kiss, and other Canon CX-based printers that lack an external video connector cost $100 more.) If the LC2 conflicts with other boards in the PC, you'll have to reset the LC2's jumpers, but chances are the default settings will suffice.

Don't bother installing the LC2 if you only have a megabyte or two of hard disk space free—it takes that much just to store frequently used fonts, plus drivers and other files required for a given application, such as *Ventura Publisher*. If you go whole hog and install all the available Bitstream fonts (as many as 35, ranging from Times Roman to Century Schoolbook), you'll need at least 6.5MB.

Keep in mind that using fonts involves more than just copying the necessary files to your hard disk. The typefaces are actually stored as outlines and must be "compiled" using a modified version of Bitstream's *Fontware* into

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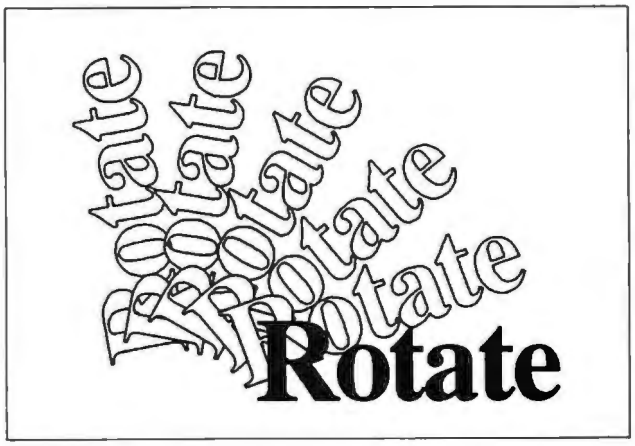


The LaserMaster not only speeds printing but gives the LaserJet PostScript powers. You can rotate and overlay text...

ANTHONY RUSSO

...stretch and skew text, and generate shadows at different point sizes.

a specific bit-mapped font in the size and style (such as 24-point bold) you desire. LaserMaster provides precompiled fonts of all the typeface outlines—but only in a narrow range of 6- to 12-point sizes. If you want 36-point ITC Bookman, prepare to wend your way through *Fontware*'s labyrinth.

Setting up your type collection means setting aside several hours for the task. For starters, you must run an install program that copies drivers and precompiled fonts to your hard disk and compiles any fonts you choose. Compiling a single font generally takes a few minutes; some sets, however, can take half an hour, and the precompiled fonts must also be liberated from their compressed file format—a 25-minute job. You then run another utility that loads LaserMaster's memory-resident driver, which allows the LC2 controller to act as LPT1, LPT2, or LPT3. Finally, you run your application, install the font from the appropriate menu, and choose the LC2 as the output device.

Be prepared for occasional detours because the user manual and install programs don't always match. For example, the manual tells you to verify that the LC2 is installed properly by selecting Load DoubleJet from the Setup menu; in fact, you should select DoubleJet Setup, which reveals an undocumented set of submenus, and then select Load DoubleJet.

Such minor glitches won't bring installation to a grinding halt—but running out of disk space will. Make sure you have enough room set aside, and install only the fonts you're likely to use frequently. If a current project calls for different fonts, you can generate them on the fly for a given session. They're not as sharp as compiled fonts and printing slows to a crawl, but they don't eat up precious disk real estate.

Once the LC2 is purring away, supported applications will not only print three to four times faster, they'll also be able to tap PostScript-like powers. In addition to rotating any font in 1-degree increments, you can create hollow or filled text with 41 patterns, add shadows to text, create opaque and transparent overlays, and scale fonts beyond the point size limits of an application.

If you only occasionally produce graphics-packed documents, the LC2 clearly isn't for you. But if you frequently generate reports, technical manuals, newsletters, and catalogs laden with drawings, scanned images, and other heavy-duty graphics, the LC2 is one way to go.
—Daniel Miles Kehoe

WHERE TO BUY

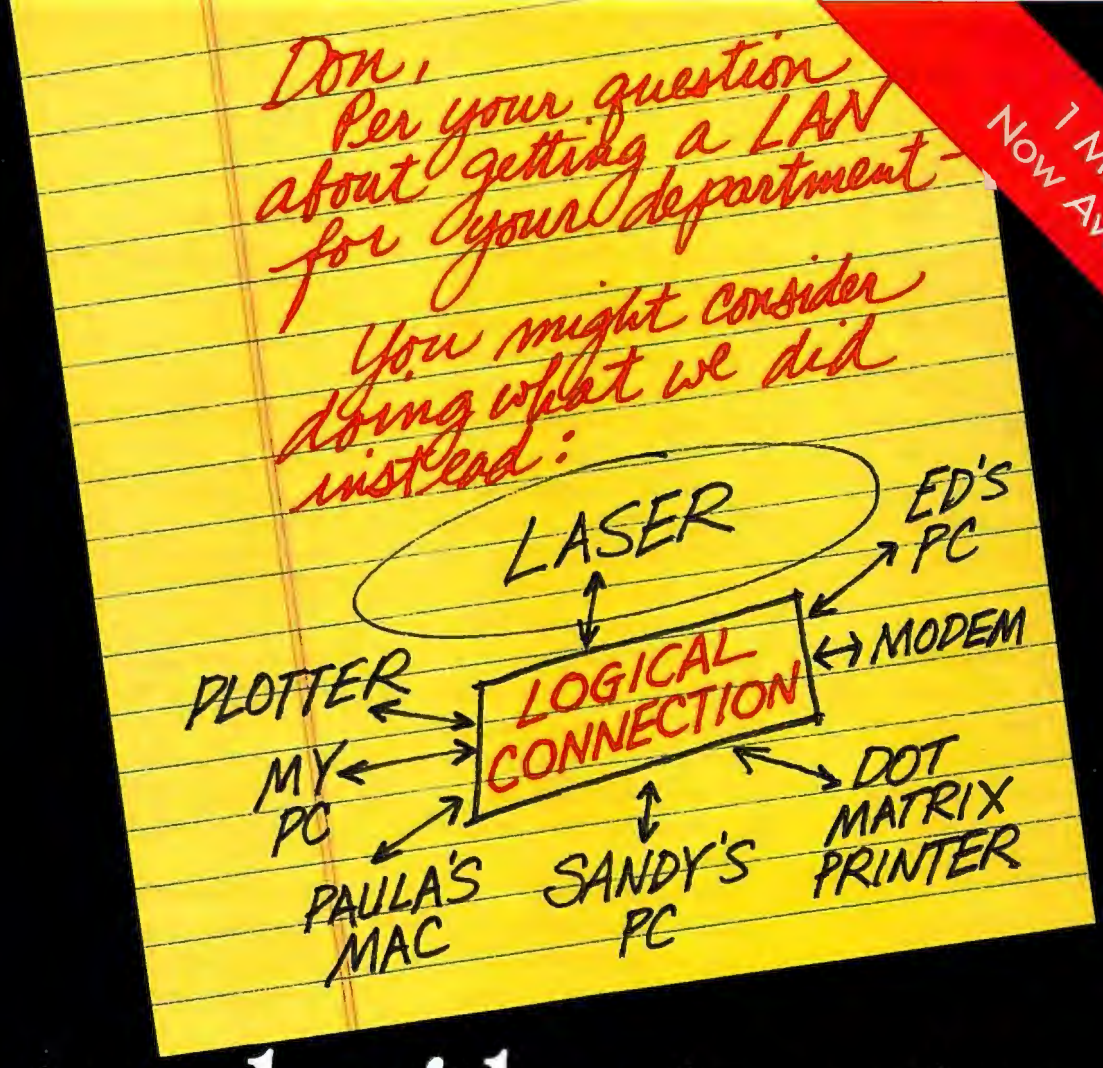
LaserMaster LC2 Controller
LaserMaster Corp.
7156 Shady Oak Rd.
Eden Prairie, MN 55344
612/944-6069
LIST PRICE: LC2 Standard controller (1.5MB, no font scaling) $1490; LC2 Enhanced controller (2MB, font scaling, 13 compatible fonts) $1985; LC2 Enhanced Plus controller (2MB, 35 fonts) $2285
REQUIREMENTS: 640K RAM, DOS 3.0 or later version
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: unlimited for registered users, no toll-free number, M–F 8–6
OTHER SUPPORT: company BBS
Reader service no. 630

Old Keyboards for New Systems

Compaq and IBM will never win Best Buys for their keyboards. Since the dawn of the original Portable in 1983, Compaq has been rightly faulted for supplying mushy, unresponsive keyboards with its systems; IBM's scrambled, post-AT layout hasn't won many converts, either. Until recently, the solution was simple: Toss the keyboard and plug in someone else's.

Unfortunately, PS/2s and the Compaq Deskpro 386/20e and

(continues)



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386S use a smaller, 6-pin DIN connector, which obviously can't accommodate the 5-pin plug used by your classic keyboard. But fear not—a solution is at hand, and from Key Tronic, no less.

Send Key Tronic $7.95 and by return mail you'll receive the PS/2 Cable Adapter—a 6-inch cable with a 6-pin connector on one end and a 5-pin on the other. Making the upgrade is child's play: Turn off the Deskpro or PS/2, unplug the system's keyboard and chuck it in the closet, plug the Key Tronic adapter into the system's keyboard socket, and plug the other end into your old, faithful keyboard. Turn on the system and you're ready to go.

Note: If you want to hook up Key Tronic's KB 5151 or 5153 keyboard to a PS/2 Model 25 or 30, you must replace a PROM chip in the keyboard. Fortunately, the operation is pretty painless. Unplug the keyboard, flip it upside down, remove the six Phillips screws on the underside, pull out the PROM chip that's front and center, and plug the new one in. Additional cost: $7.95. For $15 Key Tronic offers a PROM Kit for the PC AT and PS/2 Models 50, 60, and 80.

Although Key Tronic only warrants the PS/2 Cable Adapter for Key Tronic–PS/2 matings, the adapter works just dandy with the Compaq and third-party keyboards from Northgate, DataDesk, and others.

If you love your old keyboard—and you hate the Compaq's mushy feel or the PS/2's layout—this is one upgrade you can't pass up. —*R. L.*

WHERE TO BUY

PS/2 Cable Adapter P/N 32520, PROM Kit
Key Tronic Corp.
Catalog Accessories, MS 142-D
P.O. Box 14687
Spokane, WA 99214-0687
800/262-6006, 509/927-5395
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Daniel Miles Kehoe is a frequent contributor to PC World *on laser printer technology.*

To send correspondence or to submit material for publication in this column, please see How to Contact PC World, page 4. ●

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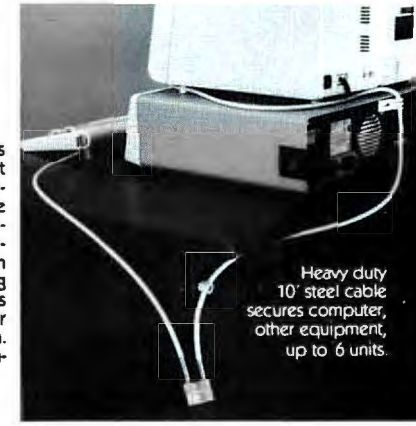

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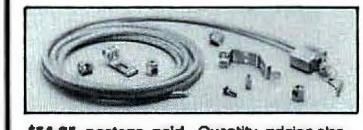

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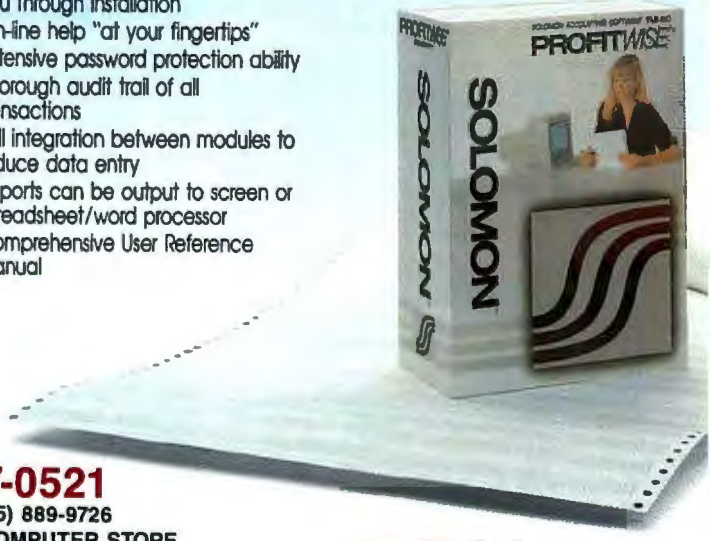

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Stop your NEC laptop from rudely interrupting 1-2-3, combine spreadsheet formulas with ease, put call waiting on hold, get fine print from dBASE, stay on schedule with Word macros, shape up WordPerfect text, and make even lazier formfeeds.

Edited by Tom Swan

Rude Interruptions

I'm pleased with my NEC MultiSpeed HD, except for one problem I encountered when using *1-2-3*. The NEC setup utility, stored in the laptop's nonvolatile RAM, uses the Floppy Disk Controller (FDC) option to shut off power to the disk drives when they're not being accessed.

Although this feature prolongs battery life, it causes *1-2-3* to sporadically exit to DOS, an event that occurs anywhere from a few seconds to 30 minutes after loading. The DOS prompt would suddenly appear in the middle of a worksheet session, and I would lose any changes made since the last save.

Luckily, NEC's warranty technicians solved the problem by turning off the FDC option—something users can do themselves. I hope my experience will save others from losing files and spare them the inconvenience of leaving their laptop in the shop for two weeks as I did.

Richard Hull
Stayton, Oregon

Editor's note: To disable the FDC battery-saving function on your NEC MultiSpeed HD, press the **<Pop Up>** *key in the lower left corner of the MultiSpeed keyboard to activate the resident utility software. Next, move the menu cursor to the Setup command, press* **<Enter>**, *then press* **F** *to select the FDC option. Type* **N** *at the next prompt, then select the Exit command. (Don't use the Quit command—it terminates Setup without recording your changes.)*

Round Up 1-2-3 Formulas

I work on *1-2-3* worksheets that contain lengthy single-cell formulas composed of nested @ functions. These formulas must also be combined in one cell, a feat requiring considerable attention to syntax. After a few frustrating sessions spent typing in the combined formulas and hunting down typos, I devised the following technique for entering such complex formulas bug-free.

First, convert each individual formula to a label by highlighting it and pressing **<F2>** **<Home>**' **<Enter>** [don't omit the apostrophe between <Home> and <Enter>]. Then copy the labels into separate temporary cells in a single column, in the sequence in which you plan to combine them. Give the group of temporary cells a macro name—\b for example—using Range Name Create. Next, move the cursor to the target cell where the combined formula will be stored, and execute the macro. *1-2-3* automatically combines the formulas as it "types" the macro. After editing the result to perfection, press **<Enter>** to convert it back to a formula.

Steven E. Huelskoetter
Collinsville, Illinois

Hold All Call Waiting

In "AT Command Survival Kit" [*Tips & Techniques*, *PCW*, January 1989], Judy Getts tells how to prevent the phone company's call waiting service from corrupting data being sent via modem. Here's a simpler method for avoiding such data interrup-

(continues)

ANTHONY RUSSO

tions: Just preface the phone numbers stored in your communications program with *70,.

For example, you might use a dialing command like this: ATDT *70,3125551212. The *70 disables call waiting, and the comma inserts a brief pause (to wait for the dial tone) before the program dials the rest of the number. You won't miss important calls, because call waiting reactivates automatically when the modem hangs up.

Phil Raso
Des Plaines, Illinois

*Editor's note: Unfortunately, this useful tip doesn't work everywhere in the country, or even throughout a single area code. Check with your local telephone company's repair service to see if a similar method for disabling call waiting is available in your area. Also, not all companies use the same code to put call waiting on hold—some use *71 or *73—so don't try *70 without verifying the correct code for your exchange.*

dBASE Fine Print

I'm a photographer, and I keep a *dBASE III* data base of slide information, which I print out on small labels using an Epson printer. To accomplish this printing task, I select compressed output and set line spacing to ⅛ inch in my .PRG program, using these commands:

SET PRINT ON
?CHR(15)
?CHR(27)+CHR(48)

SET PRINT ON prepares *dBASE* to send instructions to the printer. ?CHR (15) turns on compressed character mode, and ?CHR(27)+CHR(48) sends an ASCII escape code and a number to set line spacing to ⅛ inch. You can also enter these printer codes at the dot prompt (before issuing a LIST TO PRINT command, for example) to squeeze more fields onto each report line and more lines onto each page.

To create reports that print selected fields in italics, I insert CHR(27)+CHR(52)+*fieldname* (without the question mark) into the field column of the report generator (MODIFY REPORT). I then use CHR(27)+CHR(53) in the next field column to turn off italics. Check your printer manual for other CHR() control codes to select various print enhancements.

Jon Mark Stewart
Palm Desert, California

Scheduling With Word

I use several *Microsoft Word* macros to create a daily scheduler. It serves me better than commercial memory-resident calendar programs in two ways. First, my scheduler takes up no additional memory. Second, I can use familiar *Word* commands to edit my schedules.

(continues)

DEVELOPER'S TOOLBOX

Sailing Out to C

Like boats at a show, C programming tools range from the merely sleek to the sublime. The number of choices can be overwhelming, especially if you're just learning to sail around in C. Which compiler should you buy? Do you need a debugger? What add-on tool kits provide the most value?

Choosing a C compiler is the hardest of those decisions—and the most important. The safest bet is to pick one of the current top sellers: Borland's *Turbo C* or Microsoft's *QuickC*. *Turbo C* offers speedy compilation, and command keys designed for touch-typists. *QuickC* has excellent on-line and printed tutorials and supports a mouse. Both are superb products that run quickly, generate tight code, and have built-in debuggers.

Alternatively, you might opt for *Power C*, which goes for the rock-bottom price of $19.95 plus $10 for the run-time library sources. A separate debugger costs $19.95. At these prices, *Power C* is perfect for students and dabblers on slim budgets. However, beware of a few barnacles below the waterline. For example, I couldn't get graphics routines to work with my Vega Deluxe EGA cord. You'll also need a separate text editor to enter programs. But if you're short on cash, *Power C* is an unbeatable bargain.

After selecting a compiler, you need to provision your ship's store with a few C utilities. Dozens of good packages are available, but I've found three that are exceptional.

For organizing source code, *C:LINES/C:TREE* prints listings with line numbers and code structures clearly outlined. It processes #include files, generates symbol cross-references, and prints a tree diagram that shows function relationships. C is a difficult language to read, and a good program lister like *C:LINES/C:TREE* is a must for documenting large projects.

To help prevent bugs, I've been using *PC-Lint* to identify potentially buggy code that C compilers typically ignore.

(continues)

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Circle 184 on reader service card

I create a subdirectory on my hard drive with the command MD C:\X89 to hold my daily schedules. The file name for each day's schedule follows the format X*mm-dd*.DOC, where *mm* is the month and *dd* the day. Be sure to type a zero before single digits. I then create a *Word* autoexec macro that opens the first such file (a macro named autoexec in the NORMAL.GLY glossary runs automatically when *Word* loads):

<Ctrl>-<Esc>to\x89
<Enter><Esc>tlx
<F1><Enter>.

This file is always the current day's schedule because at day's end I use another macro to rename it.

To move from the daily schedule into a regular document, I run another macro named XTransfer^<Ctrl>-XT:

<Ctrl>-<Esc>wsh<3>
<Enter><Esc>to

This leaves the day's schedule in a pencil-thin window at the top of the screen. Since the schedule's file name in the bottom right corner of the window contains the date, you won't use the wrong schedule. The macro ends with a prompt for a new directory path.

To review the daily schedule, I expand its window with the XView^<Ctrl>-XV macro:

<Ctrl>-<Esc>to\x89
<Enter><Esc>wm1<Tab>
20<Enter><F1>

I can then add to or edit any text in the schedule.

Instead of just deleting entries for tasks I've completed, I move them to the right side of the window with my XCompleted

(continues)

DEVELOPER'S TOOLBOX

(continued)

***PC-Lint* locates misplaced else clauses, checks constant and variable initializations, and skips over compiler-specific constructions such as embedded assembly language statements. Needing only 135K of RAM to scan a 15,000-line program, *PC-Lint* is fast, smart, and essential for serious C programming.**

As good as *PC-Lint* is at preventing syntactical errors, it still can't eliminate logical errors. (A classic example of a logical error is to confuse a person's age and weight in a data base.) Nabbing such mistakes means hunting for clues left by errant statements and wayward pointers. For this, a trained gumshoe like *Sherlock C Programming Tool* is invaluable.

***Sherlock* lets you add printf() and similar debugging statements to the source code to display critical variables during program execution. By embedding such statements inside *Sherlock's* ingenious macros, you can remove debugging statements from the compiled .EXE file just by setting the macros to null. The debugging text remains in the source code, ready for action if a problem develops later. *Sherlock* is an unequalled C sleuth.**

In future columns, I'll cover add-on tool kits that give C windowing and data base capabilities. Feel free to write to me about these or any other subjects. My MCI Mail and BIX handle is TSWAN; my CompuServe ID is 73627,3241. —*Tom Swan*

WHERE TO BUY

C:LINES/C:TREE 2.06
SoftRex
4807 Bethesda Ave.
#287
Bethesda, MD 20814
301/881-8274
LIST PRICE: $79.95
REQUIREMENTS: DOS 2.1 or later version
TECHNICAL SUPPORT: unlimited, no toll-free number, M–F 8:30–5:30
OTHER SUPPORT: none
Reader service no. 730

PC-Lint 3.0
Gimpel Software
3207 Hogarth Ln.
Collegeville, PA 19426
215/584-4261
LIST PRICE: $139
REQUIREMENTS: DOS 2.1 or later version
TECHNICAL SUPPORT: unlimited, no toll-free number, M–F 9–5
OTHER SUPPORT: none
Reader service no. 731

Power C 1.2
Mix Software, Inc.
1132 Commerce Dr.
Richardson, TX 75081
214/783-6001
LIST PRICE: Compiler $19.95, Debugger $19.95, Source Code $10
REQUIREMENTS: 256K, DOS 2.0 or later version
TECHNICAL SUPPORT: unlimited, M–F 8:30–5:30
OTHER SUPPORT: none
Reader service no. 732

QuickC 2.0
Microsoft Corp.
16011 N.E. 36th Way
Box 97017
Redmond, WA
98073-9717
206/882-8088
LIST PRICE: $99
REQUIREMENTS: 512K, DOS 2.1 or later version
TECHNICAL SUPPORT: unlimited, no toll-free number, M–F 8–5
OTHER SUPPORT: "on-line" BBS $495 per year (up to 12 hours of on-line access)
Reader service no. 733

Sherlock C Programming Tool
Edward K. Ream
1617 Monroe St.
Madison, WI 53711
800/992-4763,
800/236-8711
Wisconsin,
608/257-0802
LIST PRICE: $195
REQUIREMENTS: DOS 2.1 or later version
TECHNICAL SUPPORT: unlimited, M–F 9–4
OTHER SUPPORT: none
Reader service no. 734

Turbo C 2.0
Borland Int'l
1800 Green Hills Rd.
Scotts Valley, CA
95066-0001
408/438-8400
LIST PRICE: $149.95
REQUIREMENTS: 448K, DOS 2.0 or later version
TECHNICAL SUPPORT: unlimited, no toll-free number, M–F 8–5
OTHER SUPPORT: CompuServe Forum (type GO BORLAND)
Reader service no. 735

LAN Operating Systems

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^<Ctrl>-XC macro:
<Ctrl>-<Esc>fdm<Cursor Down><Tab>10<Enter><Esc>fp<Tab>4<Enter>

To return to a document, I use my XReturn_to_document ^<Ctrl>-XR macro:
<Ctrl>-<Esc>wm1<Tab>3<Enter><F1><Esc>to

While viewing the current day's schedule, I occasionally peek into another day's files using XPlan^<Ctrl>-XP:
<Ctrl>-<Esc>tlx<F1>

Finally, at the end of the day (after expanding the current schedule with <Ctrl>-XV), I use my Quitting_for_day ^<Ctrl>-Q macro to rename that day's file:
<Ctrl>-<Esc>tr

I then remove the *X* from the file name of the finished day's schedule to retain a permanent record of my activities.

Richard O. Johnson
Van Nuys, California

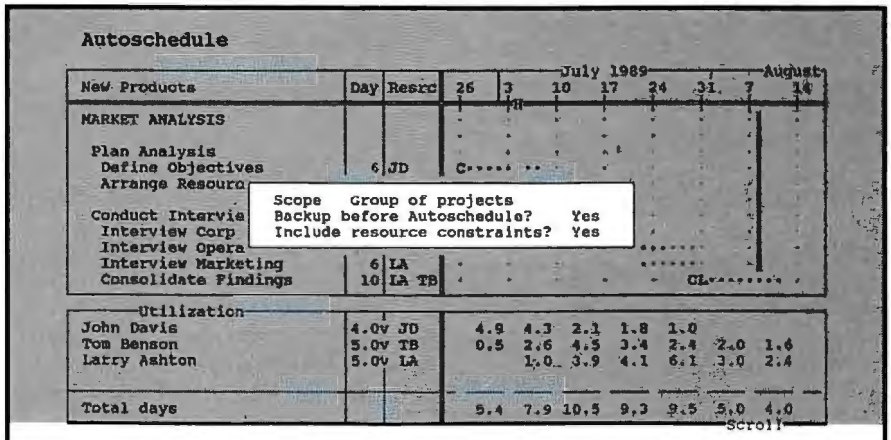
Editor's note: Before entering the macros, create at least one schedule file—X02-16.DOC, for example—in the \X89 subdirectory. Without it, you'll encounter errors each time you try to load the nonexistent file. Press **<Shift>-<F3>** *to start recording a macro, then enter the keystrokes as listed by Mr. Johnson. Press* **<Shift>-<F3>** *again to stop recording, then type the macro name, with the activating keystrokes that begin with a caret (^), at the COPY to: prompt. Finally, press* **<Esc>tgs<Enter>** *to store the macro in the NORMAL.GLY glossary.*

Spaced Out, Perfectly

When justifying text in *WordPerfect*, I use hard spaces (<Home><Space>) to separate leading hyphens, bullets, and list numbers from associated text. *WordPerfect* normally varies the width of standard spaces as necessary to align the margins in a justified paragraph. As a result, text that follows a bullet or numeral doesn't start in the same column from paragraph to paragraph. The discrepancy is especially noticeable in paragraphs that include a hanging indent. Hard spaces cure the problem.

Brian Peabody
Roswell, Georgia

(continues)



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Lazier Formfeeds

I was delighted to see the wonderful 11-byte formfeed program ["Lazy Formfeeds," *.*, *PCW*, February 1989]. I accomplish the same feat with the DOS command

ECHO <Ctrl>-L > PRN

I store this line in a batch file named FF.BAT and type FF <Enter> to formfeed the printer.

K. Gopal
Hayward, California

Tom Swan is a contributing editor for PC World *and the author of* Mastering Turbo Pascal 4.0 *(Howard W. Sams, Indianapolis, Indiana, 1988) and* Mastering Turbo Assembler *(Howard W. Sams, 1989).*

To send correspondence or to submit material for publication in this column, please see How to Contact PC World, page 4. ●

POWER TIP NO. 55

ProComm Starts a Script

Here's a quick way to start *ProComm Plus* and execute a script. At the DOS prompt type PCPLUS /F followed by the script file name. For example, to start ProComm and immediately log on to CompuServe, you type PCPLUS /Fcompserv.

Phil James
Director of Technical Support
Datastorm Technologies
Columbia, Missouri

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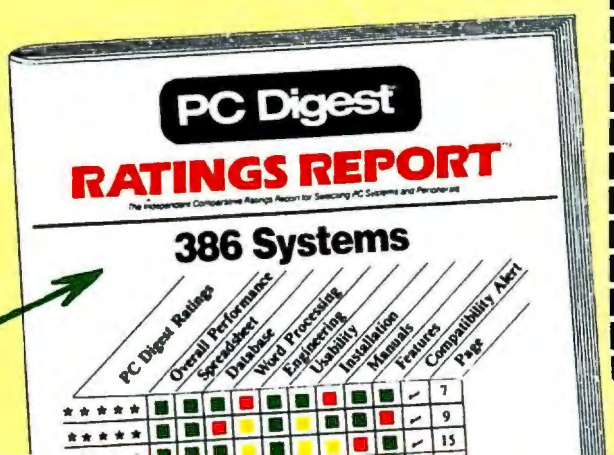

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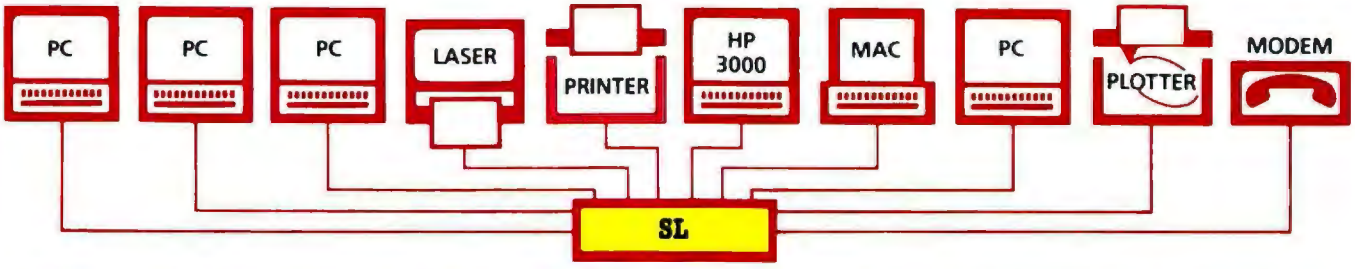

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NETWORK Q&A

Tips and strategies for departmental networking

Setting up a LAN server means evaluating a variety of options—and deciding whether to buy a proprietary unit or soup up a PC.

David Ferris

Q. *My department is installing a 27-node LAN, and we've narrowed our choices to Novell's* NetWare *and 3Com's* 3+Share. *What should we use for a server? We've heard good things about 3Com's proprietary 3S/401. Are there similar servers for* NetWare? *Or should we just use a PC? If so, what options should we choose?*

Frank Swift
Idaho Falls, Idaho

A. Choosing the right server and equipping it properly are key to a LAN's success. A server is a computer (usually a PC) that holds the bulk of the LAN operating system (LAN OS) and shares its resources with workstations. In most LANs, a single server stores shared files and software and is hooked up to printers, tape drives, and modems that all connected users can tap. As a LAN grows, you may spread these functions over several servers; you may even need separate data management and communications servers.

Typically, a LAN outgrows a server at about 40 users, but the limit depends on your applications. If 20 users frequently access a shared data base, several servers may be necessary. Note, too, that the server should be dedicated to LAN tasks. Using the server as a workstation degrades network performance and may crash the LAN.

Proprietary Servers Versus Adapted PCs

One of the first decisions you'll make is whether to buy a standard PC and customize it with third-party add-ons, buy a PC bundled with server features, or go with a proprietary unit. Proprietary servers are usually modified 80286- or 80386-based PCs sold by LAN OS vendors. Typically, the servers have an AT-compatible bus, but their proprietary ROM BIOS often forces you to buy expansion options sold by the vendor.

However, because the options are designed for a particular LAN OS, you avoid incompatibilities that crop up with a standard PC—for example, some third-party backup systems and power supplies don't work reliably with some LAN operating systems. Because proprietary servers are already installed with options (including the LAN OS), setup is easy.

Another plus: Proprietary units such as 3Com's 3S/401 and Banyan's 68000-based DTS Server are optimized for their specific LAN OS. For example, the 3S/401's triple-port memory architecture speeds disk I/O by providing equal access to RAM for the disk controller, the CPU, and an 82586-based ethernet coprocessor.

The 3S/401, a custom 80386-based PC designed specifically for *3+Share* and *3+Open*, is an excellent choice. The $14,995 price tag sounds expensive, but when you add up the costs to customize a comparable PC, the 3S/401 wins out (see **FIGURE 1**).

Novell doesn't sell proprietary servers per se, but you can buy regular 386 PCs dedicated to *NetWare* from vendors such as Acer, Samsung, or Maxar. Although these units ship with *NetWare*-formatted drives and offer server-oriented features such as keyboard keylocks, they're not optimized for *NetWare* and offer no clear advantages over a modified PC. Accordingly, the vast majority of Novell users buy standard PCs and purchase third-party hard disk sub-

(continues)

ANTHONY RUSSO

FIGURE 1

3Com Server—Power for Less

3Com's proprietary 3S/401 server beats out a comparably configured Compaq by almost $1800 and tosses in an extra 40MB of storage and 15MB of tape backup to boot.

Features	3Com 3S/401	Compaq Deskpro 386/25 Model 110
Base price	$14,990	$10,299
Hard disk storage	150MB	110MB
Tape backup unit	included (150MB)	$1999 (135MB)
Ethernet adapter	included	$495
2MB RAM	included	$799
LAN OS	included	$3040
DOS	included	$120
Total	$14,990	$16,752

systems formatted with *NetWare*.

Although the 3S/401 breathes new life into the proprietary concept, adapting a PC may be the best long-term bet for most LANs. Thanks to the PC's open architecture, you can replace obsolete boards and drives with newer technology. Also, many new 386 PCs are targeted at the server market, offering fast hard disks and other server features (see "25-MHz Speedsters—A Buyer's Market" in this issue).

Option Shopping List

What should you look for in a server? Whether you go the proprietary route or buy a PC, consider the following options:

Storage. A fast hard disk and disk controller are vital to server performance. A disk with a 40ms average seek time is too slow for most LANs. Try a 20ms to 30ms disk, and if you expect a lot of traffic, consider a 16ms speed demon such as the drive used in the 3S/401. A typical 5-megabit-per-second (mbps) ST506 controller can bog down on a busy LAN, so check out subsystems compatible with 10-mbps SCSI or ESDI controllers.

How much storage you'll need depends on your applications and the hard disk storage available on networked PCs. If you want to store a lot of shared files on the server, think big. As a rule of thumb, plan on 5MB of server storage per year for every user; for your 27-user LAN, a 300MB drive should suffice for a few years. If you expect your LAN to grow, get a disk controller that can daisy-chain several drives together so you can add storage as you need it.

Some high-end PCs (such as Compaq's Deskpro 386/25) support up to 700MB, but most disk controllers top out at 300MB. Fortunately, you can buy third-party subsystems that package fast, higher capacity controllers and drives. To save time, you can buy subsystems from Core (Los Angeles) and Racet (Brea, California) that are preformatted with the LAN OS of your choice.

Cache RAM. The more memory assigned to caching the server's hard disk, the faster the server—and the LAN OS—will run. Between 2MB and 5MB of RAM should do the job. Disk caching can speed access to hard disk data. It stores in RAM the last data read from the drive plus the next few sectors, gambling that the software will request that data next. Fetching data from the cache is much quicker than getting it from the disk.

You can boost performance further by using a disk controller that incorporates a dedicated cache of high-speed RAM. The 3S/401 and the Deskpro 386/25 employ variations on this technique, as do third-party subsystems such as the Impulse drive from Plus Development (Milpitas, California).

CPU. A server based on a 10- to 12-MHz 80286 CPU will usually suffice, but if your LAN is especially busy, turn to a server with a 16-, 20-, or 25-MHz 80386. A 27-node LAN could get by with a 286 server, but if five or more users regularly access a data base at the same time, go with a 386. Make sure the system uses a CPU with the fewest wait states; zero wait states is best, and two is too many.

Backup. Your server should be equipped with a tape backup unit that can hold all the files you want to back up. A 60MB tape drive is the minimum; 150MB or more is preferable. The backup software should be compatible with your LAN OS, back up all system files, run while the server is on line, and perform reliably while unattended.

Power Supply. A multifunction server should pack a built-in

(continues)

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power supply of at least 500 watts. To safeguard data and hardware, consider an uninterruptible power supply (UPS) as well. In the event of a blackout, a UPS can keep the server running for up to an hour. Some UPSs can even close open files on the server and shut down the system in an orderly way. (See "Buyers' Guide: Safe Power for PCs" in this issue.)

Expandability. A multifunction server needs plenty of expansion ports. Slots fill up quickly with RAM cards, printer boards, disk and backup controllers, network adapters, communications gateways, and security key cards.

However, depending on the LAN OS, you may be able to skip the keyboard and monitor—the administrator can access the server from another workstation. Freestanding "tower" systems make good servers—they not only save desk space, they come with hefty power supplies and have plenty of bays for adding hard disks and tape drives.

Thinking Servers

If you have the time and expertise, customizing a standard PC is usually preferable to buying a proprietary server. You can pick from a variety of options and keep pace with new technology. Yet integrating add-ins means headaches and extra work—you may prefer the convenience of a no-fuss proprietary server. If in doubt, let price and performance be your guiding lights. ●

David Ferris is the president of Ferris Networks, a San Francisco–based PC dealer specializing in LANs.

To send correspondence, please see How to Contact PC World, page 4.

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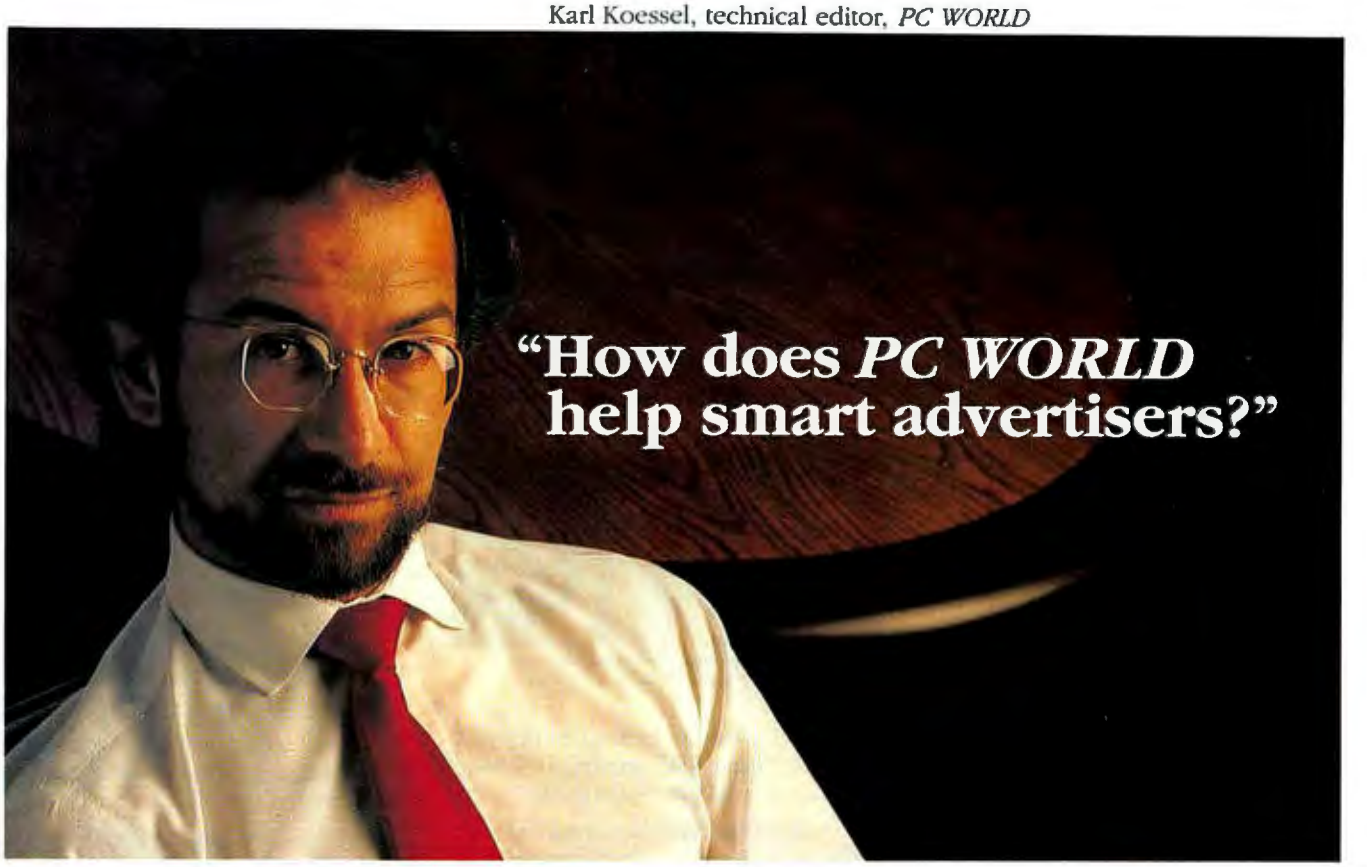

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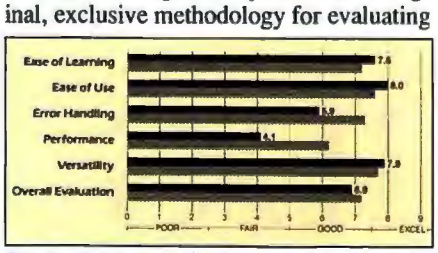

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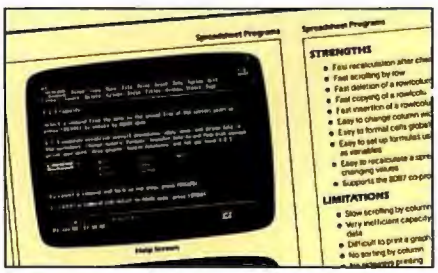

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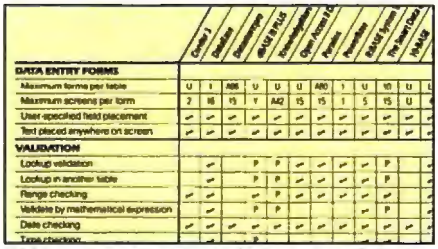

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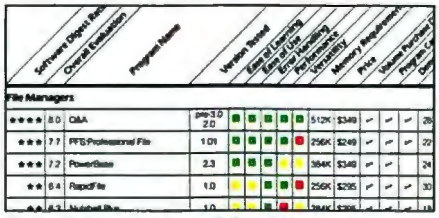

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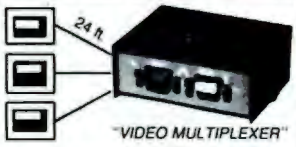

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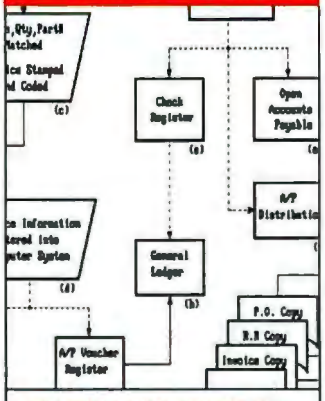

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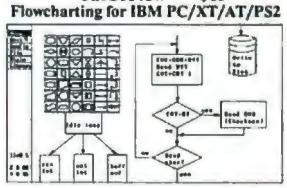

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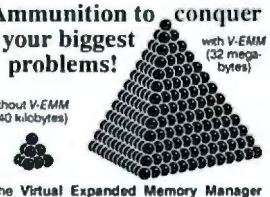

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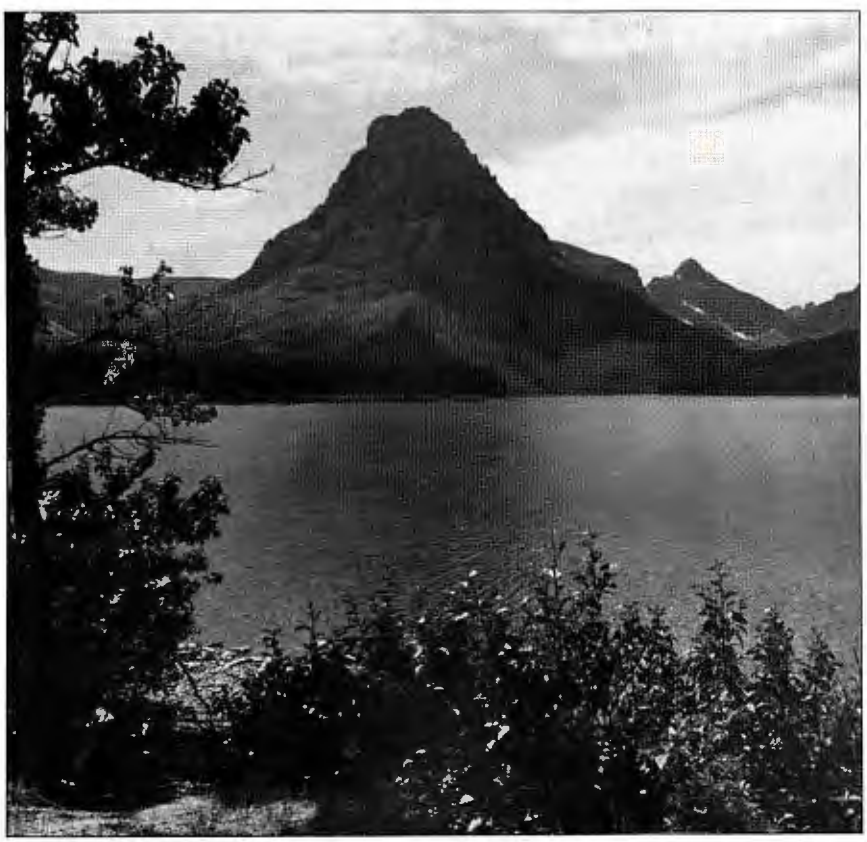

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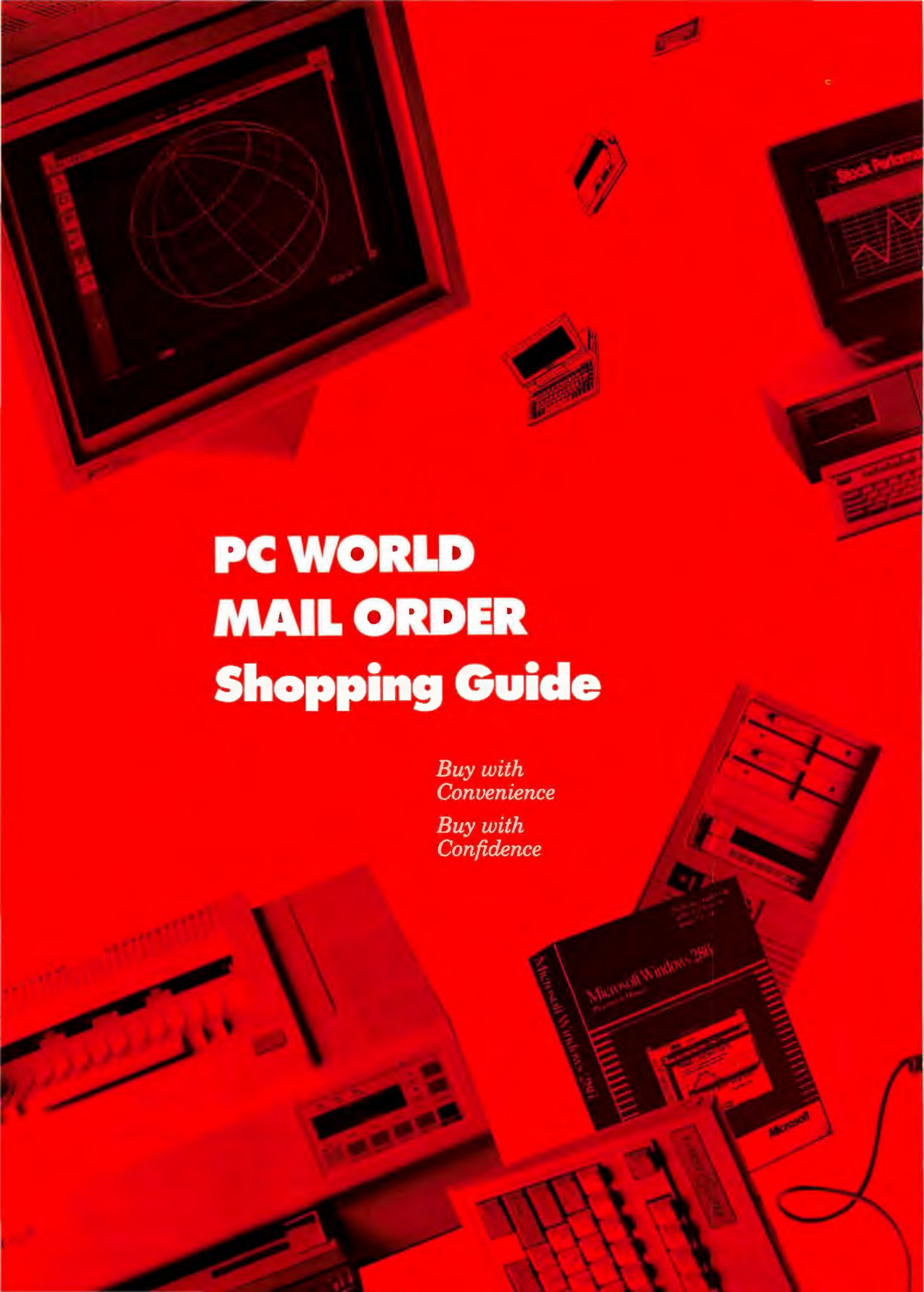

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- 8 Expansion Slots
- Security Lock
- 80287 Coprocessor Socket
- 200 Watt Power Supply

OPTIONS

60mb 25ms Drive	Add:$200
80mb 28ms Drive	Add:$400
CGA	Add:$170
EGA	Add:$400
VGA Multiscan	Add:$670

FASTDATA 286^{16}

$1595 Includes 1mb Ram, Monitor & 40mb Hard Drive

Check Our Standard Features

- 16mhz 80286
- 1mb Memory
- 40mb Hard Disk With Controller
- Hi Resolution Monochrome Monitor
- Monochrome Graphics Adaptor
- 101 Key Enhanced Keyboard with tactile click
- Parallel & Serial Ports
- Clock Calendar
- 1.2mb Floppy Disk Drive
- 5 Drive Bays
- 8 Expansion Slots
- Security Lock
- 80287 Coprocessor Socket
- 200 Watt Power Supply

OPTIONS

60mb 25ms Drive	Add:$200
80mb 28ms Drive	Add:$400
CGA	Add:$170
EGA	Add:$400
VGA Multiscan	Add:$670

FASTDATA 386^{20D}

$1995 Includes 1mb Ram, Monitor & 40mb Hard Drive.

Check Our Standard Features

- 20mhz 80386
- 1mb Memory
- 40mb Hard Disk With Controller
- Hi Resolution Monochrome Monitor
- Monochrome Graphics
- 101 Key Enhanced Keyboard with tactile click
- Parallel & Serial Ports
- Clock Calendar
- 1.2mb Floppy Disk Drive
- 5 Drive Bays
- 8 Expansion Slots (2-32 bit)
- Security Lock
- Tower & 25mhz Options
- 80387 Coprocessor Socket
- 200 Watt Power Supply

OPTIONS

60mb 25ms Drive	Add:$200
80mb 28ms Drive	Add:$400
CGA	Add:$170
EGA	Add:$400
VGA Multiscan	Add:$670

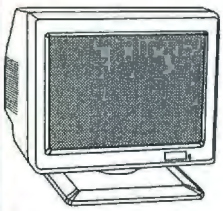
TO ORDER, CALL TOLL FREE: 1-800-441-FAST

FASTMICRO

ORDER LINE: 1-800-441-FAST

RGB Color Monitor

by Samsung



$199

These 14" monitors were purchased from a large PC manufacturer who was overstocked. They are brand new with one year warrantees and are made by Samsung. They are fully CGA compatible and work with PC compatibles. A CGA (640 x 200 resolution) card is just $49 and comes with a printer port. This is the perfect video combo for your new XT or AT clone.

SPECIALS

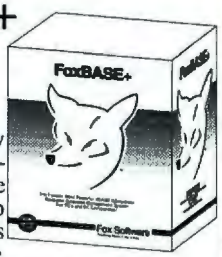
WordPerfect 5.0

$215

The most popular word processor is now even better than ever! Version 5.0 adds multiple font support, graphics integration, page preview and much more. WordPerfect 5.0 still retains its feel and ease of use that made it #1. Combine this with the best support in the industry and you can't lose.

FoxBASE+

$185



FoxBase+ 2.10 is simply the fastest dBASE compatible database software available. FoxBase+ also adds many enhancements to the dBASE language. And it's user-friendly too, its FoxCentral uses pull-down and pop-up menus and you can perform every important database operation without programming! There are even LAN, runtime, and 386 FoxBase versions available.

HARDWARE

PRINTERS

	LIST	FAST
ALPS		
Allegro 24	499	315
Citizen		Call
Diconix		
150P	499	299
Epson		Call
Fujitsu		
DL3400	995	549
NEC		
P2200	569	339
P5200	799	509
P5300	1049	669
LC890	4799	Call
Okidata		
182 Plus	319	219
320	499	329
390	699	469
393	1499	949
Panasonic		
KXP1180	300	179
KXP1191	400	239
KXP1124	529	Call
KXP1595	749	419
KXP1524	949	519
KXP4450	2595	1479
Star		
NX1000	289	169
NX2400	499	299
Toshiba		
P321SL	749	459
P341SL	999	599
P351SX	1499	929

FAX MACHINES

Murata M1200	899	699
Murata M1600	1599	849
Toshiba 30100	1396	949

BOARDS

	LIST	FAST
AST		
Hot Shot 286	645	339
Six Pak Plus 64K	210	119
Everex		
1200B Int Modem	149	65
2400B Int Modem	249	125
EVGA	499	249
Genoa		
Super EGA Hi-Res+	399	179
Super VGA #5100	445	239
Super VGA #5300	499	299
Super VGA #5400	699	419
Hercules		
Graphic Card +	299	169
Intel		
8087-2	250	139
80287-10	480	249
80387-20	730	449
Above Board Plus	795	395
Orchid		
ProDesigner	499	289
ProDesigner Plus	599	389
Tiny Turbo 286	445	247
Paradise		
Autoswitch 480	349	179
VGA Plus	399	255
VGA Plus 16	499	295
VGA Professional	799	479
Practical Peripherals		
1200B Int Modem	99	60
2400B Int Modem	199	149
Prometheus		
Promodem 2400B	199	129
Promodem 2400G	249	149

	LIST	FAST
The Complete PC		
Answering Machine	349	209
Fax 4800	399	225
Hand Scanner 400	249	139
USRobotics		
1200 Baud Internal	149	69
1200 Baud External	179	89
2400 Baud Internal	249	119
2400 Baud External	279	149
Video 7		
Fast Write VGA	549	305
Vega Deluxe	379	Call
Vega VGA	499	259
V-RAM VGA	799	469

LAPTOPS

Megahertz Modems		
2400B Toshiba	299	149
2400B NEC, Epson Mitsubishi or Zenith	399	199
Mitsubishi		
MP-286L Dual	3195	1879
MP-286L 20mb	4595	2449
NEC		
Multispeed EL II	2295	1449
Multispeed HD	3695	2249
Toshiba		
T1000	1249	759
T1000 768k Card	399	269
T1200F	2099	1369
T1200FB Backlit	2399	1499
T1200HB Backlit	3599	2399
T1600	4999	Call
T5100	7499	4495
Zenith		Call

MONITORS

	LIST	FAST
Magnavox		
7BM749 VGA	229	149
9CM082 VGA	649	419
Mitsubishi		
1409 RGB	399	259
1410 EGA	599	339
Diamond Scan 1381	799	479
NEC		
Multisync 2a	799	Call
Multisync Plus	1399	869
Princeton		
Max15	389	Call
Utltrasync	849	479
Utltra 16	1375	835
Seiko CM1430	995	599
Sony		
1302 Multiscan	995	659
1303 Multiscan	825	449
Zenith 1490	999	599

DISK DRIVES

Miniscribe		
40MB AT #3650	499	285
Mitsubishi		
40MB AT MR535 22ms	825	399
Seagate		
20MB XT Kit #225	599	247
30MB XT Kit #238	699	267
40MB AT #251	899	329
40MB AT #251-1	999	389
80MB AT #4096	1199	559
Toshiba		
360K Floppy	119	69
720K 3.5" Floppy	149	69
1.2MB 5.25" Floppy	149	79
1.44MB 3.5" Floppy	189	89

Call On Non-Listed Items

SOFTWARE

Database

	LIST	FAST
Clipper	699	399
DataEase	600	389
dBase IV	795	439
dBXL Diamond	199	105
Foxbase Plus	395	185
Foxbase Plus Lan	595	295
Paradox 3.0	725	459
RapidFile	295	179
Rbase for DOS	700	439
Reflex	150	90
Q & A	349	199
Q & A Lan Pack	299	185
Quicksilver	599	329

Desktop Publishing

Byline	295	175
GEM Desktop Pub.	299	169
Pagemaker	795	449
PFS:First Publisher	129	69
Publisher's Paintbrush	285	149
Ventura	895	Call

Financial

Bedford Integr. Acct.	249	139
Computer Assoc. BPI		Call
DAC 3.0	99	59
DAC Payroll 3.0	99	59
Dollars & Sense	179	99
Managing Your Money	199	117
Peachtree Complete II	199	149
Turbo Tax 1040	75	42

Graphics

	LIST	FAST
Deluxe Paint II	105	67
First Graphics	129	Call
Freelance Plus	495	Call
GEM Artline	495	269
GEM Draw Plus	299	165
Generic Cadd Level 3	250	149
Graph Plus	495	299
Harvard Graphics	495	Call
Perspective Jr.	149	85

Integrated

First Choice	159	89
Works	149	89
Windows 286	99	59
Windows 386	195	117

Mice

Keytronics Serial or Bus	119	75
Logitech Serial or Bus	119	65
Logitech New HiRes	139	85
Microsoft Serial or Bus	150	95
Microsoft W/ Windows	200	129
OmniMouse Serial	89	39
PC Mouse II Serial or Bus	149	82

Power Protection

Curtis Ruby Plus	115	59
Datasheild 85	90	50
Datasheild 100	99	57

Programming

	LIST	FAST
Macro Assembler	150	89
Norton Guides (Specify)	100	58
Turbo Basic	99	60
Turbo C 2.0	149	90
Turbo Pascal 5.0	149	90
Quick Basic	99	60
Quick C	99	60

Spreadsheets

Allways	150	82
Excel	495	Call
Lotus	495	Call
Lucid 3-D	99	59
Quattro	248	147

Utilities

CoreFast	149	71
Desklink	170	95
Desqview	130	73
Fastback Plus	189	95
FastTrax	60	37
Formtool	95	54
Laplink Plus	140	75
MS-Dos 4.01	149	85
Norton Advanced	149	74
PC Tools Deluxe 5.1	80	37
SideKick Plus	199	119
XTree Pro	129	61

Word Processors

	LIST	FAST
Ami	199	Call
Easy Extra	99	55
GEM First Word Plus	199	117
Grammatik III	89	49
Manuscript	495	Call
Multimate Adv. II	565	267
Professional Write	199	109
Rightwriter	95	47
Sprint	195	119
Q & A Write	199	109
Webster's Writer	60	47
Word	450	Call
Word Perfect	495	215
Word Perfect Library	129	60
WordStar Prof. 5.0	495	189

Call On Non-Listed Items

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To check on an order call: 602-437-8975

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INTERNATIONAL

MiniScribe

Card Drive 20-8225 68ms	$279
Card Drive 30-8438 68ms	$309
Card Drive 40-8450 46ms	$359

These Card Drives use quality MiniScribe drives.

--Features--

- Available for PC/XT™ and most Tandy models.
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20Mb	ST225	half ht. 65ms	$239
30Mb	ST238	half ht. 65ms	$259
40Mb	**M8450**	**half ht. 46ms**	**$319**
80Mb	ST251/PS180	half ht. 40ms	$499

ALL KITS COME COMPLETE . . .
with drive, controller, cables, How-To Manual and mounting hardware. 40Mb and larger drives also include partitioning software.

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AT/386 DRIVES

Seagate

ALL DRIVES include AT mounting hardware and "Disk Manager" formatting/partitioning software!!

40Mb	Seagate	ST251-1	half height	28ms	$399
71Mb	MiniScribe	M3085	half height	18ms	$579

High Capacity Drives

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340Mb	MiniScribe	M9380E	full height	16ms	$1995

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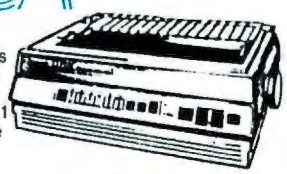
Panasonic Office Automation OA

KX-P1191

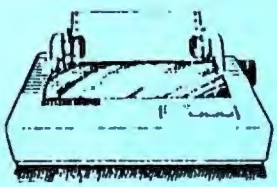
Announcing the Panasonic KX-P 1191, a 9 pin printer with advanced features that put it ahead of its class. The 1191 features the EZ-Set operator panel that lets you access the most commonly controlled printer functions right from the front panel. The 1191 has other advanced features, including an adjustable push/pull tractor feed and multiple paper paths. All these features come packaged in a rugged, ergonomic design with a two year limited parts and labor warranty.



$235.95

CITIZEN

Citizen 120-D



If you are seeking world renowned printer performance for your home, look no further than the 120-D. Your data processing needs are handled quickly at a print speed of 120 cps (NLQ). The 12-D features 9 pin dot matrix print quality, standard parallel centronics interface and a 4K text buffer.

$137.95

PRINTERS

EPSON

LX-800	$164.95
FX-850	$329.95
FX-1050	$429.95
LQ-500	$273.95
LQ-850	$515.95
LQ-950	$569.95
LQ-1050	$719.95
LQ-2550	$899.95

BROTHER

M1709	$379.95
HR40	$599.95
Twinwriter6 Dot + Daisy	$899.95
M1724L	$569.95
HR20	$339.95
HR60	$699.95

Star Micronics

NX-1000	$158.95*
NX-1000 Color	$217.95*
NX-15	$289.95
NX-2400	$279.95
NR-10	$319.95
NR-15	$419.95
NB24-10 24 Pin	$399.95
NB24-15 24 Pin	$545.95
NB-15 24 Pin	$669.95
Laser 8	$1699.95

Toshiba

321 SL	$449.95
341 SL	$599.95
351 SX 400 cps	$899.95

Citizen

120 D	$137.95*
120 D Serial	$169.95
180 D	$159.95
MSP-40	$279.95
MSP-15E	$325.95
MSP-50	$299.95
MSP-45	$379.95
MSP-55	$439.95
Premiere 35	$489.95
Tribute 124	$369.95
Tribute 224	$549 95

Seikosha

SP Series Ribbon	$7.95
SP 1200AS RS232	$189.95
SP 1600Ai	$179.95
SL 80Ai	$319.95
SK3000 Ai	$359.95
SK3005 Ai	$445.95
SL 130Ai	$599.95
MP5420FA	$999.95
SPB 10	$2995.95

Okidata

Okimate 20	$139.95
Okimate 20 w/cart	$189.95
182	$209.95
180	$219.95
182+	$225.95
183	$239.95
320	$337.95
390	$469.95
393	$989.95

Printer Ribbons Available

Cables & Connections For All Applications

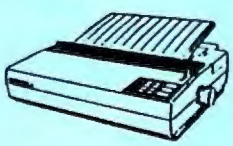
Panasonic

KX-P 1180	$179.95
KX-P 1191	$235.95
KX-P 3131	$289.95
KX-P 1124	$319.95
KX-P 1592	$359.95
KX-P 1595	$429.95
KX-P 1524	$545.95
KX-P 4450 Laser Partner	$1369.95
KX-P110i Ribbon	$9.95
KX-P32 Sheet Feeder	$199.95
KX-P34 Sheet Feeder	$99.95
KX-P35 Sheet Feeder	$159.95
KX-P420 Legal Cassete	$39.95
KX-PDPI Developer Unit	$85.95
KX-PDMI Drum Unit	$133.95
FX-BM89 Fax Card	$579.95
KXP11D RS-2332 Bd.	$69.95

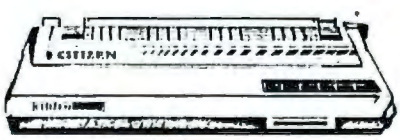
EPSON

LX-800

For fast output and professional print quality choose Epson's LX-800. This full featured 80 column printer has a speed of 180 cps (draft) and 30 cps (NLQ). Epson's exclusive SelecType front control panel lets you customize dcocuments wuth popular type styles. The Epson LX-800 delivers affordable, professional printing for your home or office.



$164.95



$425.95

CITIZEN

MSP-55

When convenience and ease of operation is required in a 15" carriage printer, you'll look twice at the Citizen MSP 55. Citizen has set standards with 300 cps (NLQ), quiet mode operation, exclusive push/pull tractor and convenient soft touch control panel. For world class performance in your office, select the Citizen MSP 55.

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CITIZEN

Mate/12 **$1359.95**

World class competition in an 80286 PC/AT from Citizen. One MB RAM is standard, along with 2 serial and 1 parallel port. EGA video card and keyboard switchable 6.25 12.5 MHz for full PC AT compatability. Citizen also includes added features such as, switchable 150 watt power supply, 1.2 MB 5.25" floppy drive, MS-DOS-GW Basic software to provide for your immediate computing needs. Leave the competition behind with the Citizen Mate 12 plus.

FCC CLASS B APPROVED

Toshiba T-1000

Pick up on the T-1000 and you'll go far. Give yourself desktop PC power wherever you need it. Toshiba's T-1000 includes 512K RAM, one built-ir 720KB 3.5" disk drive super-twist LCD display with CGA capability.

$799.95

MAGNAVOX

9CM-053

For full EGA capability, the Magnavox 9CM-053 should be your choice. This 14" CRT provides 690 H x 390 V resolution with text modes in both green and amber. Add to this a two-year warranty and you'll decide to stay smart with Magnavox.

$339.95

VENDEX

VTI-33-XT

- IBM XT COMPATIBLE WITH AWARD BIOS
- SMALL FOOTPRINT
- 8088-1TURBO PROCESSOR WITH 4.77 OR 9.54MHZ SOFTWARE SWITCHABLE
- 640K
- 2-360K FLOPPY DISK DRIVES
- PARALLEL PRINTER PORT
- RS232 SERIAL PORT
- CLOCK CALENDAR WITH BATTERY BACKUP ON BOARD
- AT STYLE 84 KEY KEYBOARD
- CGA MGA AND HERCULES GRAPHICS ADAPTOR
- 6 TOTAL EMPTY SLOTS
- 135WATT POWER SUPPLY
- MS-DOS VERSION 3.3
- GW-BASIC

$719.95

- Monitor optional

FCC CLASS B APPROVED

Seagate

ST138R 30 Meg Internally Mounted Card

- Premounted on its own Controller Card
- EZ Slot Installation (app. 10 min.)

$319.95

20-30-49 meg drives available!

LASER

Turbo XT Model II

$629.95

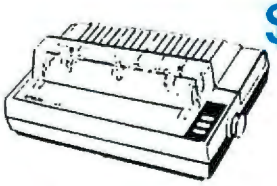
Out perform the conventional PC XT competition with Lazer's Turbo XT-II. The Lazer provides everything you expect from an XT plus such standard features as 4.77 10 MHZ speed, 102 key enhanced keyboard, security lock and a clock calendar with battery backup. Lazer's compatability is guaranteed through a 150W power supply, four accessable drive slots, (1 360K 5.25 standard) 8 I O expansion slots, parallel centronics and RS 232 interfaces, 640K RAM standard, (expandable to 1.6 MB) along with a CGA video card already installed. Introduce yourself to the new generation XT through Lazer's Turbo XT-II.

FCC CLASS B APPROVED

EPSON

LQ-500

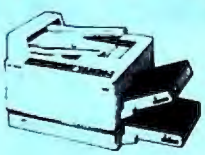
$273.95



For a 24 pin dot matrix printer that offers high performance and remarkable value, Epson sets the standard with the LQ-500 The LQ-500 is at home whenever you need high resolution text or graphics combined with high-speed operation. An 8K buffer SelecType control panel, pull tractor and parallel interface will allow the LQ-500 to expand to meet your growing needs.

Panasonic Office Automation OA

KXP4450 Laser Partner



Move your business in the laser age with Panasonic. 512K memory comes standard. 11 pages per minute print speed makes it the fastest in its class. Panasonic's laser technology and 2-year warranty—commitment to your printing needs.

*Limited Special

$1339.95

Limited Quantities

star MICRONICS

NX-1000 RAINBOW

$217.95

Color Printer!

The Star NX 1000 Rainbow adds a whole new dimension to your work through multi-color printing. Star has designed 20 printing options into this printer. Add to this paper parking, Epson-IBM emulation, high resolution NLQ/graphics for a printer with extra talent over the competition. Let Star's NX 1000 Rainbow do all the work. You just have to collect the praise.

1-800-233-8760

2400 Modem

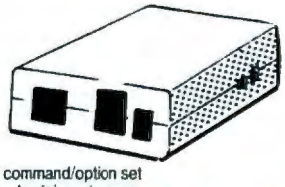
Avatex

- Auto/manual Originate or Answer
- Auto Speed Select In Originate/answer Modes
- RS-232C Interface
- 2-Year Warranty

$129.95

Avatex 1200e

Avatex



- Hayes AT command/option set
- Auto/manual originate/answer
- Auto dial with pulse or tone select
- RS-232C interface, RJ11C phone interface

$65.95

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MODEMS

Avatex

1200e	$65.95
1200i PC Card	$65.95
1200p	$89.95
1200hc Modem	$89.95
2400	$129.95
2400i II PC Card	$129.95

US Robotics

Courier 1200	$169.95
Courier 2400	$289.95
Sporster 1200 PC	$79.95
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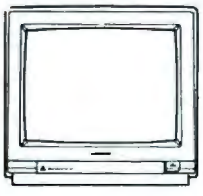

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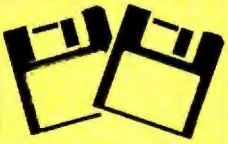

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Suggested Retail Price	**$29.00**	**$49.95**	**$219.98**	**$179.95**
Account Balancer	YES	YES	YES	YES
- Automatic Error Finder	YES	NO	NO	NO
Accounts Can Be Added When Entering Transactions (Data)	YES	YES	YES	NO
Budgeting	YES	YES	YES	YES
- Variable Budgeting By Month	YES	NO	YES	YES
Automatic Transactions	YES	YES	YES	YES
Financial Reports				
- Actual Financial Results	YES	YES	YES	YES
- Month and Year to Date	YES	YES	YES	YES
- All Months On One Report	YES	YES	YES	YES
- Budgeted Financial Results	YES	YES	YES	YES
- Actual Compared to Budget	YES	YES	YES	YES
- Actual Compared to Prior Month	YES	NO	NO	NO
- General Ledger Report	YES	YES	NO	NO
- Accountant's Trial Balance	YES	NO	NO	NO
- Net Worth Computation	YES	NO	YES	YES
Inquiry Reports				
- Check and or Deposit Register	YES	YES	YES	YES
- Account Analysis	YES	YES	YES	YES
- All Transactions with Party	YES	YES	YES	YES
- Cash Requirements Forecast	YES	YES	YES	YES
- Aged Invoices Payable	YES	NO	YES	YES
Graphics	YES	NO	YES	YES
Fiscal Year Support	YES	NO	YES	YES
Optional Password Protection	YES	NO	NO	YES
Financial Calculator	YES	NO	YES	YES
- Prints Amortization Schedules	YES	NO	YES	YES
- Prints Accumulation Schedules	YES	NO	YES	YES
Mail List Manager	YES	NO	YES	YES
- Prints Address Labels	YES	NO	YES	YES
- Prints Index Cards	YES	NO	YES	NO
- Prints Telephone Directory	YES	NO	YES	NO
- Mail Merge with Word Processor	YES	NO	YES	YES
Check Writer	YES	YES	YES	YES
- Prints Laser Checks	YES	YES	YES	NO
- Prints Any Pin-Feed Check	YES	NO	YES	YES
Personal Income Tax Estimator	YES	NO	YES	YES
Pop-up Note Pad	YES	NO	YES	YES
Pop-up Math Calculator	YES	NO	YES	YES
Capacity				
- Total Number of Accounts Per File	999	300	*	120
- Total Number of Open Transactions	100,000	65,535	*	4,000

*Varies based on RAM memory and disk space available.

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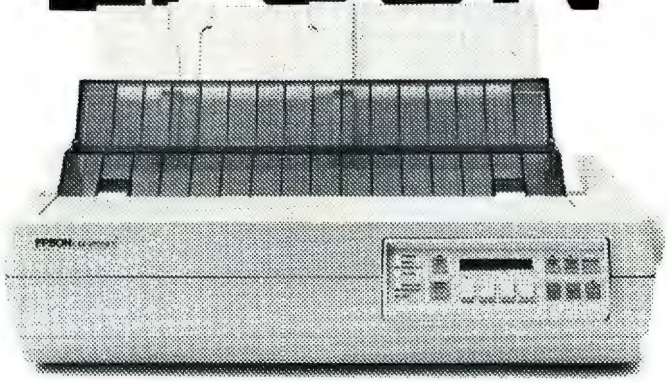

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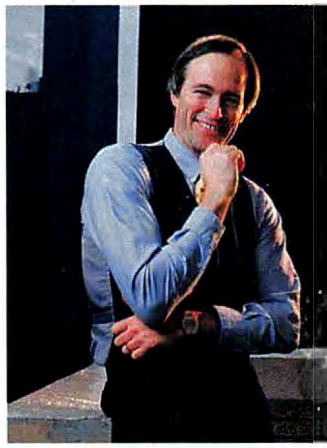

Roland J. Cole

Every successful application—whether word processor, data base, or spreadsheet—offers a set of features that are unique or better implemented than their equivalents in rival packages. But inevitably, these same programs also include features that suffer by comparison with the competition—that only imitate better keyboard macros or printing routines.

Wouldn't it be great if all programs were modular and we could choose the discrete "user objects" from each that fit our style of working—loading only as many as we need, when we need them?

I'd like to pick my own team of all-stars from each program and turn them loose on all my computer tasks. In this dream world, my favorite text-editing object would work equally well on a sentence, a data base field, or a spreadsheet label. My favorite printing object would give me proportionally spaced Times Roman output from any application.

I can approximate this ideal by loading all the programs I need under an environment like *Windows* or *Desqview* and then using the environment's mark-and-transfer features to apply the user object I want to the file I want. But even with an 80386 PC and megabytes of memory, that's an awkward process.

It would be much simpler to load only the user objects I want from each application. *SideKick* is one of the rare programs that lets me choose how many objects to load—for example, the calculator and notepad, but not the phone book. Few other memory-resident packages are this modular, but many are small enough and tolerant enough that I can load several at once—picking the macro processor from one and the pop-up calculator from another.

Full-blown applications, on the other hand, tend to be much more tightly written, and their user objects tend to be picky about the type and format of data they will deign to handle.

Why can't programs be created as a series of separate files like the DOS external commands or *Norton Utilities?* Each file could be loaded into memory only when needed and removed from memory when not required. We'd be able to employ command-line switches like *WordPerfect*'s /R switch, which tells the program when to keep overlay files in memory.

Perhaps programmers could exploit the dynamic linking and dynamic data exchange capabilities of OS/2 and multitasking environments like *Desqview* and *Windows* to create applications that would let us pull certain user objects into our own customized packages without including all of them.

I know that creating such capabilities poses a serious challenge to programmers, but the end result would be worth the effort. By using object-oriented programming and graphic environments, vendors could give us some ability to mix and match features, at least, even if only within their own families of applications. When each of us can assemble a customized set of user objects, computing will become easier and more productive. ●

Roland J. Cole is a commercial lawyer and past president of the Pacific Northwest IBM PC Users Group.

Have a different perspective? Write Dan Lavin, User Ombudsman, PC World, *501 Second St., San Francisco, CA 94107.*

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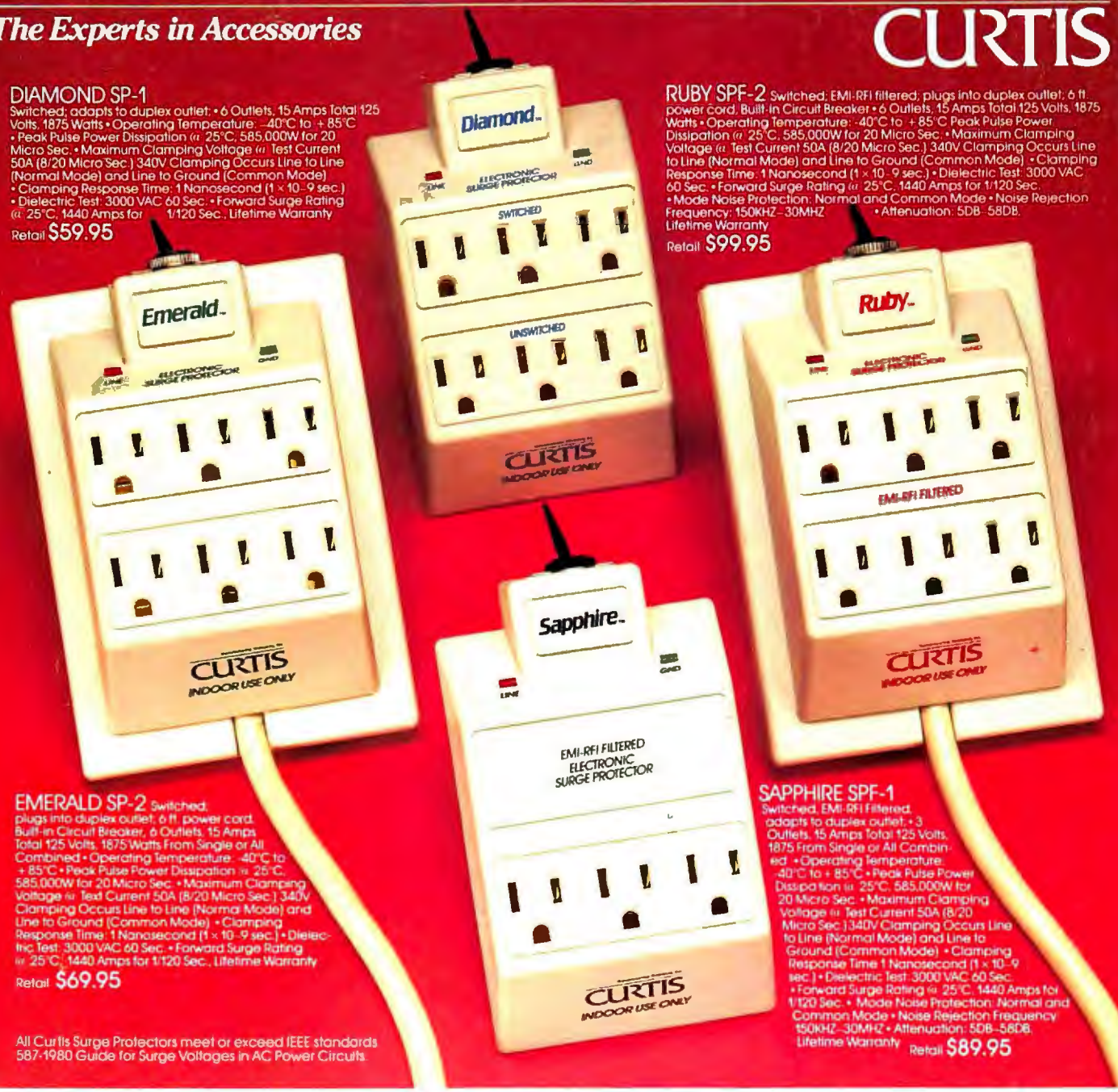

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