

PS/2 MODEL 80! • MONSTER STORAGE • CHEAP MODEMS • GAMES

PC WORLD

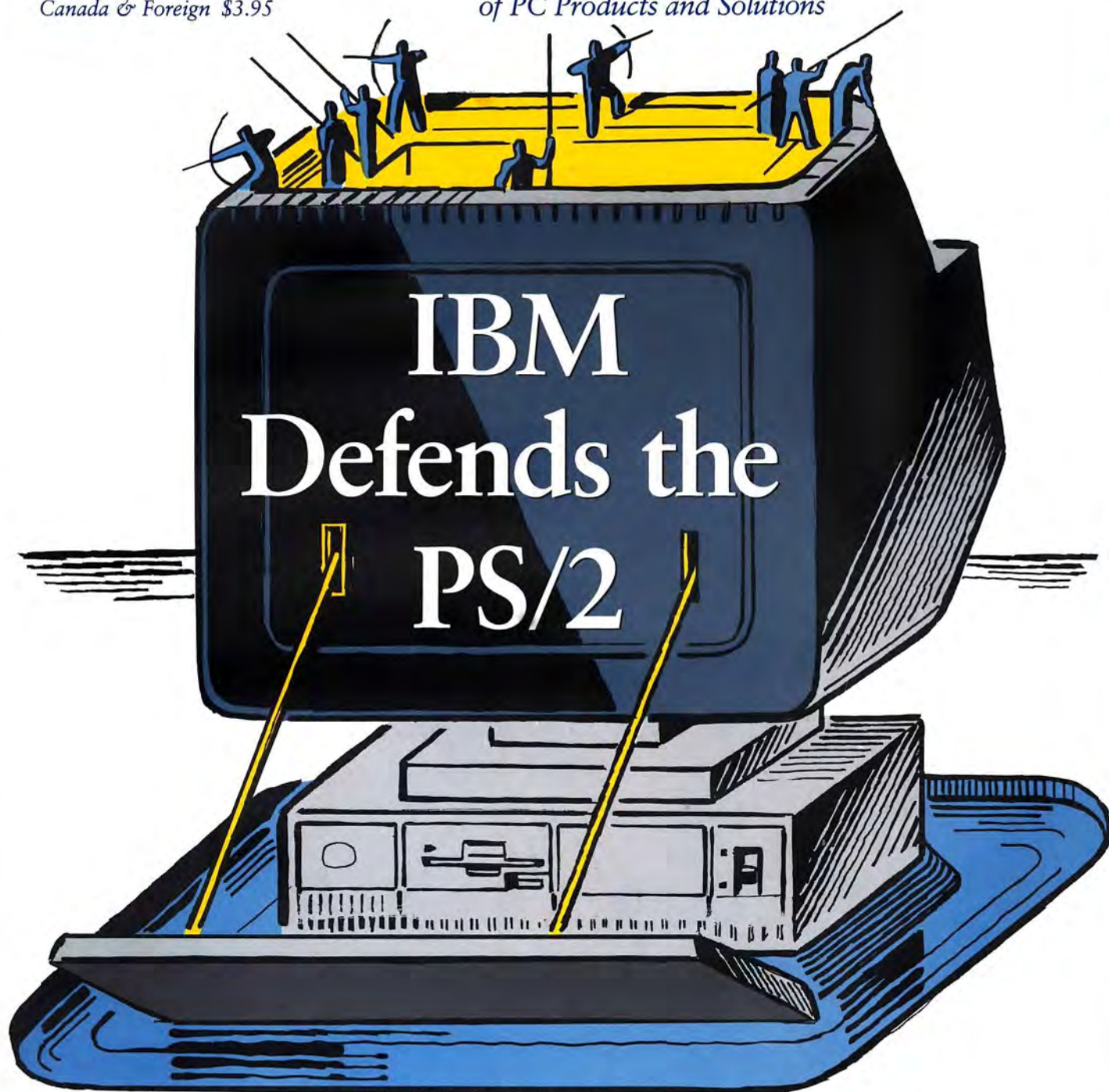
PC WORLD

December 1987 \$2.95

Canada & Foreign \$3.95

The Business Magazine

of PC Products and Solutions



*Big Blue's top scientists tell why
they think their new computers are the ones
to beat. An exclusive report.*

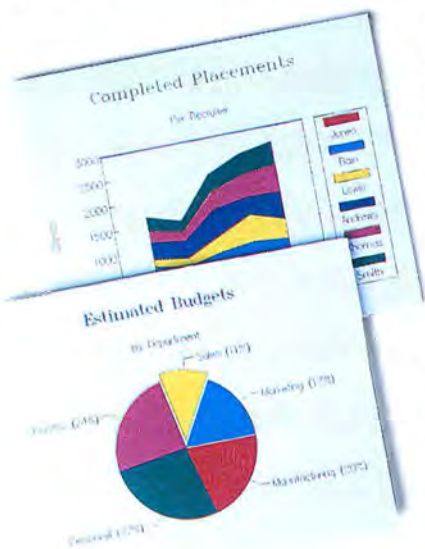


December 1987

PS/2 Model 80

With Quattro, S

Quattro™, our new generation professional spreadsheet, sheet proves there are better and faster ways to do everything. To do graphics. To recalculate. To do macros. To save and retrieve. To search, sort, load. To do anything and everything that state-of-the-art spreadsheets should do.



Technical superiority means product superiority

Lotus Development, makers of 1-2-3,* is bigger by factors than Borland. Bigger, not better. Technical superiority is a Borland trademark, and Quattro is fresh proof that it produces a better product.

Once you've seen or used Quattro, you'll be convinced, because Quattro's faster than 1-2-3, has much better *quality* graphics and a far greater *variety* of graphics than 1-2-3.

For the IBM PS/2™ and the IBM® and Compaq® families of personal computers and all 100% compatibles

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Quattro gives you presentation-quality graphics

Quattro brings new highs in quality graphics to your spreadsheet. It also brings new variety and diversity to the kinds of graphs and graphics you can produce from your spreadsheet, and you can produce hard copy of your graphics—with either printer or plotter—*directly* from the spreadsheet without leaving the spreadsheet. All you do is hit "Print." Quattro makes it easy to get hard copy—and you don't have to buy a separate graphics program.

Naturally, Quattro: has PostScript support

Quattro is state of the art, so of course it supports PostScript™—now the industry standard. Quattro merges desktop publishing into spreadsheets, lets you use tomorrow's technology today, and gives you access to all the latest laser printers and the professional results they provide—which make both you and your work look good.



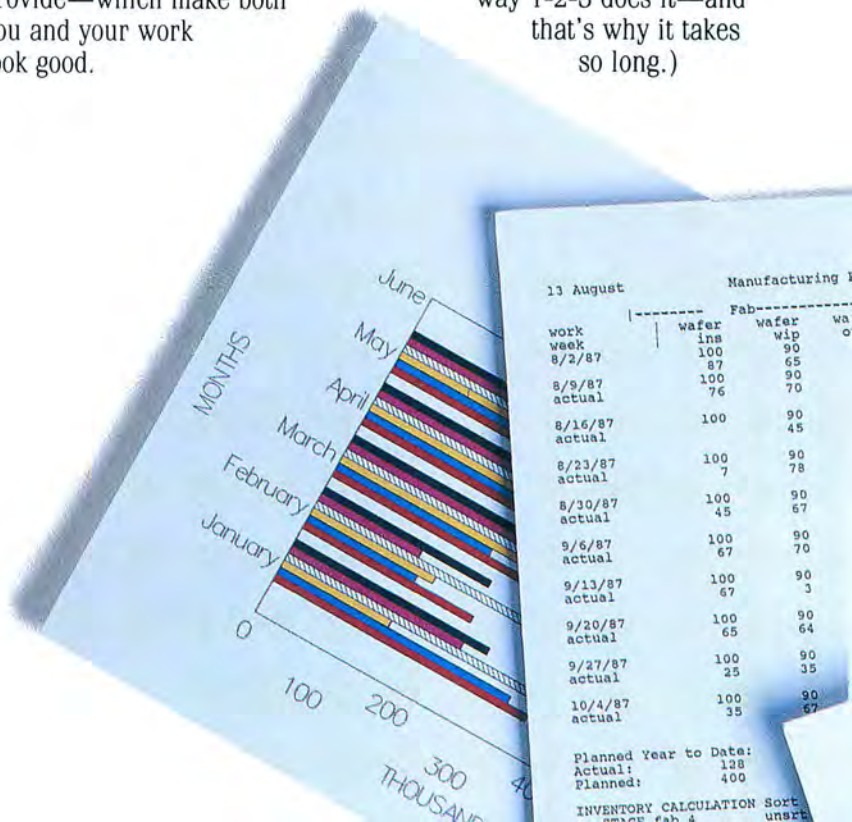
"What we show you"

Quattro recalculates a lot faster than you-know-who

The smartest and fastest way to recalculate a spreadsheet is to do what Quattro does, something called "intelligent recalc.," which in English means you only re-count the numbers that count.

In a spreadsheet, not all numbers are born equal, and changing one number doesn't always change *everything* so Quattro recalculates just the formulas that matter, not all the formulas it knows. (You wouldn't reshoot a whole movie just because you changed one scene,

but unfortunately, that's the way 1-2-3 does it—and that's why it takes so long.)



Seeing is Believing



"What they show you"

Quattro demystifies Macros and makes your work go faster

Using macros—electronic shortcuts—is easy with Quattro. Quattro offers a complete macro debugging environment and puts you in control as you "single-step" or fast-forward through your macros. Quattro's "Macro Learn Mode" lets you record macros as you work—which is something 1-2-3 users have been waiting for—and the wait is over.

You can't lose with Quattro

If you forget to close and save your spreadsheet—or a power outage shuts down your computer—all is not lost. Quattro automatically keeps track of every change you've made to the spreadsheet during the session, so if disaster strikes, it misses.

Quattro lets you build your own menus

Quattro includes a Menu Builder that lets you customize menus. Coupled with macros, this application development feature allows you to create dedicated applications quickly and easily.

You know how to use Quattro

You can tell Quattro to respond to 1-2-3 commands. You don't have to learn a whole new

program. Quattro works directly with all 1-2-3 file formats. No importing/exporting or macro translation is required.

Quattro can also directly load and save ASCII, Paradox,* and dBASE,* files.

Compatible with 1-2-3? Yes.

Faster than 1-2-3? Yes.

Technically superior to 1-2-3? Yes.

Half the price of 1-2-3? Yes!

“ A formidable competitor to Lotus.

John C. Dvorak

This is the first time a major software company has taken on Lotus on its own terms—namely speed.

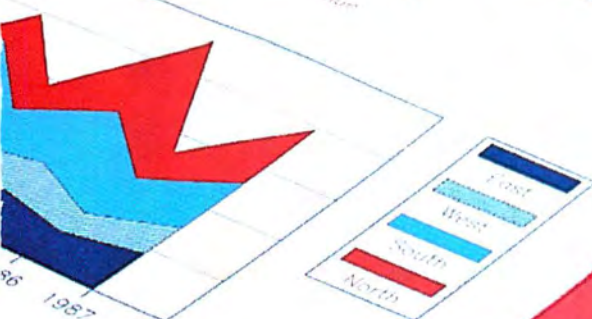
Stewart Alsop **”**



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Twice the power.
Half the price.

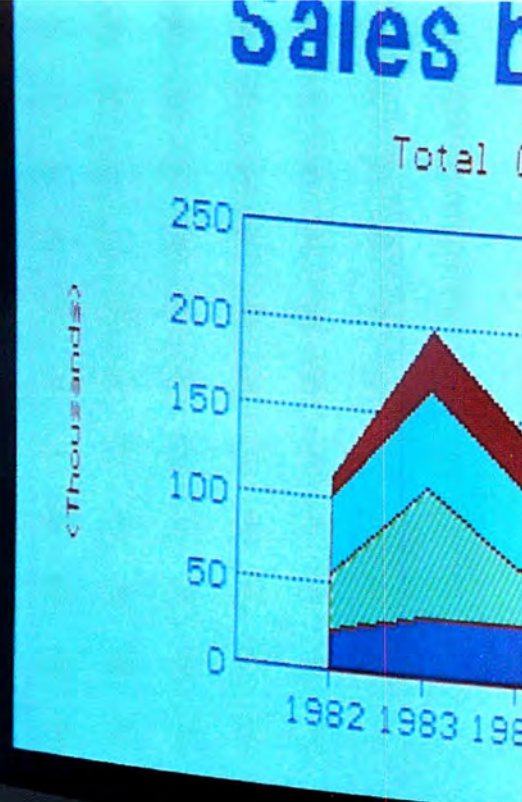


Sales by Division
Total Gross Revenue



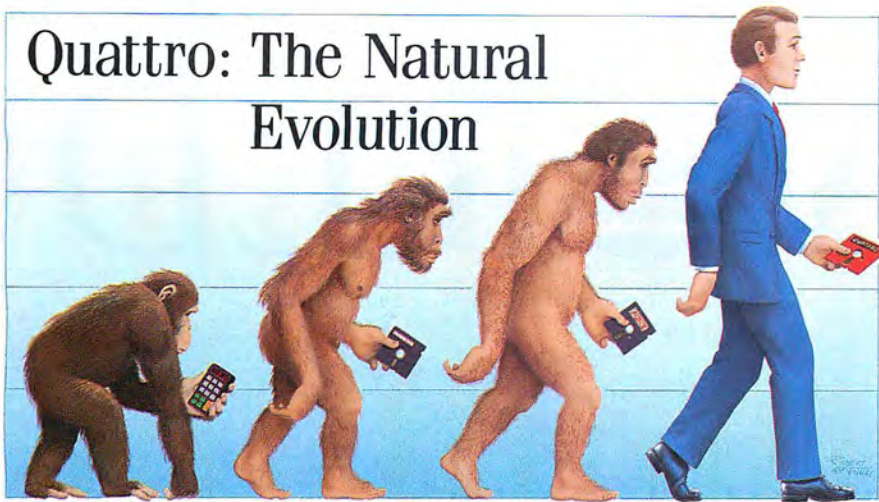
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23,456.00	35,905.00	35,905.00	86,732.25
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1982
LOTUS 1-2-3®

1987
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half the price of 1-2-3. It's compatible with all your existing 1-2-3 files—but it makes everything in them look better, print better, and makes your work go faster.

Quattro: The New Generation Spreadsheet

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SPEED	ReCalc Cash Flow Model (5K cells)	.27	2.90 sec.
	Delete Row 15K cells (Recalc Time)	.76 sec.	2.38 sec.
	Load File (15K cells)	15.9 sec.	19.8 sec.
	Page Down (A1 to A1000)	12.2 sec.	17.4 sec.
GRAPHICS	Presentation-quality Graphics	YES	NO
	Graph Types	10	6
	Integrated Graph Printing	YES	NO
	Full Graph Customization	YES	NO
	On-Screen Font Styles	11	1
	PostScript Support	YES	NO
VERSATILITY	User-modifiable Menus	YES	NO
	Menu Shortcuts	YES	NO
	Pull-down menus	YES	NO
	Point and Press Editing	YES	NO
	Automatic Installation	YES	NO
POWER	Macro Learn Mode	YES	NO
	Maximum Number of Macros	Unlimited	27
	Single Step Macro Debugging Environment	YES	NO
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PC WORLD

The Business Magazine of PC Products and Solutions
December 1987



152 A Model for the '80s

IBM's top-of-the-line PS/2 is faster than any other 16-MHz 80386 computer—and not as expensive as you might think. *PC World* examines the Model 80's strengths, weaknesses, and Micro Channel potential.



166 Mass-Storage Muscle

Need to store warehouses full of data—or run a local area network off your AT? The latest crop of 100MB hard disk drives can do the job, and at a reasonable price. Super hard disk drives from Priam, Micropolis, Alloy, and Core reviewed.



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PC WORLD

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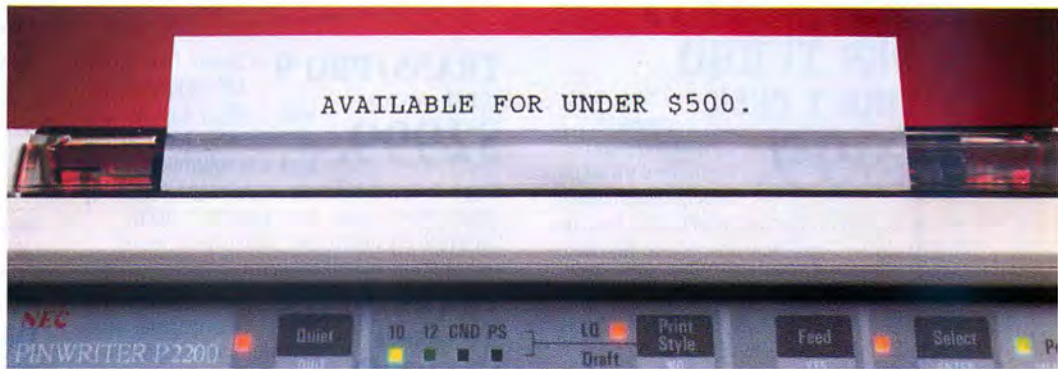
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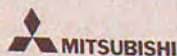


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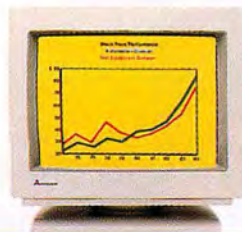
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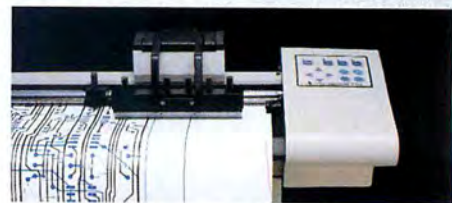
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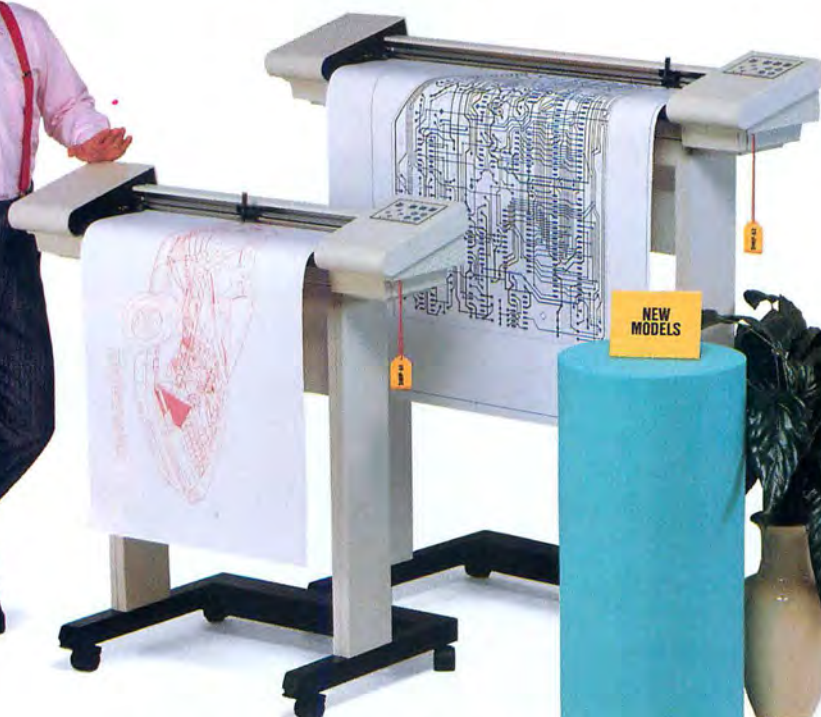
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David Bunnell

What has happened to the original vision of the PC as a tool to democratize society and free the world from the tyranny of ignorance and injustice? There is a new grass-roots movement forming, a new activism on the wing.

The Participatory PC

As the year draws to a close, it feels in many ways like the end of an era in personal computing. It's time to take stock of where we've been and where we're heading. Six years ago the IBM PC was introduced. In January, we will celebrate the fifth anniversary of *PC World*.

For those of us who have been active in the industry since the earliest days of the personal computer revolution in the mid-seventies, it's been a grand era, a belle époque of incredible innovation. We've witnessed amazing technological breakthroughs, tapped energy fields we scarcely dreamed existed, and shared moments of almost metaphysical wonder as we felt the relentless force of the information age propel us into the twenty-first century.

Some people even made a lot of money in the process.

But what of the original vision of the PC? That it would set the human race free, that it would equalize opportunity for all races, creeds, minority groups, social classes—even help save endangered species. Desktop democracy for everyone. That was our Holy Grail.

I think it's time to examine just how far we've come in fulfilling some of those goals.

How much of that dream is real—and how much is just folklore, an invention of those people who stand to benefit most from marketing the PC vision?

The theme of personal computers as tools for liberating society has certainly permeated the advertising of our industry. Remember the archetypal Apple Macintosh television commercial in 1984, which showed a female runner smashing the image of Big Brother with a hammer? And how about IBM's PC commercials that depicted the guy in the office who could leave work early because he had a PC? Suddenly, Joe Office Worker could take his kid to a baseball game instead of working late.

Seen in the cold light of day, the concept of the PC as the panacea for all of society's problems may prove to be an illusion. A myth perpetuated by the founders of the

(continues)

industry who sincerely hope that it's true, but, well, shucks, what if it isn't?

I certainly have been as guilty as anyone of endorsing the PC vision. Over the years I've written my share of editorials proclaiming that the PC is nirvana, that it's the magic solution, that it's the tool

overall picture is not so rosy. One of the most deleterious effects of the PC revolution is that PCs simply are more available to the haves than to the have-nots. The gap between the rich and the poor, between the advantaged and the disadvantaged, has grown bigger—not smaller.

the Mid-Atlantic Center for Sex Equity, is quoted as saying in an article in the *American School Board Journal*.

As far as bridging the gender gap, forget it. A recent Stanford University study found that twice as many boys as girls have access to computers in the home. Enrollment statistics from computer camps show that three times as many boys attend these camps as do girls, for all grade levels.

Equality? That may be the brand name of a made-in-Korea PC clone for all I know, but it's definitely not the status quo in today's information society.

Increasingly, too, PCs are being used to invade the privacy of the individual. In some workplaces, PCs are even programmed to keep track of workers' keystrokes so that employers can monitor how much the workers are producing and who's slacking off.

Sending a message over E-mail or MCI is much less secure than writing an ordinary letter and mailing it through the post office. It's easier than ever for the powers that be to intercept personal communications—to keep track of whom you're doing business with and whom you're in telephone contact with. Your phone bill conveniently lists all the numbers you've called over the past month.

A strong potential exists for massive invasion of privacy through technology—and it's a

(continues)



Modems and networks could further participatory democracy in the future.

that will help decentralize the government and create a more democratic society with diverse views and a greater exchange of ideas.

In some ways, the PC has stimulated democracy. There are on-line bulletin boards where people debate Star Wars and Nicaragua and organize letter-writing campaigns to Congress. My recent column criticizing the FCC's proposal to hike phone rates for telecommunications resulted in a mass of letters to Washington.

An earlier editorial protesting Congresswoman Pat Schroeder's proposed bill to outlaw software rental helped knock that piece of legislation out of the water. More controversially, my column last year deploring Georgia's sodomy law because it violates everyone's right to privacy generated a lot of responses in Governor Frank Harris's mailbox.

So here's the score, as I see it. Although the PC has had some undeniably positive effects on society, I must conclude that the

Instead of smashing barriers of discrimination, the PC has created a new caste system based on privileged access to data. It has erected a sort of a floppy disk Berlin Wall with digital barbed wire to keep out the informationally disenfranchised.

Statistics reveal, for example, that between two-thirds and three-quarters of the richest schools in the United States have at least one microcomputer, while 60 percent of the poorest have none.

A University of Minnesota study, funded by the National Science Foundation, reports that students in the nation's 12,000 most affluent schools are four times more likely to have access to computers than are students in the 12,000 poorest districts.

"If a particular race, sex, or economic group occupies an inferior position in society, you only have to add one and one to see that technology will compound the problem," John Lipkin, former professor of education at McGill University and now consultant to

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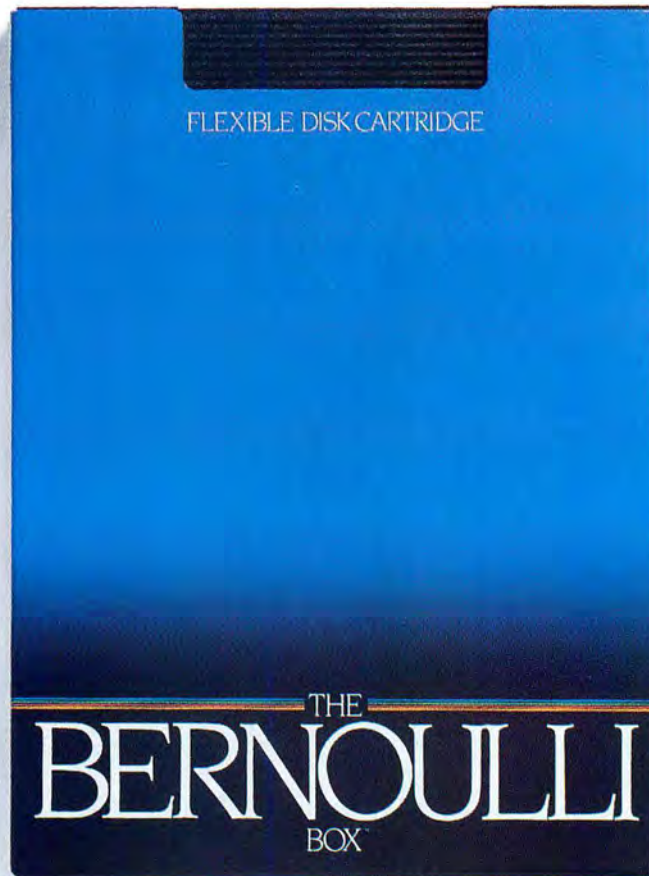
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ticking time bomb. In Australia recently, the government tried to introduce a national ID card for every citizen, which would embed each citizen's personal history in a microchip. Fortunately, that attempt at benign totalitarianism was promptly squashed Down Under.

There are other distressing signs of a weakening democratic society.

Fully 25 percent of American adults are functionally illiterate; they cannot read or write at the fifth-grade level. Cultural literacy virtually does not exist. Voter participation in local, state, and national elections has dropped. And

an astounding 70 percent of American adults rely on television as their sole source of news and information.

That's really scary.

What has happened to the much-heralded promise that the PC would spread the intellectual riches? It's either one of the best-kept secrets or one of the worst-delivered jokes of all time.

For want of an easy answer, I cast my mind back to those idealistic early days. Perhaps there are some clues to what went wrong, where, and how the original PC vision might be resurrected—if, in fact, it can be.

I think it can.

My own involvement in the PC revolution dates back to 1974 in

Albuquerque, New Mexico, when I witnessed the creation of the world's first commercially available personal computer—the MITS Altair PC. I was responsible for running the advertising and technical writing division at MITS at the time.

Now I wouldn't exactly characterize myself as an ex-hippie, but my political sensibilities were shaped significantly by the campus politics and various social causes of the sixties and seventies. I opposed the war in Vietnam and I was present at Wounded Knee.

One political idea that really excited me during that tumultuous

Where we got the idea that something small
could be powerful.



period was something called *participatory democracy*. This philosophy provided the theoretical framework for the Students for a Democratic Society (SDS) movement, which was launched in Port Huron, Michigan.

Participatory democracy is a concept that takes representational democracy an important step forward. It calls for a much greater degree of participation by all citizens in the process of government. Very simply, as expressed in SDS's founding document at Port Huron, citizens have the right—and, indeed, the responsibility—to play an active role in influencing the government's policy-making decisions that will affect their lives.

In 1975, while I was working at MITS, I had the opportunity to attend a personal computer fair held at the University of California at Berkeley. This early PC convention was sponsored by the Berkeley-based People's Computer Company, which was among the first groups to have an Altair personal computer. I remember Bill Gates's BASIC was running on it.

I discovered that we were kindred spirits. They, too, believed in the principles of participatory democracy. In a sudden flash of insight, I realized that one flaw of participatory democracy as articulated in the sixties was that the

technology was not yet there to make it realistic on a big scale.

There was no way that a mass of people could effectively communicate with each other through conventional dialogue.

It might have been feasible for a small organization like a local SDS chapter to engage in this political process, but on a larger scale it was a lost cause. In fact, a downside of participatory democracy was that it tended to result in a lot of long-winded meetings during which precious little was accomplished.

At the People's Computer convention, I saw the potential for using the PC as an interactive

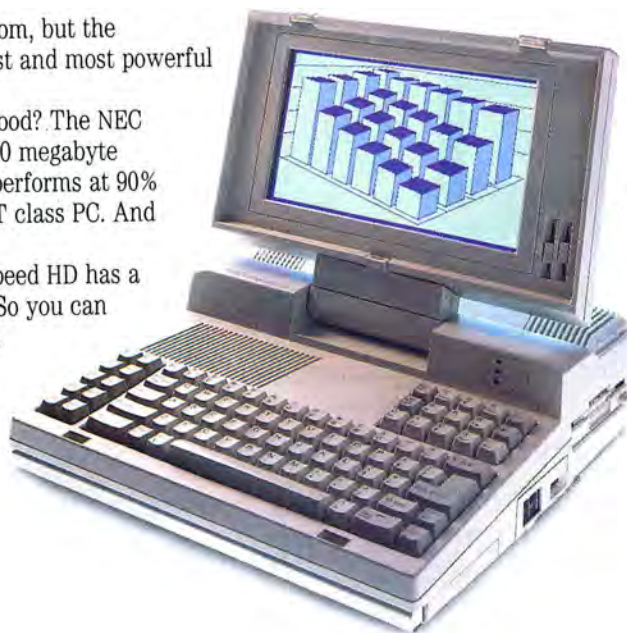
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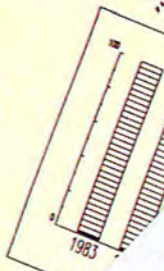
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Heavy hitting powers All-Stars to the top

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East Division			North Division			West Division		
Team	W	L	Team	W	L	Team	W	L
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Brusiers	14	2	Grass Stains	13	3	Crunchers	12	4
Watercoolers	10	6	Mullers	9	7	Ramblers	11	3
Print Outs	7	9	Backstops	8	8	Hot Spots	10	4
Batmen	7	9	Smashers	6	11	Go-Getters	11	3
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communications tool. Modems and networks could further participatory democracy in the future. People could debate vital issues on line and vote on a scale never conceived of. Eureka!

There in Berkeley, I finally felt a sense of solidarity. I looked around and saw that many of the early pioneers of personal computing shared a common vision—among them, Lee Felsenstein of Community Memory; Steve Jobs and Steve Wozniak of Apple Computer; Jim Warren, who was later to found the Computer Faire; and Dan Bricklin, who created *Visi-Calcul*. We were all products of the sixties.

Others, too, shared our vision. They weren't left-wingers or counterculture freaks. They were conservatives with viewpoints bordering on libertarianism, a breed of ultra-right-wing Republicans who believed fervently in the freedom of the individual.

The vision rose among all of us almost simultaneously. The PC was the tool we were looking for that would help make our society more democratic. It would at least help us fulfill some of our dreams for a better society.

Where have all the hackers gone, long time passing? What happened? We've been waylaid by success, by complacency, by the quest for more firepower in our micros. *Connectivity* is the great rallying cry. That is, except where it really counts, where it counts

more than ever before in a world poised on the edge of a Great Darkness that could easily snuff out what little freedoms we actually enjoy today—unless we do something about it. We may be connecting through coaxial cables, but those same cables are beginning to resemble nooses around our necks.

Where do we go from here as we network our way into 1988 and beyond? I think we need to start from the grass roots again. My wish for the coming year is that people who really care about the potential of the PC will do more than just be aware of the PC's promise. We need to become actively involved again.

We need to move away from being quiescent armchair quarterbacks to becoming real quarterbacks out in the field. If we don't, I'm afraid that all those who still believe in the vision of personal computing will grow greatly disillusioned. We'll become old men and women, bitterly regretting our failed cause. The battle for PC freedom will perhaps be remembered as yet another noble campaign that was lost, not unlike the Spanish Civil War in the 1930s.

The personal computer industry will come to resemble the automobile or television industry. The visionaries of the automobile industry imagined a world liberated through universal transportation and the ready dissemination of goods, ideas, and services. Now more Americans are killed in automobile accidents each year than were killed in all of the Vietnam War. Smog threatens our health

(continues)



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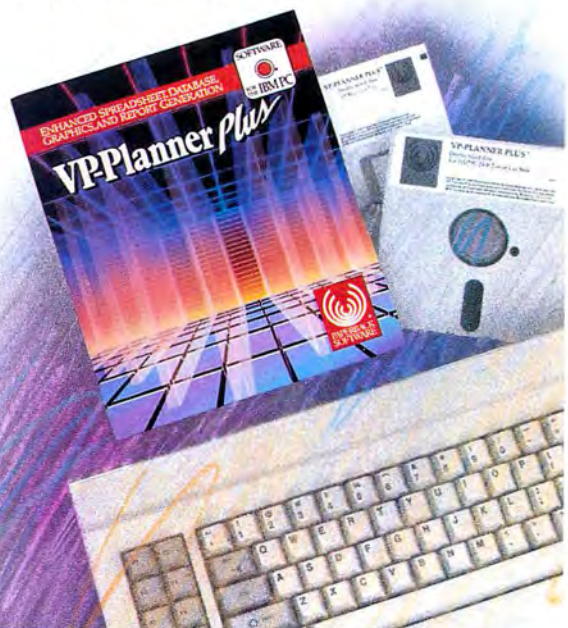
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Ironically, the same king of vision was held dear by the pioneers of the personal computer. "One person, one computer." That's the way it was presented, remember? In fact, that was Apple Computer's original philosophy, before the "Year of the Local Area Network" became the credo of our new micro-millennium.

We never envisioned that networks could transform personal computing into impersonal computing. We should heed a lesson from the world of television.

Network TV has created a more homogeneous society. Instead of elevating cultural literacy, television targets material at the lowest common denominator of viewer intelligence. It's decreased diversity in our society by making us all talk, laugh, and look the same. Because of television commercials like those for Kentucky Fried Chicken and McDonald's, practically every town you visit in the United States looks like every other.

(continues)

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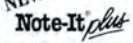
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In networking computers and tying PCs to mainframes, perhaps we are falling into the same kind of trap. Instead of giving individuals more power and contributing to group discussion, such connectivity might become a centralized force that controls our lives and monitors our every move.

To arms! To the barricades! The decade of the nineties is really the dark, oblique side of the sixties. We are coming around again, although we may not realize it yet. The same kind of struggle needs to occur, although the new activism of the day will be waged on the PC. Are you computer-hip?

But first we have to open our eyes. It's quite disappointing to look at on-line information utilities like CompuServe, The Source, and others and see the limited menu items they feature. Why aren't there more activist groups? There should be hundreds of political groups on line.

We should be able to hook up and talk to people who are concerned about the same issues as we are—whether nuclear disarmament, environmental conservation like the protection of the ozone layer, American Indians' rights on the reservation, relations with the Canadian government, trade protectionism, or whatever our favorite cause may be.

We should be able to locate any special interest group and instantly tie up with all the people around the planet who have similar concerns. Whether you're in a

small or large town, it can be difficult, if not impossible, to physically connect with fellow activists. But on line it should be a snap to build consensus, organize pressure groups, and coordinate your strategy for making your own vision happen in the world.

The PC can be a tool for that. But it won't be unless we take some radical steps. It won't be unless a hard-core group out there of about a hundred thousand people read this editorial and then act.

To begin with, the on-line services should be filled with issues.

Save the Whales should be a bulletin board. People should be able to dial up and contact all the major players involved in this cause. You should be able to get all kinds of information on the subject and make your own opinions and requests known simply by using your personal computer and your modem.

If I want to help save the cougars in California, I should be able to do that just by calling up the appropriate menu.

A warning: In advocating this new form of participatory democracy on the PC, I am by no means advocating instant decision making. Traditional participatory democracy has grown in a way that allows for reflection and lots of debate. There is great peril in "kangaroo networking."

Say, for example, the U.S. Navy reports that Iranian speedboats have attacked a U.S. ship in international waters. The United States population, now networked, votes 51 to 49 percent to declare war on Iran.

(continues)

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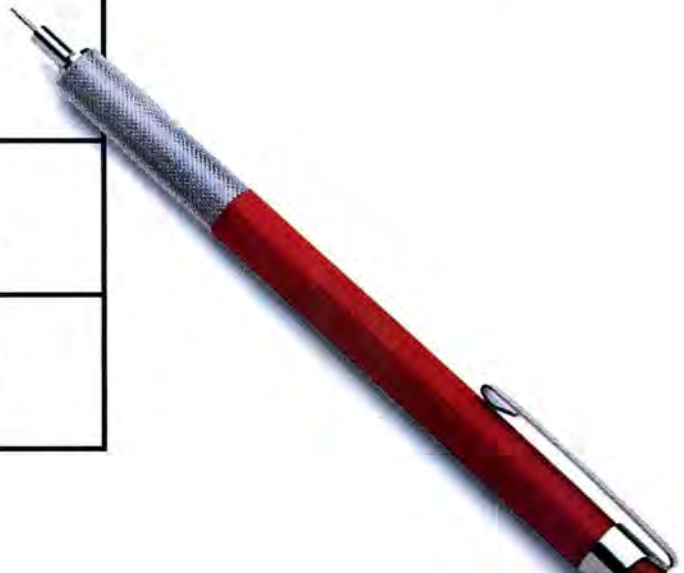


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Only after it's too late do we discover that it was all a big mistake. The speedboats didn't really attack, they just came too close. The United States shot at them, they shot back at us—all for the wrong reasons. We don't want to get into shooting wars over data bugs.

Furthermore, participatory PC democracy must protect the rights of minorities. I don't believe that the majority should rule in areas where minority rights are infringed upon. For example, we could probably vote 51 to 49 percent to reinstitute slavery in this country. But that wouldn't make it OK.

All I'm advocating right now is the use of personal computers to organize and to implement social action by people who are concerned about such things. Nationwide participatory democracy for everyone is a much more complicated proposition. I believe that it can be achieved, but it will take a long time for us to work out all the details.

We can and we should get started right away—especially as we enter a presidential election year. The entire primary system ought to become computerized, for example. All the voters in one state could talk to each other, exchange views on issues, hear from candidates, and investigate the issues in

as much depth as they wished to before they chose their candidate.

In this way, voters could make more intelligent decisions. The race for president would no longer be merely a TV public relations event that focused on fleeting image rather than substance.

One goal we could achieve with our PCs would be to completely change the way in which we elect our president. It seems absurd that candidates spend 18 months during the primaries shaking hands and kissing babies for television cameras. By the end of that process, their brains must be mush. At that point, probably none of them is mentally capable of running the Oval Office.

It's more urgent now than ever that we change the focus of politics to personal computers. I yearn for the day when it becomes more crucial for a candidate to be on line for a CompuServe conference than to be on network TV in a paid commercial.

We're already overwhelmed by massive amounts of information on TV that provide us with only the shallowest insight into what is really going on in the world.

I'm casting my vote for the universal personal computer user. I urge you to do the same. If we don't rally on line together, then it's really the end, PCs or no PCs. Wake up, America. The life-support system of our democracy is in danger of crashing. And that's not something any of us cares to participate in. ●

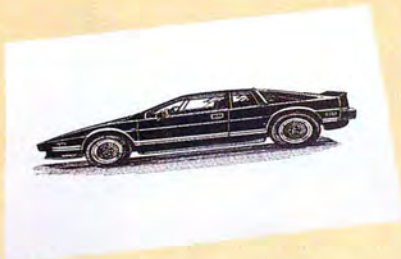


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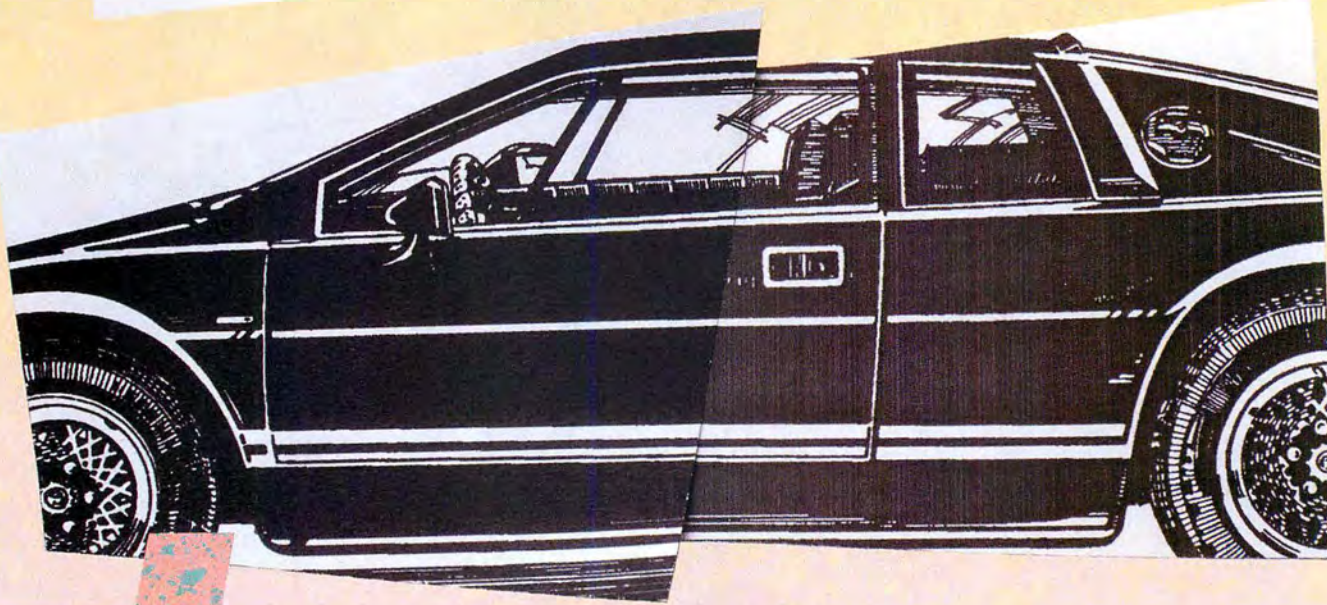
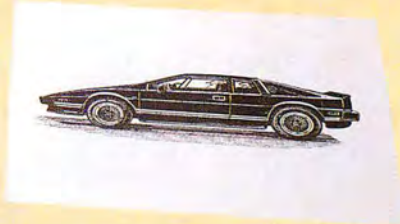
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These unretouched print samples show the superior print quality of QMS-PS 810 over printers using first-generation print engines.



Introducing the PostScript laser printer that blacks out at high speeds.

The new QMS-PS® 810 can compose and print the most complex pages in record times, with richer, more saturated blacks than ever before. All with the desktop publishing power of Adobe PostScript®, and the superior print know-how of QMS, an industry leader.

Under the hood QMS ASAP™ (Advanced System Architecture for PostScript) is proprietary technology that helps eliminate the hardware bottlenecks that hinder other PostScript printers. As a result, QMS-PS 810 boasts processing speeds remarkably faster than other PostScript printers in its class. And faster output means greater productivity. In addition, the QMS-PS 810 laser

printer's new Canon® SX® print engine covers solid areas and prints fine detail better than previous-generation engines.

Fast start, strong finish You can adorn your documents with one or all of the 35 Adobe typefaces. Thanks to PostScript, there's an infinite number of font variations available. You can also make type as large or as small as you want. And put it anywhere on the page. In fact, with PostScript you enjoy total control over the design of your page. It gives you the complete desktop publishing power to do things that would otherwise be virtually impossible. So you get high-quality output exactly how you want it.

Along with PostScript, the HP LaserJet +™, Diablo® 630 and HP-GL™ printer emulations are added for your non-PostScript software.

The QMS-PS 810 laser printer is easy to use, maintain, and comes with a one-year warranty. It's available from Laser Connection dealers. Laser Connection is a sales and marketing subsidiary of QMS. For the dealer nearest you call **1-800-523-2696**.

**The new
8-page/minute
QMS-PS 810
laser
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unny, they run the same engine, but the QMS KISS^{plus} gets better mileage.



	QMS KISS ^{plus}	HP LaserJet Series II
Engine	Canon SX 8 ppm/300 × 300 dpi	Canon SX 8 ppm/300 × 300 dpi
Emulations	4, 6, or 7	1
Resident fonts	24 or 34	6

Think of it as a form of supercharging. The new QMS KISS^{plus} laser printer takes you further with the higher-resolution Canon® SX® engine than the Hewlett-Packard® LaserJet Series II®. Because where HP restricts growth to simple memory upgrades, QMS expands both memory and capabilities. As a result, QMS KISS^{plus} sets new standards of value and performance, standards first set by QMS with the QMS KISS™ laser printer.

Three ways up QMS KISS^{plus} is the first laser printer that lets you choose the level of functionality you need, by offering three personality modules.

So if you're working with text and business graphics only, personality module 10 gives you 24 resident fonts, 512K RAM and four printer emulations (ANSI X 3.64, Epson® FX 80, Diablo® 630 and QUME® Sprint II®).

To combine text with more sophisticated graphics, personality module 20 moves you up to 34 fonts, a full megabyte of memory and six emulations (IBM Proprinter™ and HP LaserJet+™, plus the four from module 10).

For text and full-page graphics, the 2.5-megabyte memory and HP-GL™ plotter emulation of personality module 30 handle the most complex projects. Also included are the same 34 fonts and six emulations from module 20.

There's more. An easy-to-read, easy-to-use front control panel. Two font cartridge slots for using a wider variety of fonts. An easy-to-maintain design for clean, simple upkeep. And the new Canon SX print engine gives you richer-looking printouts.

A better route Put it all together and you'll find the QMS KISS^{plus} gives you more standard equipment. And more options.

The QMS KISS^{plus} is sold by Laser Connection dealers. Laser Connection is a sales and marketing subsidiary of QMS. For a test drive, call **1-800-523-2696** for the Laser Connection dealer nearest you. And be sure to ask for *The Sourcebook*™—our exclusive catalog filled with the latest laser printer products and enhancements.

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Circle 103 on reader service card

ossing a laser printer's used toner cartridge is like paying someone \$60 to take out the trash.

Why? Because it can be refilled with toner and restored to its original condition, for about half the cost of a brand-new toner cartridge. That's how Laser Connection's Toner Refill Certificate Program can save you nearly \$700 a year for each laser printer in your office. And while other programs can promise savings, they lack our expertise. Expertise that guarantees you quality.

Break an expensive habit Not only does a toner refill certificate save you money, your cartridge comes back better than new.

Our reconditioning and patented resealing process enables us to refill a used toner cartridge with 50% more toner than it first contained. With a blue toner refill, your cartridge is returned with 25% more of that color. So your reconditioned cartridge will actually last longer than a new one.

To further insure print quality, we use toner that's denser than new and replace your old cleaning rod with a new one.

Get with the program Any toner cartridge used on laser printers employing the Canon*

CX* print engine (that includes printers made by Hewlett-Packard*, Apple*, QMS, Canon and others) can be reconditioned.

A participating dealer can get you started. Just purchase a Laser Connection Refill Certificate for each cartridge. You'll find instructions and shipping materials for sending us your empty toner cartridge. You'll get back a factory-reconditioned cartridge returned to you via Federal Express*. A cartridge that costs less and works better than new ones. It's also backed by our guarantee—if you're not happy with the performance of your cartridge, we'll give you another refill certificate to replace it.

To start putting away your \$700 in savings, call **1-800-523-2696** for the Laser Connection dealer nearest you. And be sure to ask for *The Sourcebook*™ — our exclusive catalog filled with the latest laser printer products and enhancements.



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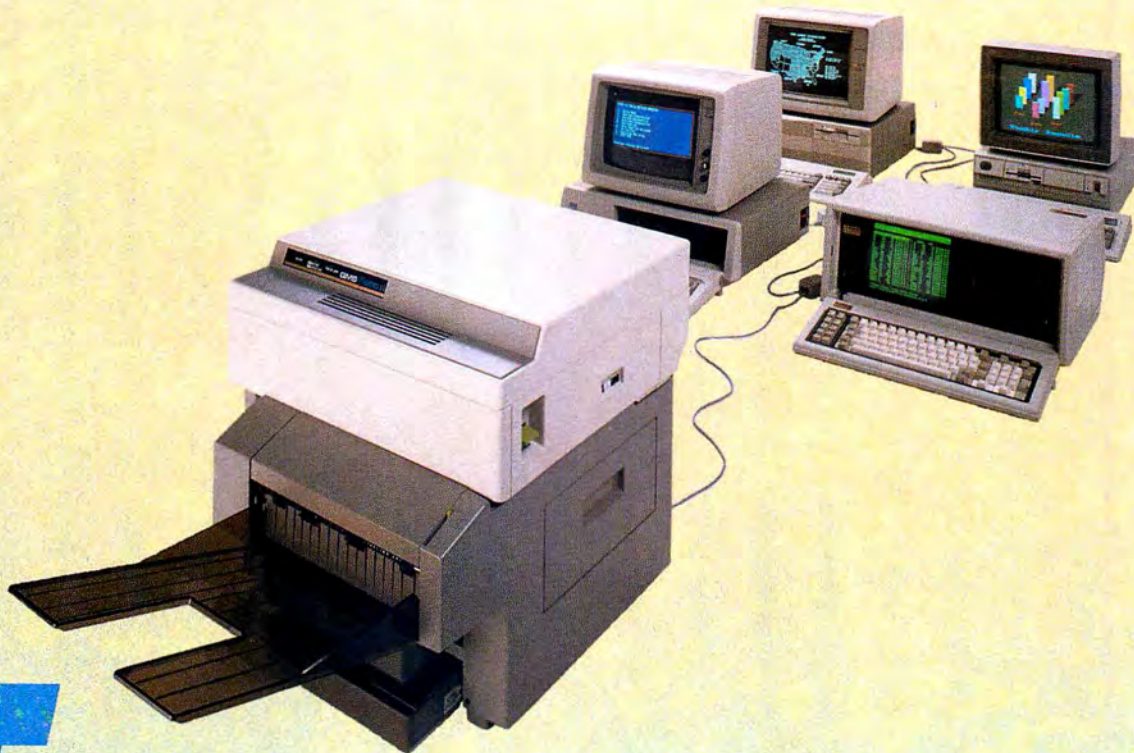
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The PostScript laser printer sure to get high ratings at its network debut.

The new 8-page/minute QMS-PS 800 II laser printer

The QMS-PS® 800 II is an 8-page-per-minute laser printer that combines the desktop publishing power of Adobe PostScript® with the superior printer technology of QMS, a leader in printer technology for 10 years. Exceptional paper handling, faster processing speed and a Canon® CXD® print engine with 10,000-page-per-month duty cycle give QMS-PS 800 II the versatility you need on your PC network.

A network sensation QMS-PS 800 II holds 500 pages, so operators aren't constantly refilling depleted paper trays. Users can even designate automatic switching between the two trays for doing letterhead/second page printing. Select faceup or facedown collation. And manually feed odd-sized paper stock.

With QMS ASAP™ (Advanced System Architecture for PostScript) proprietary technology, QMS-PS 800 II delivers outstanding performance. In fact, the more complex the page, the more it outperforms other PostScript printers. Two megabytes of memory, expandable to three megabytes, also add to the overall page processing speed when you are creating complex documents.

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

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

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How to tell the difference between DESQview™ 2.0 and any other environment.

Selecting DESQview, the environment of choice, can give you the productivity and power you crave, without the loss of your old programs and hardware. If you like your existing programs, want to use them together, transfer data between them, print, sort, communicate with or process-in-background, yet still have the need to keep in place your favorite PC(8088, 8086, 80286 or 80386), DESQview is the "proven true" multitasking, multi-windowing environment for you. Best of all, DESQview 2.0 is here now, with all the money saving, time saving, and productivity features that others can only promise for the all-too-distant future.

And with DESQview's new graphics enhancements for Hercules, CGA, EGA, and VGA, Version 2.0 still offers the same award winning and pioneering features for programs that earned DESQview its leadership, only now you can also run desktop publishing programs, CAD programs, even GEM™, Topview™, and Microsoft Windows™ specific programs. In some cases you'll add as little as 10-40K to your system overhead. Now you can have multi-tasking, multi-windowing, break the 640K habit too and still get an auto dialer, macros, menus for DOS and, for advanced users, a new complete application programmer's interface capability. No wonder that over the years, and especially in recent months, DESQview, and now DESQview 2.0 have earned extravagant praise from some of the most respected magazines in the industry.

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IBM Personal Computer and 100% compatibles (with 8086, 8088, 80286 or 80386 processors) with monochrome or color display; IBM Personal System/2 • Memory: 640K recommended; for DESQview itself 0-145K • Expanded Memory (Optional): expanded memory boards compatible with the Intel AboveBoard; enhanced expanded memory boards compatible with the AST RAMPAGE • Disk: Two diskette drives or one diskette drive and a hard disk • Graphics Card (Optional): Hercules, IBM Color/Graphics (CGA), IBM Enhanced Graphics (EGA), IBM Personal System/2 Advanced Graphics (VGA) • Mouse (Optional): Mouse Systems, Microsoft and compatibles • Modem for Auto-Dialer (Optional): Hayes or Compatible • Operating System: PC-DOS 2.0-3.3; MS-DOS 2.0-3.2 • Software: Most PC-DOS and MS-DOS application programs; programs specific to TopView 1.1, GEM 1.1 and Microsoft Windows 1.03 • Media: DESQview 2.0 is available on either 5 1/4" or 3 1/2" floppy diskettes

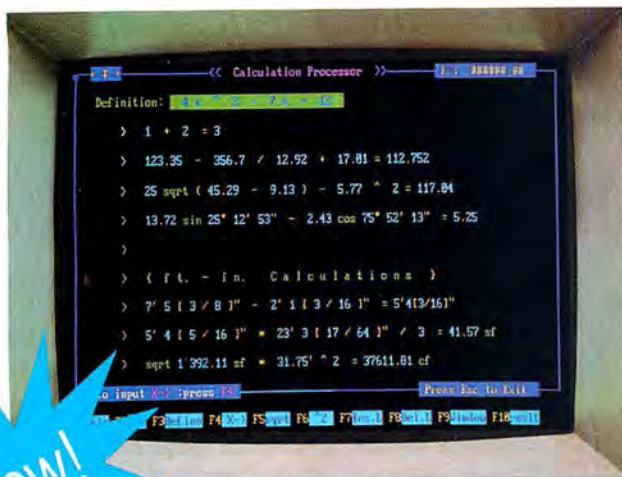
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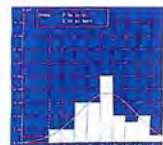
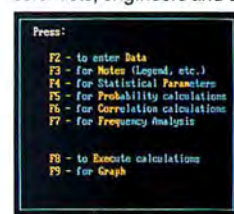
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Remarks	Calculations	Results
1: Chapter 1: Excavation Works		
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1.2 new pavement	5.223 (sq. ft.)	0.925 (sq. ft.)
1.3 incl. excav.	121.280 (cu. yd.)	792.250 (cu. yd.)
1.4 wt. excav.	1.268 (cu. yd.)	1.268 (cu. yd.)
2: Chapter 2: (Gen.) Excav Works		
2.1 filter material	6.200 (cu. yd.)	130.640 (cu. yd.)
2.2 setting	1.226 (cu. yd.)	10.927 (cu. yd.)
3: Chapter 3: Concrete Works		
3.1 4" concrete	11.424 (cu. yd.)	3.452 (cu. yd.)
3.2 6" concrete	157.880	157.880 (cu. yd.)
3.3 Chapter 4: Miscellaneous	0.125	4.450 (317.48)
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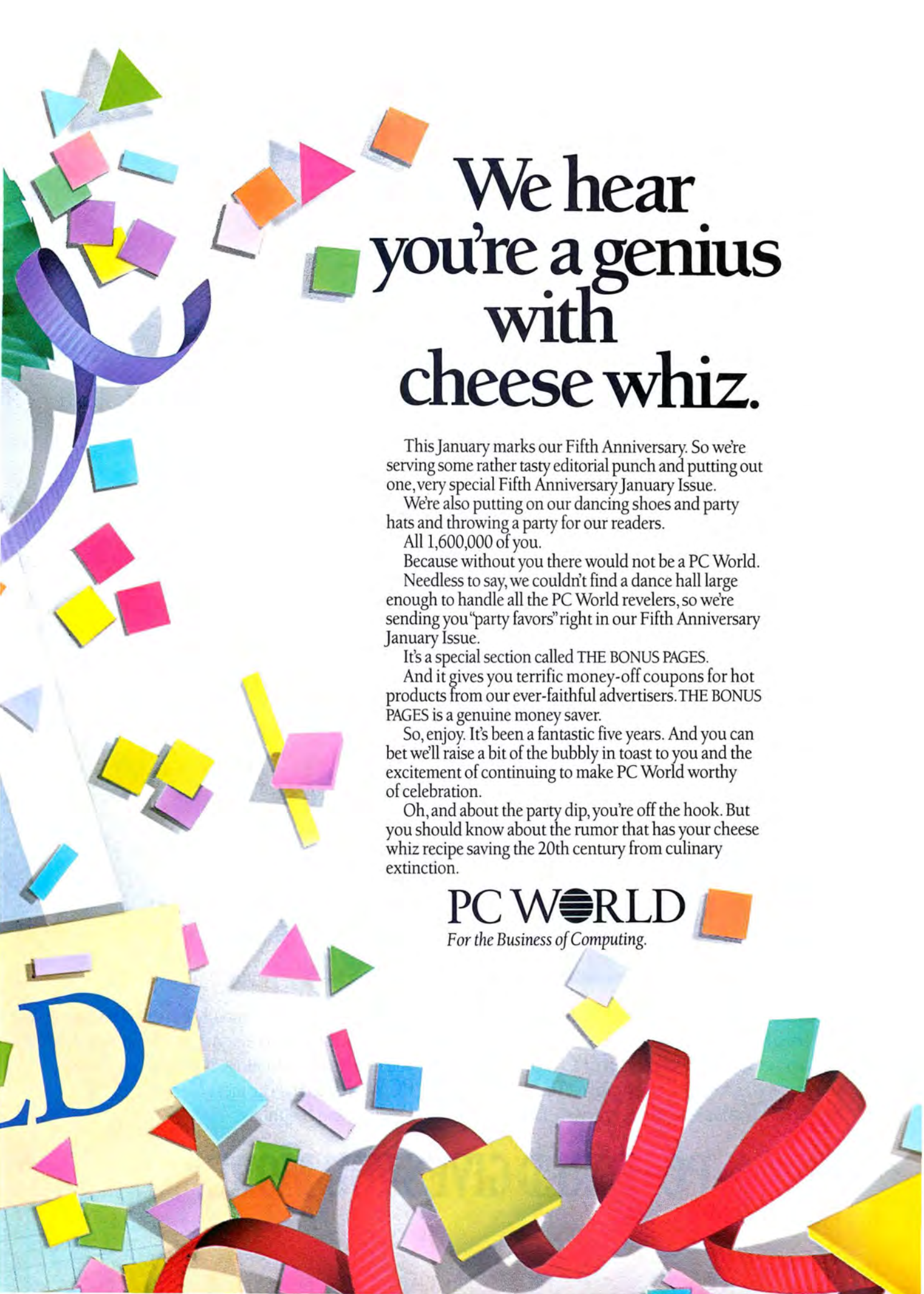
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We hear you're a genius with cheese whiz.

This January marks our Fifth Anniversary. So we're serving some rather tasty editorial punch and putting out one, very special Fifth Anniversary January Issue.

We're also putting on our dancing shoes and party hats and throwing a party for our readers.

All 1,600,000 of you.

Because without you there would not be a PC World.

Needless to say, we couldn't find a dance hall large enough to handle all the PC World revelers, so we're sending you "party favors" right in our Fifth Anniversary January Issue.

It's a special section called THE BONUS PAGES.

And it gives you terrific money-off coupons for hot products from our ever-faithful advertisers. THE BONUS PAGES is a genuine money saver.

So, enjoy. It's been a fantastic five years. And you can bet we'll raise a bit of the bubbly in toast to you and the excitement of continuing to make PC World worthy of celebration.

Oh, and about the party dip, you're off the hook. But you should know about the rumor that has your cheese whiz recipe saving the 20th century from culinary extinction.

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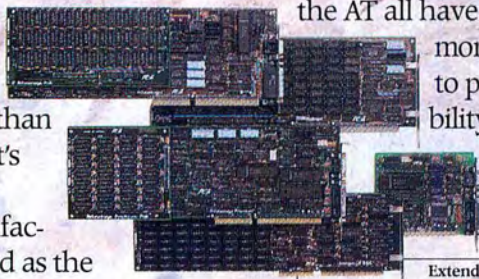
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RAMvantage!	128K - 3 MB	—	No	Yes
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Letters

Reactions and responses from the PC World community



The Emperor's New Clones

Since IBM heralded the PS/2 series, all the magazines, including *PC World*, have mouthed the IBM party line: The PS/2s are better than their predecessors. The Model 30 is the bridge to the future. The PS/2 offers better connectivity, especially with IBM mainframes.

I've been waiting for somebody to expose this puffery for what it is.

As your review points out ["Personal Systems Revealed," *PCW*, August 1987], the Model 30 uses the Intel 8086, so it can't run OS/2—which IBM heralds as the wave of the future. Also, the Model 30 doesn't use the new VGA but instead requires the inscrutable MCGA, which takes up more real estate than the VGA but offers less functionality. It also uses the old PC bus instead of the new Micro Channel. Moreover, even the old XT wasn't crippled by having only three expansion slots. This bridge doesn't lead to the future; it leads to Brooklyn.

As for connectivity, the PS/2s lack adapters for 3270s, networks, SDLC, and X.25. Of course, you can install adapters in your generous three slots. The AT also lacks these adapters, but at least it gives you eight slots.

The PS/2 line has its good points, but the fact remains: The Model 50 and the Model 30 are implementations of inferior systems on a superior technology.

*Seymour J. Metz
Annandale, Virginia*

Although our review doled out some praise to IBM, we also called the Model 30 "half an orphan" because it lacks the Micro Channel and can't run OS/2. And

though we admire the PS/2 line's ergonomics and find the Micro Channel superior to the standard AT bus, we berated the Model 50 for its "slow hard disk, wan power supply, and lack of expandability" and roundly criticized IBM for its inflexible pricing schemes. Are you sure you have the right magazine? —Eric Knorr

Overkill on Will

After reading David Bunnell's poisonous attack on IBM's PS/2 line ["PS/2, OS/2, and You Know Who," *PCW*, August 1987], I've concluded he's been listening to Will Zachmann of IDC for too long. In other publications Mr. Zachmann has made it his business to denigrate IBM products. Bunnell quoted Zachmann *four* times, without quoting anyone else. Has *PC World* stooped so low that it can't remain objective? Maybe the magazine should change its name to *PC Clone*.

*Chris Novak
Manchester, Missouri*

We view opinion pieces as a way to highlight issues—not to bash IBM or anyone else. That's why we're happy to receive—and print—reader opinion, too. —Ed.

Robbing Joe to Subsidize Minnie In "The On-Line Brain Drain"

[David Bunnell, *PCW*, September 1987], Federal Communications Commission [FCC] attorney Ruth Milkman defends FCC plans to

(continues)

charge packet-switching networks and on-line information services a special access fee for long-distance service. She asks self-righteously, "Should Aunt Minnie subsidize Joe Computer User?"

We can debate whether the fee is justified, but who's subsidizing whom? This proposal will drastically increase rates for computer owners who communicate via modem over long-distance phone lines. Packet-switching networks like Tymnet and Telenet lease lines from the phone companies, so they pay for the use of these lines. The packet switchers then pass those costs along to Joe Computer User.

Since Joe doesn't make long-distance phone calls, he shouldn't have to pay for them. Access fees will actually force Joe Computer User to subsidize Aunt Minnie's inefficient local phone service. The FCC proposal is designed to institute a new subsidy, not eliminate an old one.

*Wolf N. Paul
Carrollton, Texas*

Fee for Service

Few things have delighted me more than the FCC's proposal to charge computer users for the use of local phone company services. Local rates should reflect underlying costs. As long as local users

are charged for access to long-distance lines for voice communication, they should also pay access charges for data communication.

The total amount that even the most frugal on-line service user lays out for hardware, software, and subscription fees makes the FCC charge look petty in comparison. I suspect that rather than dampening on-line activity, time-based access fees will encourage people to use modems much more efficiently.

*Jan R. Harrington
New York, New York*

(continues)



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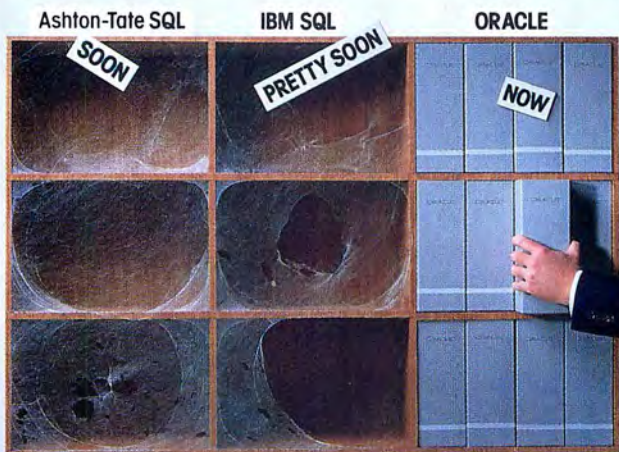
- Ashton-Tate has announced its intention to replace its outdated database technology with a SQL DBMS under OS/2, and
- IBM has announced its intention to offer SQL for OS/2 in its Extended Edition.

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Dear Ashton-Tate,

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Since you've announced your intentions to go to SQL, I really don't feel like developing obsolete applications in dBASE. I have every confidence your first attempt will be full-featured and bug-free. Send me what you've got, when you get it.

Name _____

Title _____

Company _____

Street _____

City _____

State _____ Zip _____

Dear IBM,

Old Orchard Road
Armonk, NY 10504

Attached is a blank check. I keep reading that you've already announced that you're going to announce SQL for OS/2 and the Personal System/2.

When you do, fill in the check amount. Hope to hear from you sometime in the next couple years.

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In fact, it was a mere 60 days after the PS/2™ announcement that we demonstrated IRMA's Micro Channel Architecture™ compatibility at COMDEX. And 60 days later that honest-to-

goodness PS/2 users started transferring data with IRMA 2™ and Smart Alec™, our micro-to-System 3X counterpart.

That's just the beginning. Other DCA connectivity products for PS/2s are shipping as we speak. Including IRMAX Multisessions™, IRMAX APA Graphics™, IRMA 3279 Graphics™ and IRMALAN DFT Gateway™.

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Basically Correct

The comparison of Turbo Basic to Microsoft's QuickBASIC version 3.0 in Dennis Dykstra's review [*From the Software Shelf, PCW*, August 1987] was enjoyable. However, the article contains a few inaccuracies.

In the features table, QuickBASIC's combined limit for array variables is incorrectly listed as 64K. In fact, QuickBASIC can handle dynamic arrays up to available memory, with the sole restriction that any single array be limited to 64K. Also, QuickBASIC does have "snow" elimination during direct writes to CGA memory.

It's true that Turbo Basic's in-memory compile speed is slightly faster than QuickBASIC's, but Turbo Basic catches only 1 compile-time error for each compilation. Therefore, the user must complete the compile-correction step once for each error in a program. QuickBASIC, on the other hand, can catch up to 26 errors with one compile step, significantly speeding up the development process.

While Mr. Dykstra was careful to call out stand-alone .EXE files, he ignored the fact that QuickBASIC does, in fact, create .EXE files from the user environment. Although these files require the BRUN run-time code, there's no performance penalty. In addition,

for large applications BRUN can dramatically reduce the size of the application on disk.

Finally, to say that "Turbo Basic will appeal to programmers who want to test and debug large programs one module at a time before combining them into a final product" is very misleading. Turbo Basic has no module capabilities. A programmer must combine the source into one monolithic program (even though the editor is limited to 64K). Then all code for every new .EXE file must be compiled. QuickBASIC stores procedures in separately compiled modules that can be

Maybe it's not what you're saying that's so dull.

Horizon Airlines
Page 2 of 3

FIRST HALF RESULTS

For the first half (months) of the year, sales fell below budget by 10% caused by delays adding new routes to the system. However, in May and June sales exceeded budget by 40% as the new routes came on line and new business was expanded. To offset the loss in sales and to meet customer demand, we increased flight frequency by 10% through the end of the year. Plans for the second half of the year are to increase sales by 15% over the same period a year ago. The budget numbers were set at 100%, but for the first half of the year, sales were 110%.

NEW DIRECTIONS

While we maintain a commitment to operate and expand our passenger service, we are also exploring new business ventures. The new line of services is expected to be completed by the end of the year. These services will be provided to customers who are not currently served by our existing routes.

Air freight (AF) services are now offered in other Horizon's centers. Service is being added slowly and will benefit from operational improvements in the second half of the year. Also, in the third quarter several large customers should add significant volume to our freight business.

Finally, a new direct sales force will begin selling a variety of products and services to AF customers in all states. The market research conducted in the first half of the year suggests that these offerings will be very profitable. Managers will use the information to produce and coordinate the company's commitment to meeting the needs of all its customers.

MOST PROFITABLE ROUTES

In the first half of the year, a profitable route originated from our base located in every region of the country. In the second half, the cities with high profitability were Portland, OR, San Francisco and Los Angeles. In the third half, Atlanta, Chicago and Dallas were the most profitable routes, while in the fourth, the cities were Atlanta, Boston and New York.

It is important to note that in the first half of the year, we added routes to the east and west coast of most profitable regions. This is a significant accomplishment and will benefit the company's strategic objectives for the year. It suggests that changes in customer preferences and other competitive factors are the result.

linked together, so that the user only has to relink, rather than completely recompile.

Gregory E. Lobdell
Product Manager, Languages
Microsoft Corporation
Redmond, Washington

Most of Mr. Lobdell's points are correct, but I'd like to clarify a few. The features table was condensed due to space limitations, and in the process the array and scalar "program size limit" items were accidentally combined. The table should have shown that both Turbo Basic and QuickBASIC support individual dynamic arrays

as large as 64K, with the number limited only by available memory.

If QuickBASIC provides automatic snow elimination during direct writes to CGA memory, Microsoft certainly hides the fact well. I found no such reference in QuickBASIC's documentation.

Admittedly, QuickBASIC is more modular than Turbo Basic; it permits you to compile modules and later link them into a single large program. However, Turbo Basic's support for INCLUDE files permits testing and debugging of large programs one module at a time. After the modules are debugged individually, they can be combined with the main program via INCLUDE statements and re-

compiled as a single large program. This approach may prove unwieldy for professional software developers, but I suspect it will appeal to many BASIC programmers. —Dennis Dykstra

Evidence Master on Trial

We commend you for the fine review of the Evidence Master litigation support system [From the Software Shelf, PCW, June 1987], but we'd like to correct three errors.

First of all, an important feature of the program is that data

(continues)

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entry errors will *not* cause information to be lost. *Evidence Master* produces a report that enables users to spot errors quickly, and the sorting routines sort all data correctly, even if queries are mistyped. We stress this point because in some programs information entered incorrectly really is lost forever.

Also, the California Continuing Education of the Bar is the California distributor for the program, but San Francisco Legal Systems developed the program and retains national distribution rights. Finally, *Evidence Master* is not copy protected.

Christopher N. Visher
President
San Francisco Legal Systems
San Francisco, California

Your corrections regarding Evidence Master's distributor and copy protection status are duly noted. However, whether the program "loses" data that isn't entered correctly is a closer call. We entered a summary in which we deliberately misspelled two names in the name fields; one had the first letter wrong, the other, the last. We then asked for a report of every document in which the name—spelled correctly—appeared in the name field. The test summary wasn't included in the report.

The method Mr. Visher suggests will work, but if a misspelled name appears among hundreds of others, it's still very hard to spot. Mr. Visher says that a future version of Evidence Master may offer error trapping during data entry.
—Ed.

1.2MB Drives, He Said

Tsk, tsk for telling your readers that installing a 1.2MB drive in PCs, XT's, or compatibles is impossible without an 8/16-bit slot [Consumer Watch, PCW, September 1987]. Several mail-order

(continues)

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PC Magazine
September 15, 1987

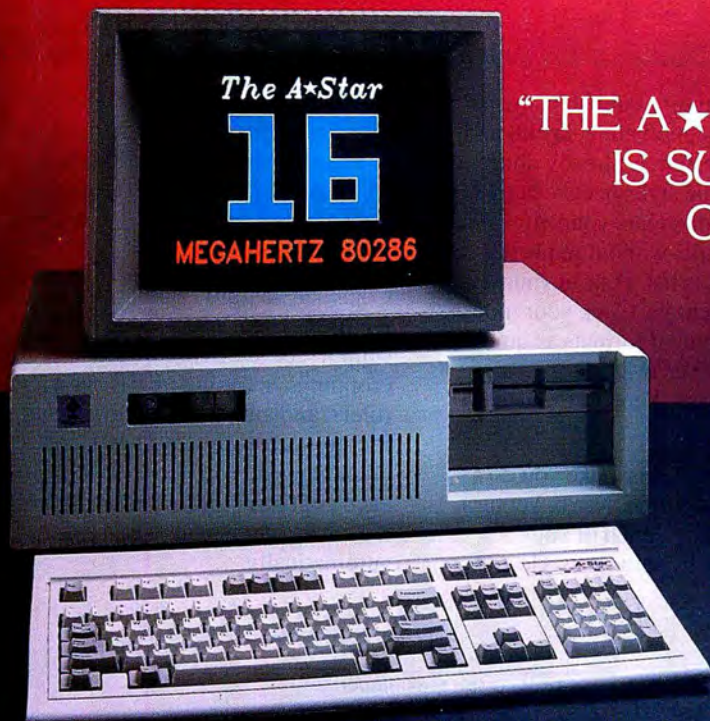
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The Adventure Begins

This trip really began in September last year when Gerry won first prize in a raffle at the Medical Center which Rush-Presbyterian-St. Luke's Medical Center holds every year. The prize was two round trip tickets to Hong Kong on United Airlines, and ten nights in the Hong Kong Hyatt Hotel. Analyzing our good fortune, we concluded that we wanted to do more than spend ten days in Hong Kong and return, but at the same time, United, having just gotten its routes and equipment from Pan American, had not yet received authority to fly to other destinations or between points in the Far East.

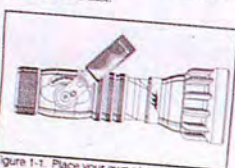


Figure 1-1. Place your own picture in this frame.

The Adventure Begins

On February 10th, United acquired this authority, and on February 11th Debbie began putting our trip together. We left on March 2nd and returned on March 26th. We entered seven countries, traveled over 25,000 miles on four airlines, made over 500 Kodachrome slides, almost 200 Kodacolor prints, and 5 1/2 hours of color and sound videotape.

Chicago to Tokyo

11:03 P.M. Chicago time. 30,000 feet somewhere over the Western Pacific, we are 8 hours and 42 minutes out of Los Angeles with about 2 more hours to go to Tokyo. We were about an hour and ten minutes late out of Los Angeles.

Travel Log

So far, it's been a long and interesting day and I guess it's just about half over. We did the following:

- Arose at 5:30 A.M.
- Left the house at 7:00 A.M.
- Arrived in Los Angeles at 12:35 P.M.
- Arrived in Tokyo at 11:46 P.M.

Chapter 1

The Adventure Begins

This trip really began in September last year when Gerry won first prize in a raffle at the Medical Center which Rush-Presbyterian-St. Luke's Medical Center holds every year. The prize was two round trip tickets to Hong Kong on United Airlines, and ten nights in the Hong Kong Hyatt Hotel. Analyzing our good fortune, we concluded that we wanted to do more than spend ten days in Hong Kong and return, but at the same time, United, having just gotten its routes and equipment from Pan American, had not yet received authority to fly to other destinations or between points in the Far East.



Figure 1-1. This picture has very little to do with this story. You might want to place a more appropriate picture in this frame.

On February 10th, United acquired this authority, and on February 11th Debbie began putting our trip together. We left on March 2nd and returned on March 26th. We entered seven countries, traveled over 25,000 miles on four airlines, made over

Presenter's Name
Presenter's Organization

Topic is the Most Important

- Use line breaks to add space vertically
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- Another subtopic
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Circle 25 on reader service card

houses sell a 1.2MB drive controller card that replaces the original 360K card and mounts in a normal slot. Works just fine.

Jules D. Jettelson
Thomaston, New York

PC-Write Gets DCA

Thanks for the *PC-Write* review [*From the Software Shelf*, PCW, August 1987]. Now there's good news on the compatibility front for *PC-Write* users: For the past five months a DCA-RFT conversion utility has been available for \$29.

We were surprised you felt *PC-Write*'s on-screen display "barely resembles its printer counterpart," since the program displays true line and page breaks, justified text, and bold and underlined text. Forthcoming versions will feature concealable dot lines, more dramatic page breaks, and a menu for dot lines and fonts. Perhaps these enhancements will make a difference to eagle-eyed reviewers.

Bob Wallace
President
Quicksoft, Inc.
Seattle, Washington

Dollars and Sense

It's enough to turn Big Blue red. Figure 1 in "A PC Genealogy" [PCW, August 1987] labels IBM Personal Computer sales for 1981 in dollars. Wrong. Sales were in units. Thus, IBM didn't make \$35,000 from PC sales that initial year—it sold 35,000 units. Had IBM sold only \$35,000 worth in 1981, there'd be no PCs today and probably no *PC World* either. We regret any confusion the mislabeling may have caused. —Ed.

Tag Team Word Processing

For editing en masse, you can get more information about *CompareRite* ["Author, Author, Author!," PCW, August 1987] from JuriSoft, Inc., at 763 Massachusetts Ave., Cambridge, MA 02139, 617/864-6151, 800/262-5656.

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

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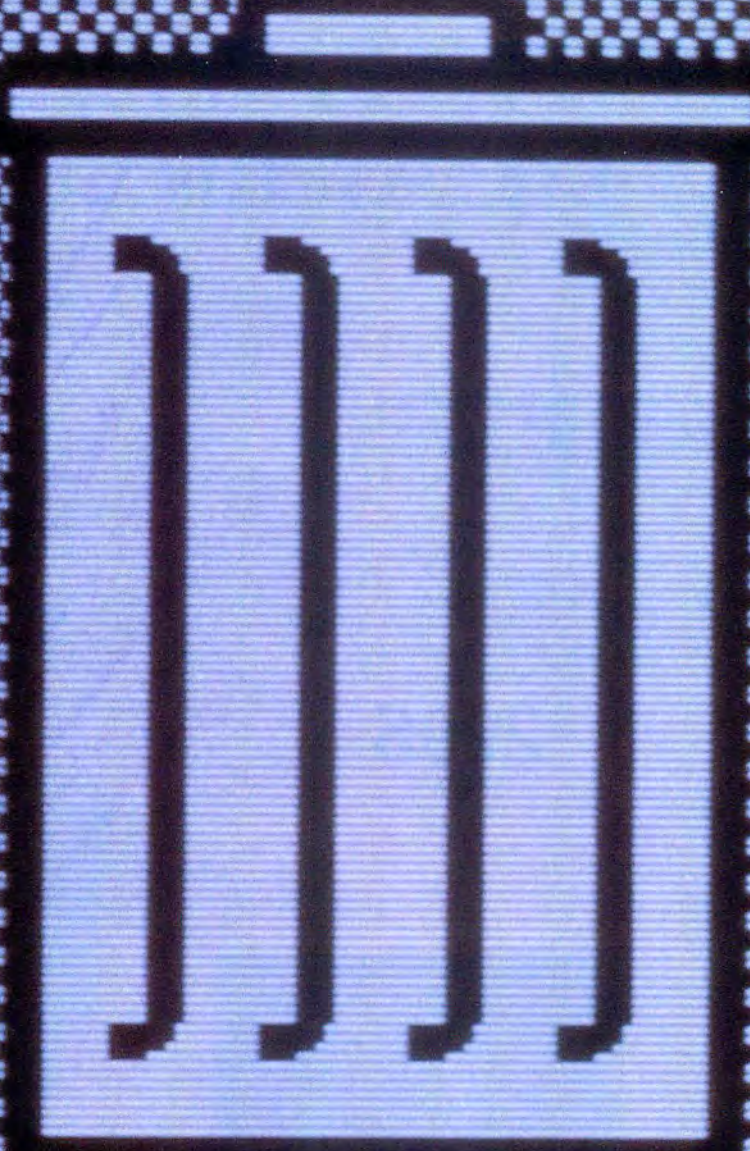
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Richard Landry

Rivals and allies large and small prove there's more than one way to go beyond 640K.

Good News for DOS, Bad News for IBM

I recently went to two parties that celebrated the continuing long life of DOS, and guess who I missed at each of them? IBM.

Why was Big Blue unavailable for two of the most significant industry events of the year? Perhaps because the software and hardware developers who hosted these parties are making it likely that you will want to wait a while before moving over to OS/2. And to IBM, that's just plain bad news.

Take Microsoft's party in honor of its new program, *Windows/386*. At this press extravaganza, Bill Gates flashed a diagram on the wall showing two paths to a future 386 operating system that will ultimately replace OS/2. One route, the "end-user path," showed personal computer users upgrading to *Windows/386* before moving on to this future operating system, "OS/2 386." The other route, the "ISV (independent software developer) effort," showed software firms first building OS/2 applications, then later, OS/2 386 software.

Some in the crowd couldn't help but notice what the diagram

seemed to hint: that many personal computer users will find it more sensible to buy 386 systems and extend them with *Windows/386* than to make an investment in OS/2 software that may turn obsolete when OS/2 386 appears. One particularly sharp editor took the diagram a step further, redrawing it in his notepad and replacing the words "ISV effort" with "IBM's plan." "That's where IBM wants to catch everybody," he said, penciling in the words "OS/2 Extended" below.

IBM has a big stake in selling OS/2 to the business market. That's because the PS/2 and OS/2 represent both legs of a strategy aimed at dressing large corporations in Blue livery from top to toe. OS/2 Extended offers IBM the opportunity to tie the new operating system's communications and data base extensions directly to the giant's own hardware, making it fruitless to buy any compatible, no matter how well built or powerful. If you wanted to use

(continues)

OS/2 Extended, there's a good chance you'd be better off with a PS/2 Model 50 than a Compaq Deskpro 386, despite the Model 50's 286 processor and slow hard disk. So it's no wonder that IBM would skip an affair where Compaq vice president Mike Swavely would toast: "Open, independent industry standards are the best short- and long-term answer for PC users. They provide freedom of choice and security of investment."

Why is *Windows/386* a threat to IBM's plans for OS/2? And why would Microsoft introduce a product that competes to a degree with an operating system it designed? If you look beyond the rather narrow capabilities that OS/2 Extended will provide—communication with IBM mainframes and data base applications—then you see that the most important feature OS/2 itself brings to the party is its ability to use more than 640K of memory for multitasking and large applications in 286 protected mode.

Windows/386 also can run a number of applications simultaneously—multitasking—and it fully protects each application from the others by using the 386 chip's virtual 86 mode. That means no collisions among applications—in short, a "protected mode." Furthermore, any program that's so designed can take advantage of expanded memory as well, permitting applications to grow well beyond the 640K limit. Here's the catch: You'll need a 386 system,

not a 286 or 8086; but you'll be able to run all the DOS applications that you now own, such as *1-2-3* and *dBASE*, without upgrades or modifications.

Although Microsoft has a big stake in OS/2, it's got a longer-term investment in making sure that the PC standard is defined by

Quarterdeck nevertheless pitched the story that it alone has the guns to shoot down OS/2 before the new operating system gets off the ground.

The latest version of *Desqview*—the multitasking operating environment reviewed in this issue—supports the 386 chip's superb

Why would Microsoft introduce a product that competes to a degree with an operating system it designed?

its own operating system family, not by anyone else's add-ons or hardware. If big business follows IBM down a path that strays too far from Microsoft's operating system turf, then Big Blue may find itself in the enviable position of controlling the standard for several years to come. With Compaq leading the pack, a host of compatibles manufacturers are also joining forces to keep the standard open. So they're all producing 386 systems and licensing *Windows/386*.

Meanwhile, at the other event IBM failed to grace, a company much smaller than Microsoft suddenly found itself with the tools to offer multitasking at a lower cost than either OS/2 or a 386 system.

Quarterdeck Office Systems' *Desqview* turned out to be the secret life of a party thrown in honor of the new Lotus/Intel/Microsoft (LIM) expanded memory specification 4.0. Dwarfed in a room crowded with heavyweights Microsoft, WordPerfect, Lotus, Borland, AST, and Intel,

memory-management capabilities. But using the new LIM 4.0 spec, *Desqview* can also perform background processing in expanded memory on 8088 and 80286 systems running DOS—a claim that Microsoft just can't make for *Windows/386*. Furthermore, Quarterdeck says *Desqview* will soon operate with the new DOS-extender technology that's being incorporated into products like Borland's *Paradox* to further boost their access to memory beyond 640K (see "Great Extenders," *Industry Outlook*, in this issue). But according to Microsoft's Gates, it's physically impossible to use DOS-extender technology with *Windows/386*.

Windows/386 is intended to become an industry standard with broad support from hardware manufacturers like Compaq, Zenith, Wyse, AT&T, and PC's Limited; it's elegantly designed to

(continues)



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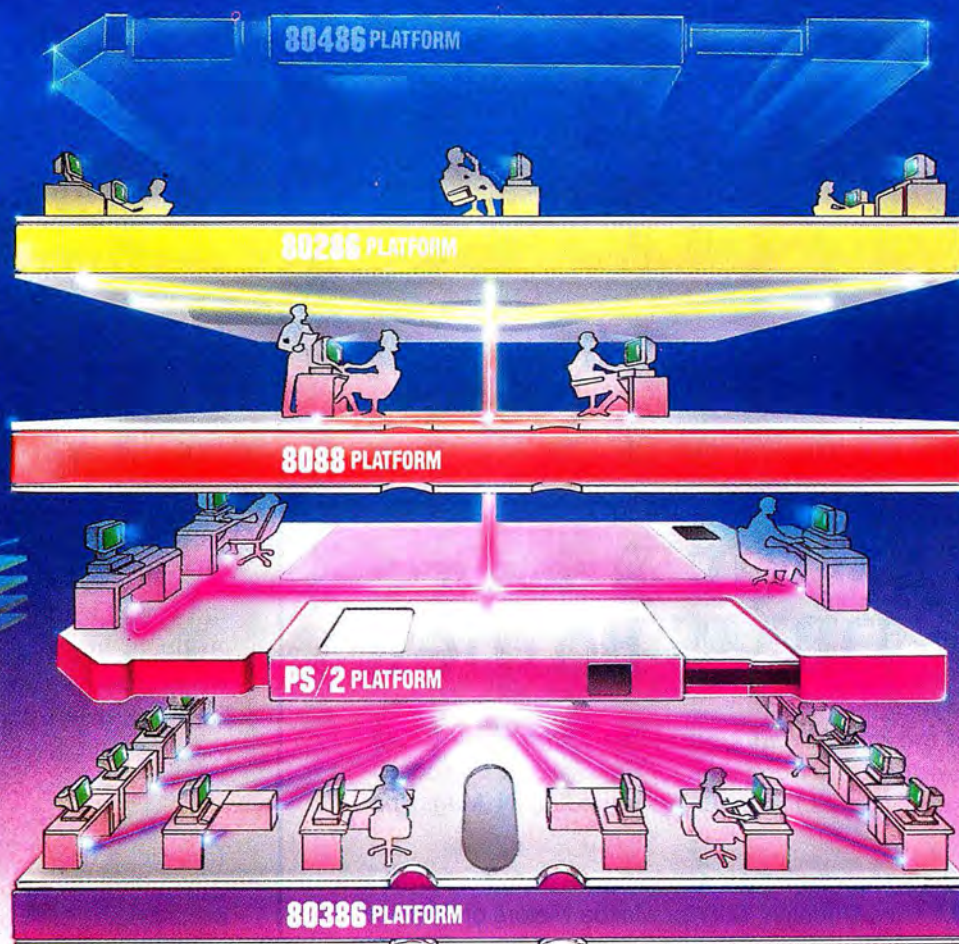
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handle even the most ill-behaved application, and it reinforces the trend toward 386 systems and graphic user interfaces. Ever since its introduction, *Desqview* has had to grapple with ill-behaved applications one at a time; but it has the common sense to run on all DOS-based systems and the smarts to take advantage of the newest personal computer innovations around. Will either product win your vote as the OS/2 alternative of 1988? I know one industry giant that's dying to find out.

This issue of *PC World* takes a close look at some of the products, trends, and issues that will shape personal computing in 1988. While industry observers continued to raise doubts about IBM's new personal computer line, *PC World* editors Eric Bender and Karl Koessel and I went directly to the IBM labs at Boca Raton, seeking answers to some of the questions surrounding the PS/2 and OS/2. We conducted two days of interviews with the top PS/2 designers and emerged with the insights you'll find in the article "Why Buy a PS/2?" About the same time, *PC World* senior editor Eric Knorr checked into National Software Testing Laboratories to observe the PS/2 Model 80 run a gauntlet of tests that measured the role of disk caching in the performance of Big Blue's hottest PC. You'll find the results in his review, "A Model for the '80s."

(continues)

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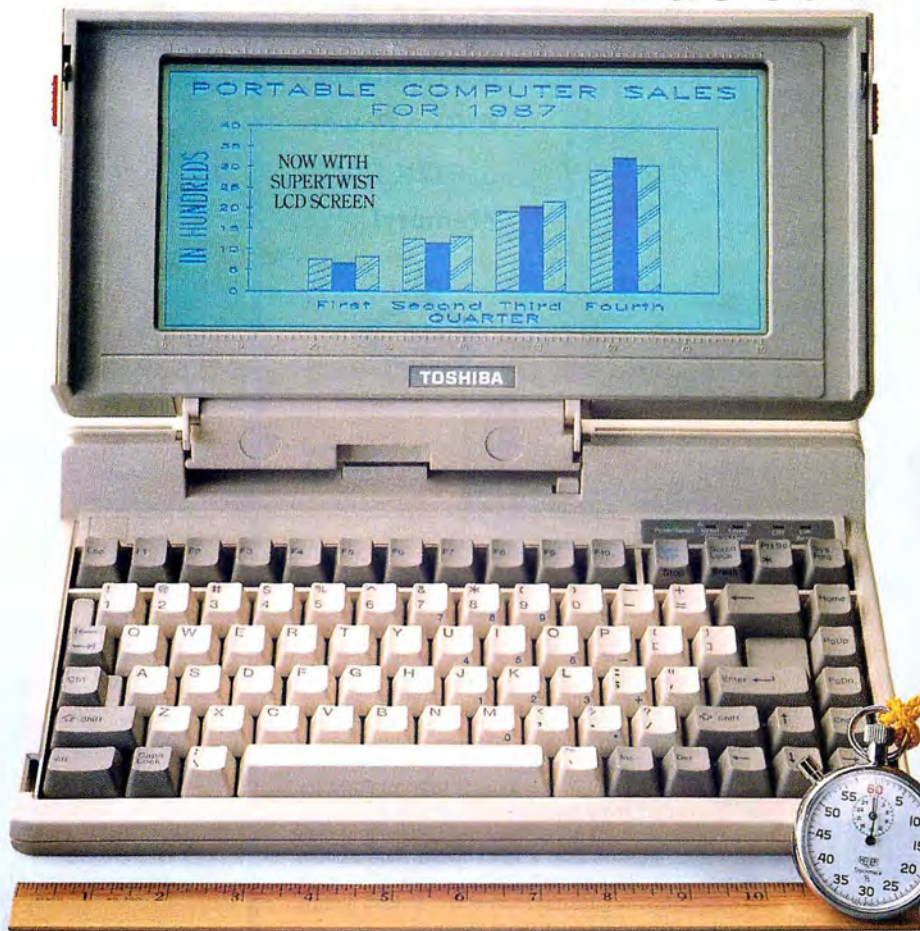
Circle 210 on reader service card

Our analysts also take a moment to peer into the crystal ball at 1988's budding issues. While Will Zachmann wonders aloud who will win the coming OS/2 communications battle between IBM and Microsoft, Stewart Alsop does a reality check on the argument that it's OK to buy 286-based systems for the next few years. And in his first column for *PC World*, Framework designer Robert Carr looks at whether there will be life after OS/2 for TSRs like *SideKick* and *Metro*.

Finally, don't miss our year-end coverage of mass-storage products, including senior editor Robert Luhn's review of 100MB + hard disk drives and associate editor Michael Goodwin's roundup of removable media alternatives. I'm sure you'll also enjoy the How To articles from Michael Goodwin and personal computing guru Peter Norton on setting up your hard disk and automating its use with batch files.

As always, I'm interested in your comments on these or any other subjects. You can write to me at *PC World*, 501 Second St., San Francisco, CA 94107; or send an MCI message to Richard Landry/301-3685. ●

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Stewart Alsop

Sometimes, bucking conventional wisdom is the only way to go.

Why You Shouldn't Buy 80286 Machines Anymore

Is the computer industry telling the truth? With IBM and Microsoft in the lead, the industry has been telling us that it's okay to buy computers based on the 80286 processor because it will remain the mainstream processor for years to come.

On the surface, the industry would seem to be telling the truth. After all, computer manufacturers and software developers understand the 80286. It's been more fully tested and debugged than the 80386; it's been licensed by Intel, which means that multiple sources provide competition, driving prices down; and, generally speaking, it seems adequate in both speed and design.

The problem is that most of the people who run the leading companies in the industry would privately admit that the 80286 is, to paraphrase Steve Jobs, a brain-damaged processor.

You can't really blame Intel for the mistakes it made with the 80286, since the chip's basic design was set even before IBM introduced the original PC. And Intel couldn't have foreseen how

popular that computer would become and how important upward compatibility would prove to be. But when it designed the 80286, Intel made a basic mistake. It gave the 80286 two incompatible operating modes: real mode (which means that it operates the way an 8088 or 8086 operates, but with a more efficient design) and protected mode (which means that it operates completely differently than the 8088 or 8086). Real mode was intended to maintain compatibility with DOS; protected mode was intended for more powerful operating systems like UNIX. The problem is that real mode doesn't give DOS a way to acquire new features or capabilities, yet DOS can't be used in protected mode without being completely rewritten.

There are two ways to solve this problem. Either you accept the 80286 for what it is and design a

(continues)

new, incompatible operating system that can still somehow run old applications as they are run today. Or you fix the chip that caused the problem in the first place.

appropriate system software (such as *Desqview*, *Windows 386*, or *PC-MOS/386*), would allow you to begin using more than one of your existing programs at a time. It would let you grow into using a

around that chip. IBM has done that, I think, because it doesn't want to admit that it made a mistake in introducing the original 80286-based machine, the PC AT, or that it sold a flawed machine to nearly a million people. As a result, IBM is in the process of introducing a largely incompatible operating system: OS/2. This operating system will require anybody who wants to use the new applications that are being developed for it to switch from DOS to OS/2, replacing all of their DOS applications with those written for the new operating system.

Although most users won't really need to make that switch for several years, this basic conflict is causing anguish among those who have to plan major purchases for companies and those who are designing software products for delivery in the next year or two. In essence, it seems that IBM's decision to continue to focus on the 80286 processor as the mainstream chip isn't gaining the support of the industry. Consider these two facts:

- Microsoft itself is no longer buying new 80286 computers. And it is passing those it already has down the line, so that the kind of computer considered mainstream at most companies is now considered obsolete at the

IBM doesn't want to admit that it made a mistake in introducing the original 80286-based machine—the PC AT—or that it sold a flawed machine to nearly a million people.

When Intel set the specifications for the 80386 chip, it decided that it might as well fix the original problem. So it gave the 80386 four different modes: two to maintain strict compatibility with real mode and 286 protected mode and two more to provide a growth path—the 386 protected mode and a new virtual 86 mode. The virtual 86 mode is fascinating: It allows DOS to be extended so that multiple sessions of DOS can run at once. That means users can work with more than 640K of memory and run more than one task at the same time under different copies of DOS.

More important, virtual 86 mode exists on the 80386 along with protected mode. As far as I can tell, the 80386, along with the

real, protected, multitasking operating system without forcing you to give up your old software, which is what OS/2 requires. But that's at least three years off. By 1990 or so, you would have one operating system (something like OS/2 integrated with a control program like *Desqview*, *Windows 386*, or *PC-MOS/386*) that would permit multiple, isolated sessions of DOS, each running a single DOS application, and also encompass an integrated, protected, multitasking operating system that would run new applications with great new features and capabilities. That would give you the benefit of using multiple, existing applications while gradually adopting new applications that run in the multitasking system.

But, for a variety of reasons, IBM decided to accept the flaws of the 80286 and base much of its product development and marketing strategy on machines designed

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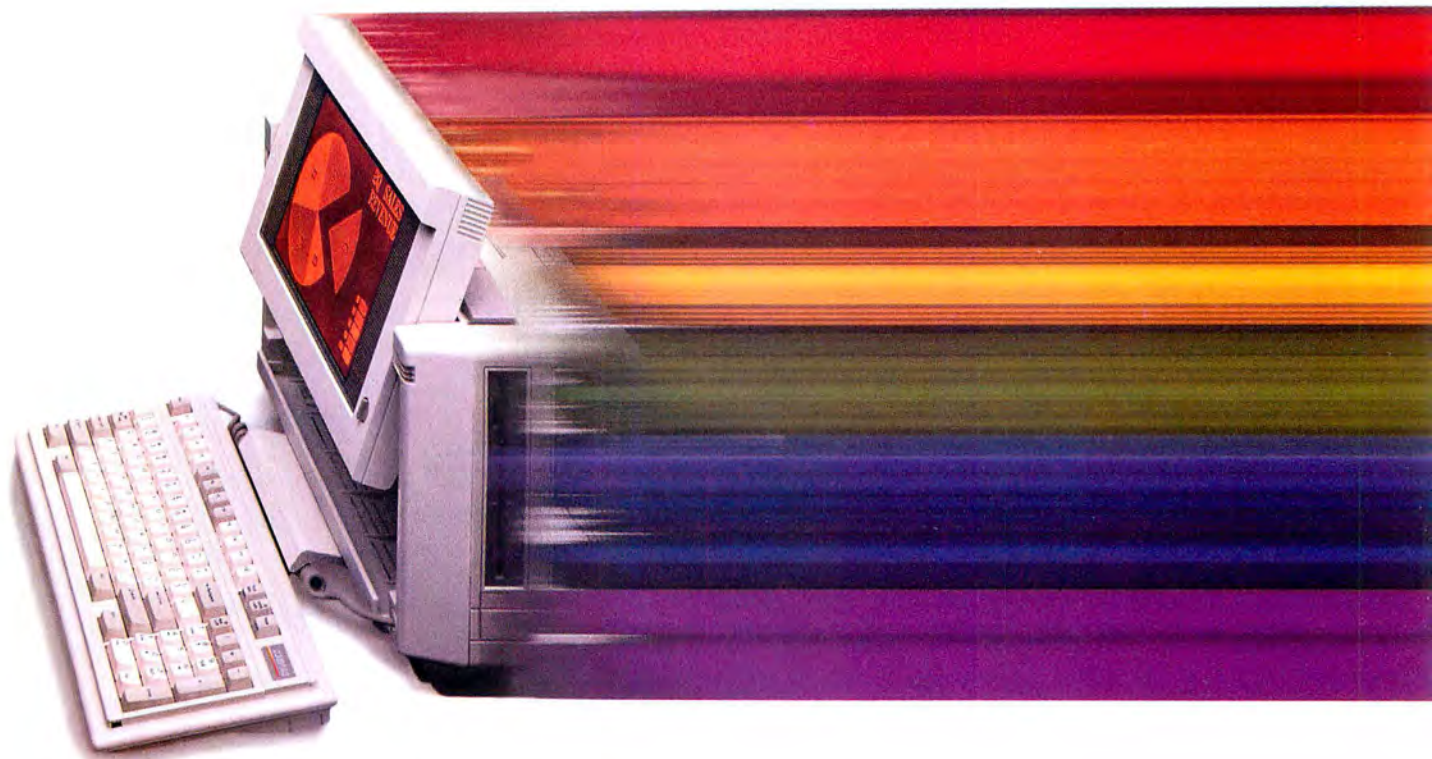
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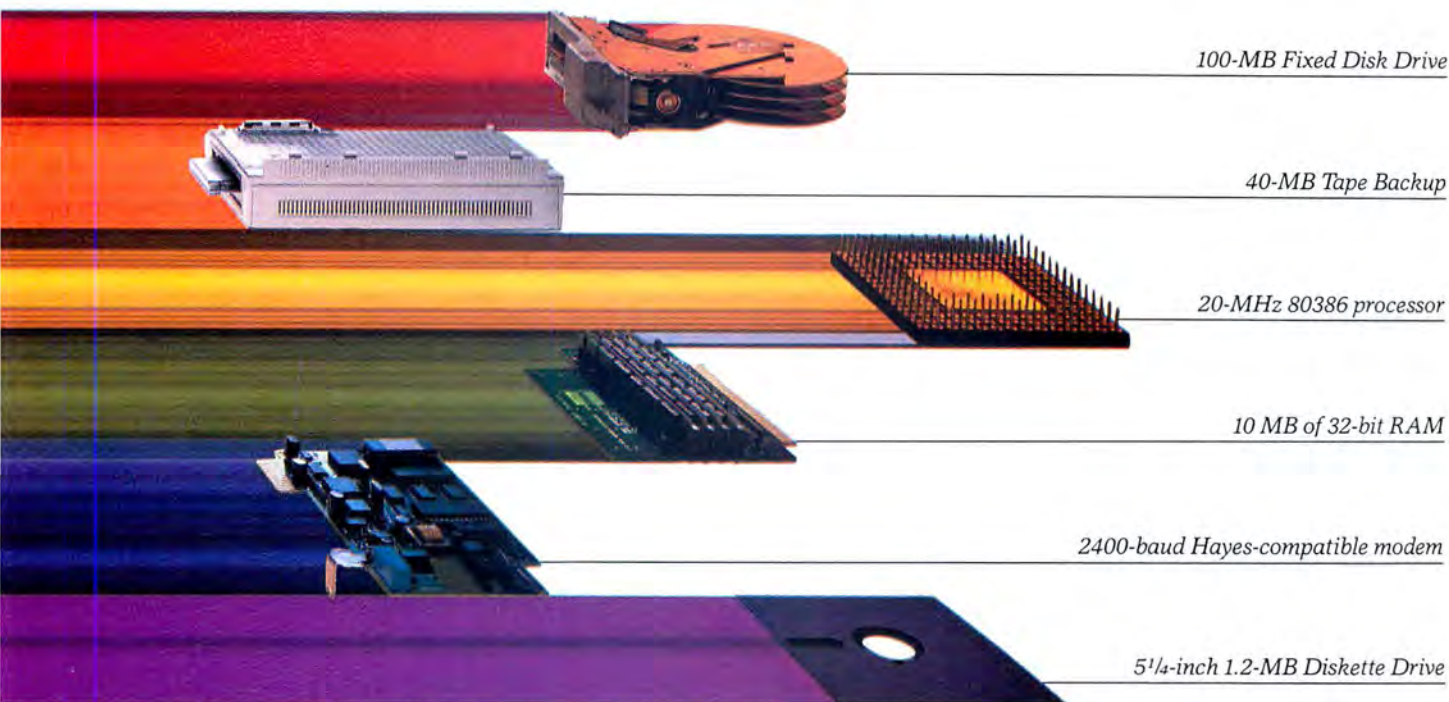
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company most responsible for developing the machine's system software.

• Compaq, the company responsible for defining PC compatibility, is working as fast as it can to become the first company to sell mostly 80386-based computers, even though 80 percent of the computers it sells today are built around the 80286 processor. Compaq also recently announced an agreement with Microsoft to bundle *Windows 386* with its new 386 systems for a limited time.

Even Pete Peterson, executive vice president (sort of chief operating officer) at WordPerfect, wonders why IBM is requiring its users to upgrade to an incompatible operating system (OS/2) instead of providing a compatible hardware upgrade path. "If Apple can produce a hardware upgrade to make a IIe into a IIGS, then IBM should be able to offer a hardware upgrade for ATs, 30s, 50s, and 60s," Peterson says.

You know what I would do if I were responsible for buying PC compatibles for my company? I would follow Microsoft's lead. Unless you're really stuck on IBM, you can find good, solid 80386-based computers for decent prices from companies like Dell Computer and Tandy. If you're willing to pay a premium, you can get very-high-performance 386 machines from Compaq and AST Research. And you can also get 386 machines with a new, theoretically high-performance bus

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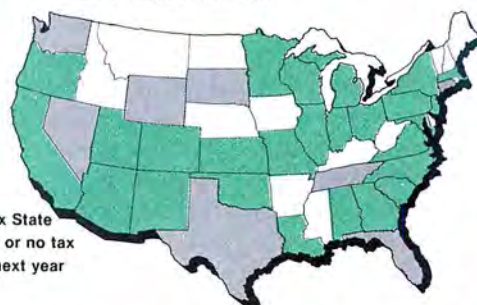
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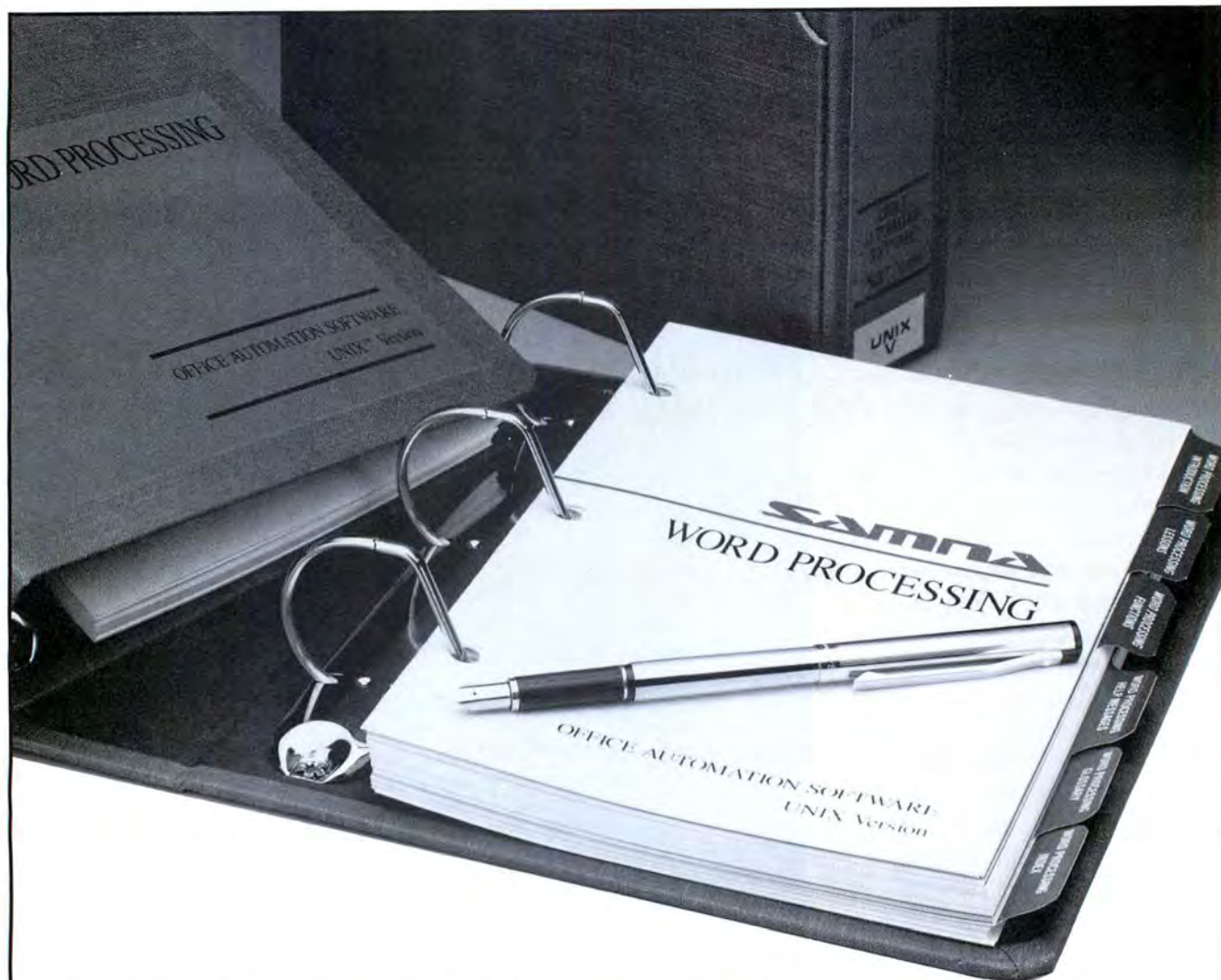
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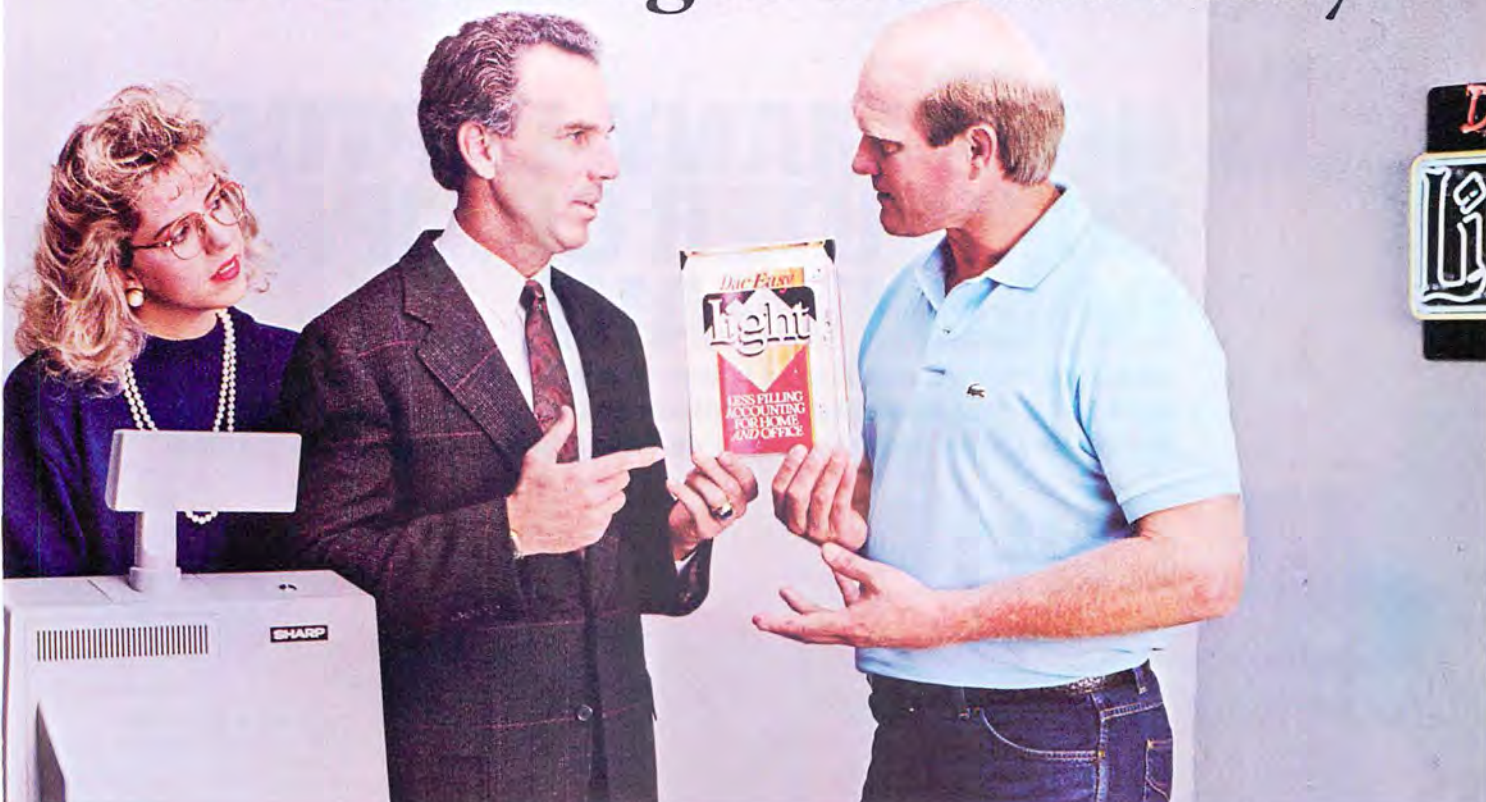
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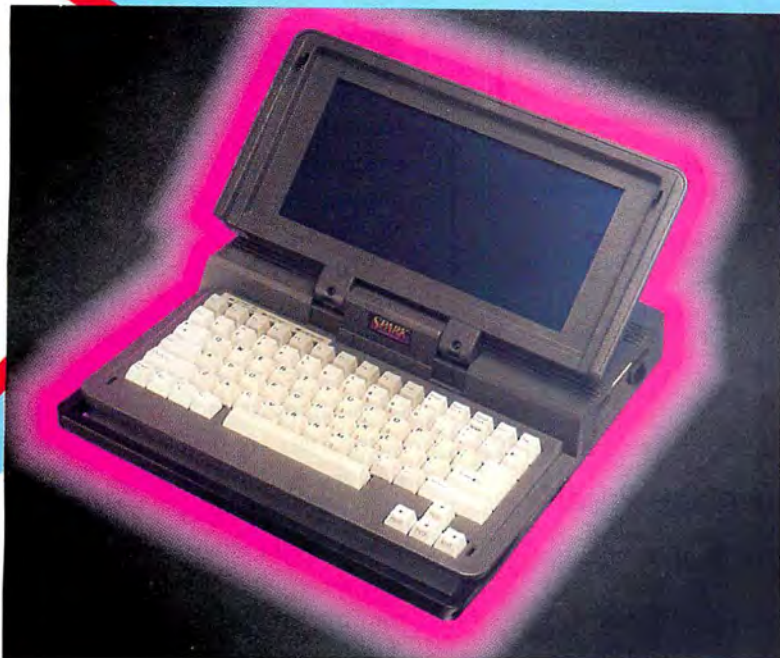
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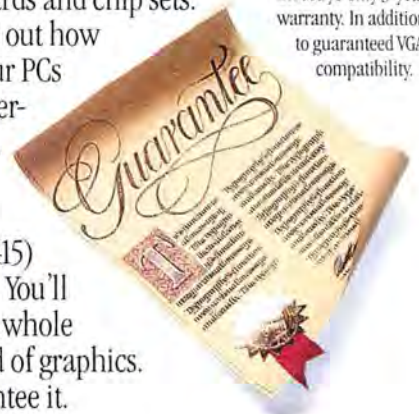
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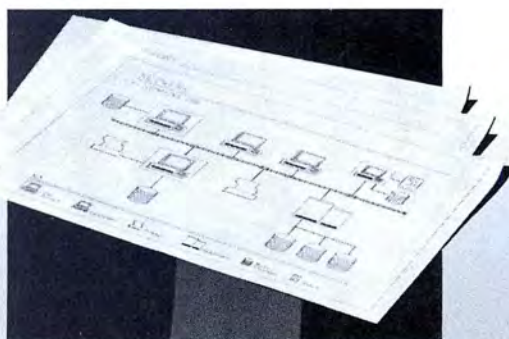
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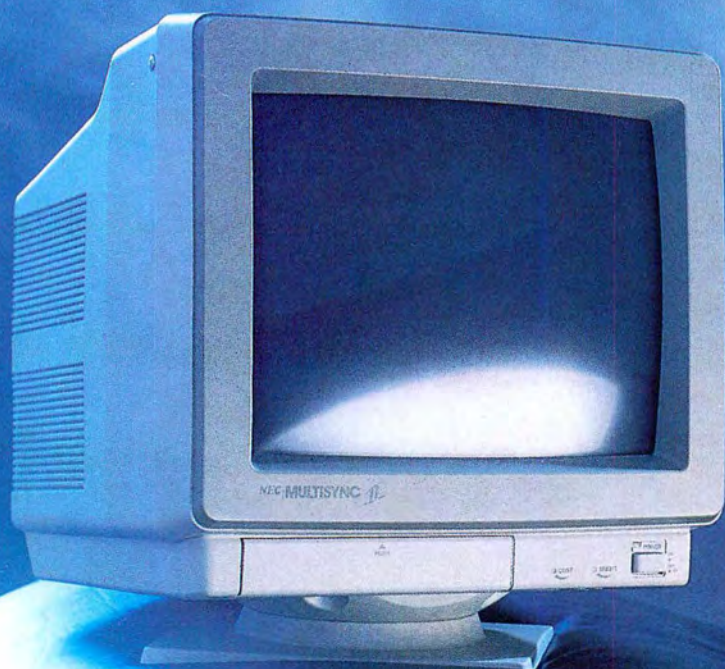
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Circle 163 on reader service card



William F. Zachmann

On IBM: The Connectivity Battle Ahead

A battle is on the OS/2 communications horizon. The combatants, IBM and Microsoft, will vie for users' loyalties by flexing their considerable technological muscle.

Perhaps the biggest OS/2 battle of all will be fought over how to network OS/2 systems. This isn't just an OS/2 issue. The larger conflict will be over which would-be standard will win out. The battle involves network software standards generally, but the most important theater of operations by far is local area networks. The outcome will be important to IBM as well as to all the other vendors in the market.

For the foreseeable future, local area networks are the most important new communications technology. New long-distance and metropolitan network alternatives are important, too, but they are essentially better, faster, and cheaper ways of doing the sorts of things that are already done.

Local area network technology takes us one step further. It is an area of innovation that introduces a new and qualitatively different element to PC connectivity. It provides an essential foundation on which future information systems will be built. It opens the door to

system architectures that will differ radically from those of the past and present. It creates the conditions for the development of entirely new kinds of systems.

LANs provide important advantages over the older options for data communications within a building or campus environment. They can also make it much easier to connect terminals, personal computers, or other workstations to one or more computer systems in flexible configurations. Local area networks also speed data communications, easily handling faster data-transmission speeds than those currently available through telephone systems.

The real value of a LAN, however, is that it can help build a large and powerful system using inexpensive, modular, microprocessor-based components. In this respect, the LAN is not merely a communications medium. Instead, it functions as an extended system

(continues)

bus, enabling workstations and servers to work together in much the same way that the expansion bus in an IBM PC AT or compatible (or the Micro Channel bus in a PS/2) enables different disk, video, and communications cards to work together.

Users may face a crucial decision, however: Which networking extensions of OS/2 should they use to obtain the maximum benefit from LAN technology and the distributed-resource system architectures it makes possible. This decision will be all the more diffi-

6.2 and PU 2.1. These are logical and physical units defined within IBM's SNA to take advantage of some of the capabilities of LAN technology. Unfortunately, the peer-to-peer extensions of SNA typically carry their history with them in the form of extraneous overhead. Current software that implements LU 6.2 on PCs, for example, places much more demand on system resources than local area network software from third parties typically does.

Microsoft's approach is quite different. The OS/2 LAN Manager is a straightforward implementation that is upwardly compatible with Microsoft Networks 1.0 and 2.0 and NETBIOS. It is explicitly designed to enable software processes in different workstations and servers to communicate in much the same way they would if they were all on one system.

OS/2 offers a rich set of options for interprocess communications. These amount to ways in which active programs running in the OS/2 multitasking environment can talk to one another. Unlike electronic mail or terminal communications, interprocess communications takes place behind the scenes, without the user's participation.

For example, a spreadsheet program might need to access data kept by a data base management program. OS/2's multitasking, combined with its interprocess communication tools, makes it possible for the spreadsheet program to communicate with a separate data base program to obtain

(continues)

With networking extensions to OS/2, IBM and Microsoft have apparently come to a parting of the ways.

By combining personal computers and larger, more capable microprocessor-based servers over a local area network, users can build systems with the power of minicomputers and even mainframes. In this way the low cost of microprocessor-based systems can be applied to ever bigger applications. With the ability to deliver a million instructions per second still costing a hefty \$100,000 on a mainframe but as little as \$1000 on a micro, there are compelling economic reasons to go with microprocessor-based servers whenever possible.

The multitasking capabilities of OS/2, combined with powerful microprocessors like the Intel 386, make it a natural choice for newer, more powerful servers. OS/2 will provide the underlying operating system environment for data base servers, AI/expert system servers, computational servers, and increasingly powerful general-purpose servers.

cult if Microsoft and IBM offer what amount to competing alternatives.

With the OS/2 Presentation Manager, IBM in effect accepted Microsoft's *Windows* as a common standard, but with networking extensions to OS/2 the two companies may have come to a parting of the ways.

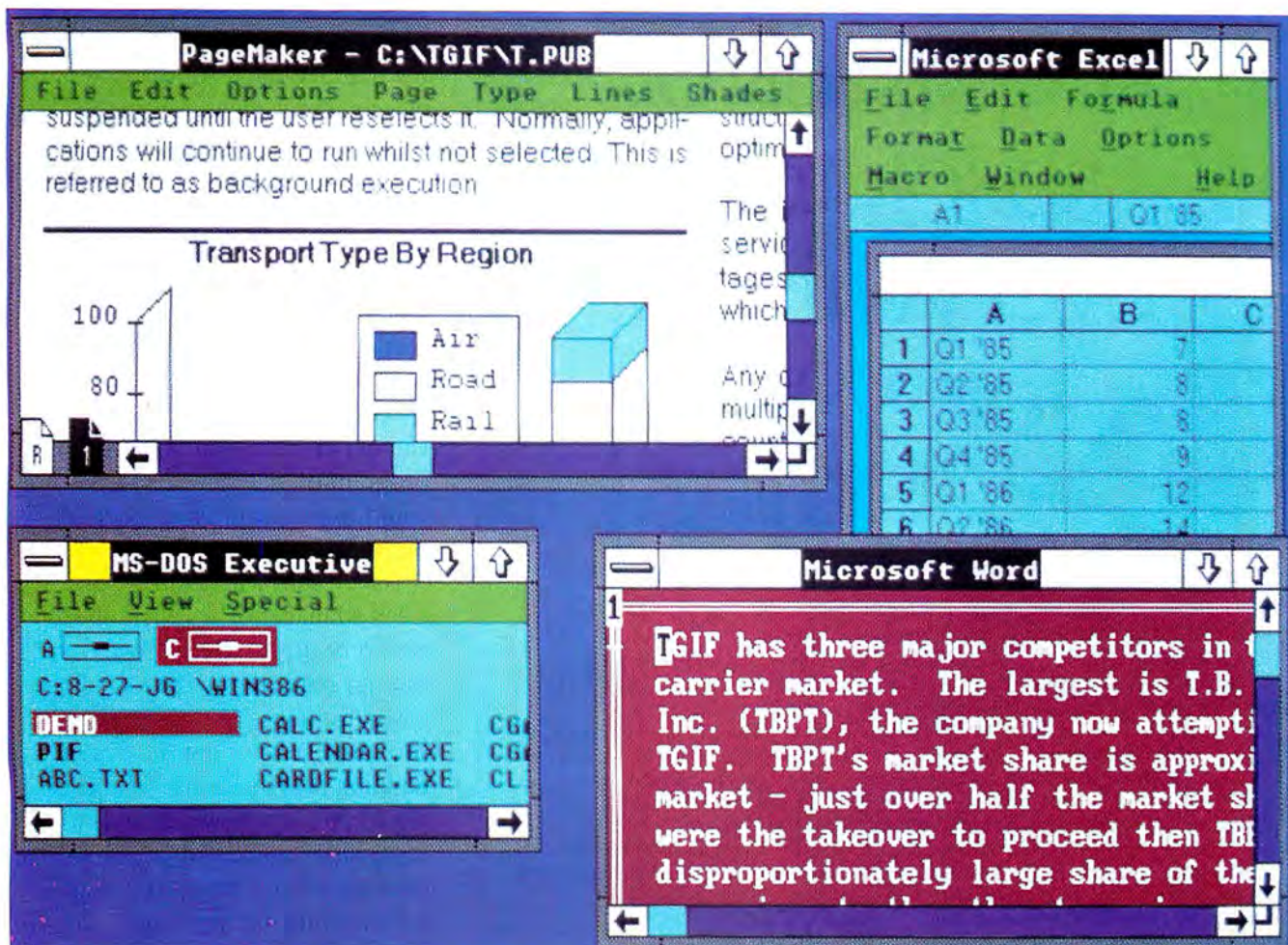
IBM's OS/2 Extended Edition Communications Manager and Microsoft's OS/2 LAN Manager basically represent different philosophies of networking. IBM's OS/2 Communications Manager is primarily oriented to the traditional data communications model embodied in IBM's systems network architecture (SNA). Microsoft's OS/2 LAN Manager is specifically designed to maximize the new architectural opportunities created by local area network technology.

With its traditional data communications perspective, IBM approaches these new opportunities indirectly through peer-to-peer extensions to SNA that have forbidding sounding names like LU

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the required data. All this takes place without the user being directly involved.

Microsoft's OS/2 LAN Manager extends key OS/2 interprocess communication facilities to processes running on other systems, whether they are servers or other workstations. In this way (to use the previous example), a spreadsheet program on one machine can obtain data from a data base program on another as easily as it could from a data base program on its host system.

As a result, Microsoft's OS/2 LAN Manager offers what promises to be an extremely powerful tool for maximizing the incredible cost advantages of microprocessor-based systems and servers in building big-league applications. OS/2 applications will be able to easily share work with applications on other systems as if they were running on the same machine.

If your main concern is simply to get personal computers to act like terminals to a mainframe, IBM's Communications Manager may be the way to go. But if you really want to take advantage of the superior price/performance ratios as well as the power and flexibility that the most modern technology offers, Microsoft's OS/2 LAN Manager will likely provide most users a far more direct alternative. Unless, of course, IBM decides to incorporate Microsoft's LAN Manager after all. ●

William F. Zachmann is vice president of research at International Data Corporation.

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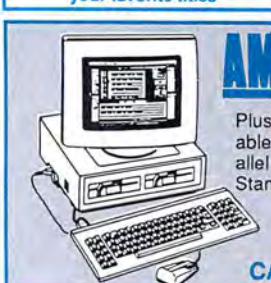
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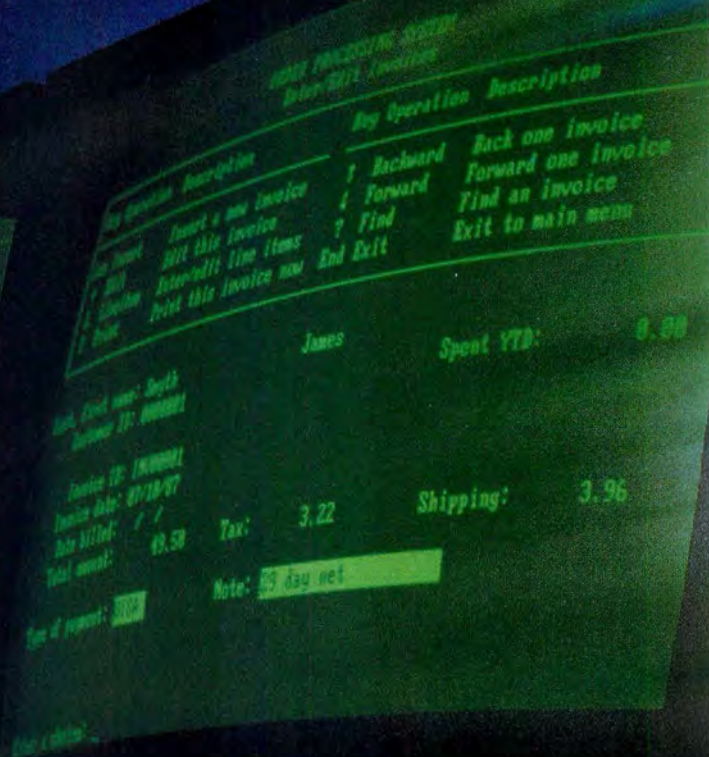
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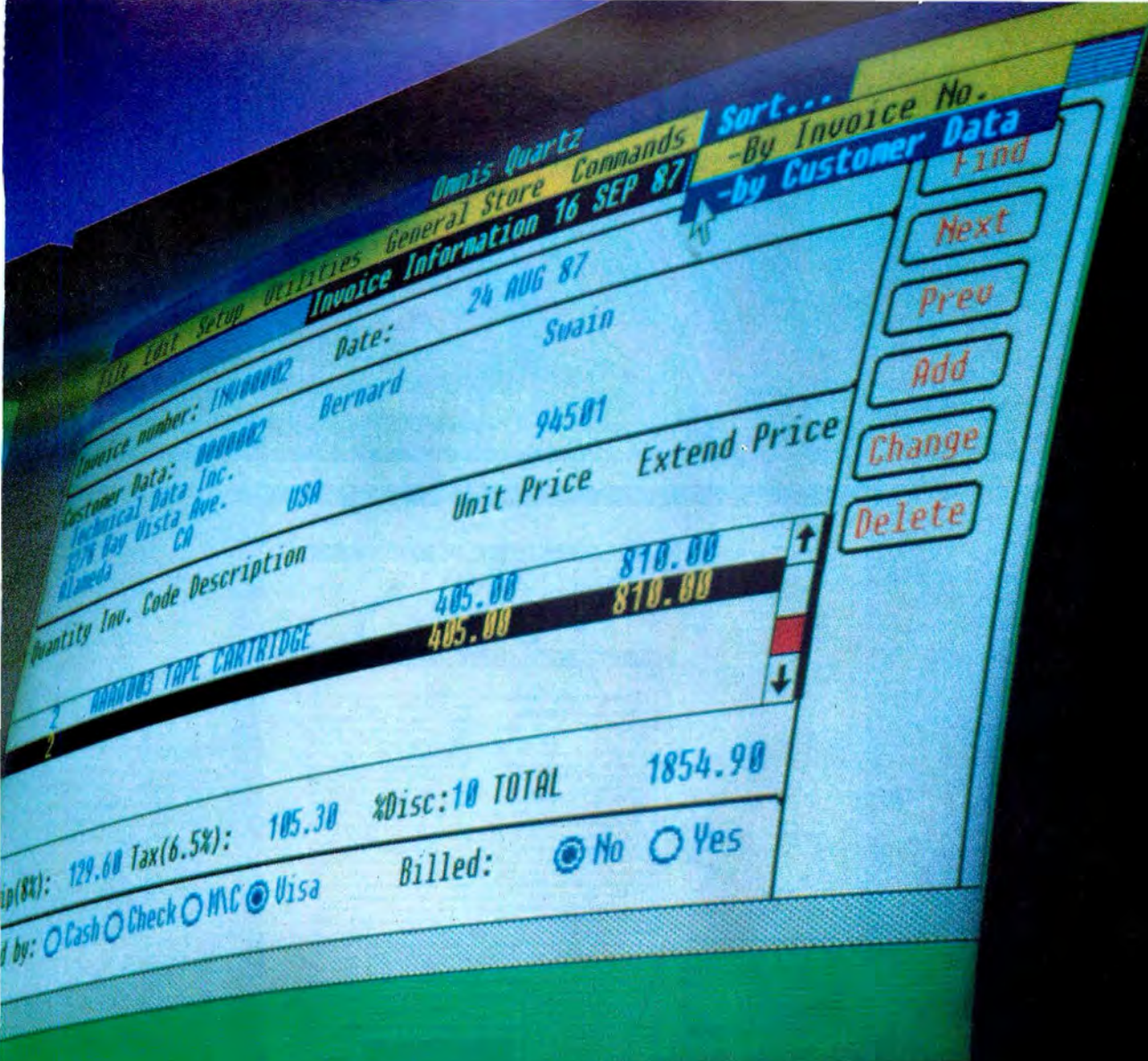
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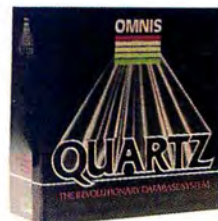
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N.e.w.s

ZSoft Announces New Windows Products

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

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

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

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

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

IBM PS/2 Fully Supported

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

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

Publisher's Paintbrush supports the new 8514A display adapter for the models 50, 60, and 80 in 640x480 256-color and 1024x768 256-color modes!

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

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

ZSoft Corporation can be reached by phone at (404) 980-1950, or by mail at 1950 Spectrum Circle Suite A-495, Marietta, Georgia 30067.

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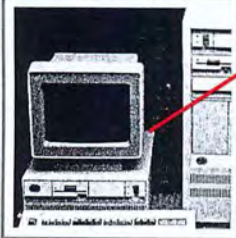


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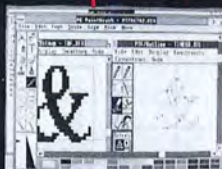
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Top of the News

AST Strengthens Board and System Lines

AST Research is readying four product lines that demonstrate how its board-making expertise helps its system design, and vice versa. In December, AST will ship the Premium/386, a 386-based computer that directly challenges the high end of both the Compaq and the IBM PS/2 lines (see "Bridging the Micro Channel" in this month's *Product Outlook*). In January, AST will ship a turbo/memory board that turns its Premium/286 AT compatible into a 16-MHz 386. The Fastboard/386 connects to the motherboard via one of the Premium/286's proprietary Fastslots, eliminating

the need to remove the 286 processor and run a cable to its socket. The \$1995 Fastboard/386 also carries up to 5MB of high-speed 32-bit static-column RAM. Additionally, AST has just released a motherboard replacement that turns an IBM PC or XT compatible into an AT compatible. The \$845 Xformer/286 runs at 10 MHz with zero wait states and holds up to 1MB of main memory. AST also is preparing a 6-MHz/10-MHz 80286-based workstation for first-quarter release. The Premium Workstation, priced at

\$2295 for the single-disk model, can be turned into a LAN, mini, or mainframe workstation with the addition of the appropriate AST communications card. These products exemplify how AST's board and system businesses will build volume, cut manufacturing costs, and enhance engineering for both lines, says President Safi Qureshey. Since the board marketing leader began diversifying 18 months ago, it has sold more than 50,000 Premium/286s and seen its system business grow to more than 50 percent of its revenues.

Lotus Drops Copy Protection, Adds 1-2-3 Utilities

The last holdout among major software vendors, Lotus Development is dropping copy protection on all current and future releases of *1-2-3* and *Symphony*. However, Lotus spokesperson Phil Greenough reports that the company hasn't yet decided whether it will offer an upgrade for the 3 million installed copies of the two programs, which are le-

gally shared among an estimated 7 million people. Those wishing to upgrade may have to wait to buy *Symphony* release 2, due out in the first quarter, or *1-2-3* release 3, scheduled for the second quarter. Coincidentally, Lotus has begun shipping two *1-2-3* release 2.01 add-ins—*Speedup*, which selectively recalculates only those worksheet cells that have been affected by changes, and *Learn*, an automatic key-

stroke recorder for macros. All future *1-2-3* releases will have these unprotected utilities; current users can get upgrades free from selected dealers or for a \$20 handling charge by calling Lotus directly at 617/623-6572. Greenough could not say whether Lotus will use this upgrade method to distribute unprotected *1-2-3* disks.

Intel Announces 386 Turbo Board for XTs

Intel Corporation's Personal Computer Enhancement Operation will begin shipping an 80386 turbo add-in board for IBM PCs, XTs, and compatibles in January. The company says that its new \$995 Inboard 386/PC will improve

the performance of these first-generation machines by up to ten times. Some of the earliest PCs may also require an upgraded power supply. The Inboard 386/PC uses a single slot and connects via ribbon cable to the 8088 CPU. It comes with 1MB of 32-bit 120ns RAM, and a 2MB Piggyback Memory board

may be added for \$1145. Intel's Inboard 386 began shipping in April and, Intel claims, has taken 75 percent of the market for 80386-based accelerator boards for IBM AT compatibles.

True VGA Comes to PCs

Video Seven has begun delivering the Vega VGA, the first graphics board to provide the IBM PC, XT, AT, their compatibles, and the PS/2 Model 30 with the full Video Graphics Array (VGA) color capabilities of the PS/2 Models 50 and above. On an analog monitor, the \$499 Vega VGA has a palette of more than 256,000 colors with a choice of 16 at a resolution of 640 by 480 pixels and 256 at a resolution of 320 by 200. The

board also supports the Hercules 132-column mode for improved text resolution, along with 64 shades of gray. When used with a multiscan (digital, variable frequency) monitor, the Vega VGA provides 640-by-480-pixel and 800-by-600-pixel resolutions with a choice of 16 colors from a palette of 64. (IBM's VGA doesn't drive digital monitors.) The Vega VGA also differs from so-called enhanced EGA boards—such as Video Seven's VGA Deluxe—which achieve VGA resolution

with a BIOS upgrade but have a palette of only 64 colors. Running 400 percent faster than Video Seven's current EGA boards, the Vega VGA fits in a short slot and automatically switches among MDA, CGA, EGA, and VGA modes as needed. Video Seven is reducing the suggested retail prices of its Vega and Vega Deluxe EGA boards by \$150 each, to \$249 and \$379, respectively.

Lotus's Personal Information Manager

Lotus Development is preparing for first-quarter release a "personal information manager" designed to help managers and others organize and analyze their work. *Agenda*, a stand-alone text-oriented product, lets the user enter information on the fly and extensively cross-reference it with minimal effort. The user starts by writing a note, to-do list,

memo, or similar "item" of up to 350 characters. As new items are entered, *Agenda* extensively cross-references matched character strings, with the user determining how literal the match need be. Up to ten pages of text can be appended to each item, and item categories can be grouped into different "views." *Agenda*'s dynamic linking capability suggests hypertext, but that isn't the technology on which the product is based, says Product Marketing Manager Conall

Ryan. He calls the \$395 product a text engine that employs artificial intelligence inferencing techniques and predicts that it will become the same kind of platform for those who work with text that *I-2-3* is for number-oriented workers. A *Metro* accessory version of *Agenda*'s note editor ships with the program, allowing the user to enter information without loading *Agenda*.

AutoCAD Puts On a Graphic Interface

Autodesk has added a graphic user interface to its market-leading computer-aided design package and has enhanced file portability between operating systems. *AutoCAD* release 9, the eighth major update of the product since it was introduced in 1982, provides pull-down menus with dialog boxes and icons that the user can customize, making the product look like a Macintosh application. But Autodesk is

preserving *AutoCAD*'s current menu along the right side of the screen for those who prefer it, as well as the ability to enter speed-key commands from a keyboard or digitizing tablet, reports Walt Spevak, director of product management. *AutoCAD* drawings now can be transferred directly between systems using DOS, Apollo's AEGIS, DEC's VMS, or Sun Microsystems' version of UNIX. Other improvements include the addition of 20 text fonts and a

new type of curve-fitting. Autodesk will maintain the \$2850 price of its program, which boasts an installed base of approximately 110,000 and a market share of around 50 percent in PC-compatible CAD software. Current users of *AutoCAD* version 2.06 (Autodesk has changed its product-numbering methodology) can get an upgrade from Autodesk or their dealers for \$150.

(Boldly go where no game has gone before.)

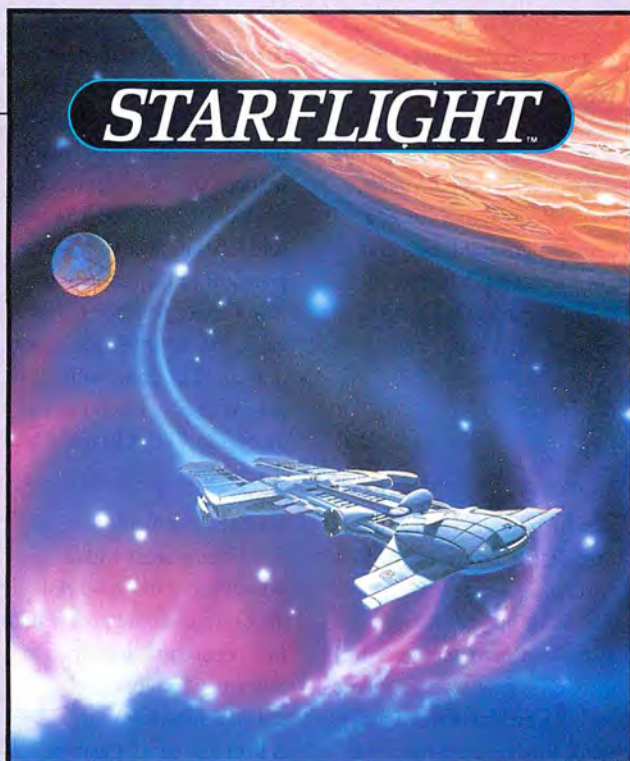
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Starflight Cluebook also available \$12.95 direct.

Toshiba T5100 Targets Work-at- Home Power Users

Toshiba has introduced an 80386-based portable aimed at work-at-home power users, whom the company sees as a new class of personal computer buyers. The Toshiba T5100 is a 16-MHz computer with a single 3½-inch disk drive, a 29ms 40MB hard disk, and 2MB of 32-bit dynamic RAM, expandable to 4MB, with one wait state. The

\$6499 computer is aimed at individuals with no specific portable application other than a desire to bring work home. To the company's surprise, these customers have snapped up 75 percent of the 50,000 80286-based T3100s sold to date, says Toshiba vice president of PC marketing Dan Crane. To reach home users, the T5100 provides not only an EGA-compatible gas plasma display but ports for an optional EGA monitor and

a 101-key keyboard. The standard configuration includes an 82-key keyboard and parallel, serial, and 5¼-inch floppy drive ports. There also is an expansion slot for either a 1200-bps modem card or a \$199 interface card for a \$999 five-card expansion chassis. Nearly identical in size and appearance to the T3100, the dark-gray T5100 weighs 15 pounds.

Optical Drives Boost Storage, Speed

Readying themselves for the first-quarter release of IBM's write once, read many (WORM) optical storage device, other manufacturers are increasing data transfer speeds and at least doubling capacity while lowering per-megabyte prices. Micro Design International, maker of 12-inch optical drives, had planned a 400MB drive as its first 5¼-inch product. Instead, it has just begun shipping the

800MB LaserBank 800, a \$9995 subsystem with a 40MB sub-25ms hard disk and a transfer rate of 200 kilobits per second. Information Storage, which offers a 230MB subsystem for \$2795, is beta testing a 1-gigabyte-capacity WORM model for first-quarter release. Called the 525GB, it will retail for between \$2995 and \$3495. Its 800-kilobit-per-second transfer rate is almost three times that of its predecessor. OEM drive maker Optotech has doubled

its single-cartridge drive's capacity to 800MB. WORM manufacturers, whose best markets are CAD and LAN users, slashed prices more than 25 percent in April when IBM announced its 200MB WORM for \$2995. They appear to be driving toward a price of \$8 per megabyte, compared to \$12 per megabyte for comparable Winchester devices.

Trailing-Edge Computers Selling Well

Despite the industry's preoccupation with ever-more powerful technology, most of the growth in PC unit sales this year has come on the trailing edge. International Data Corporation estimates that more than 3.6 million IBMs and compatibles will be sold by year's end, representing a healthy 36 percent increase over the current installed base of 10.1 million machines. Ironically, most of the new machines are 8086 and 8088

based. "Companies and individuals are taking advantage of these low-priced clones," says IDC analyst Aaron Goldberg. That trend "isn't glamorous, but it sure ships a lot of boxes," he says. IDC predicts 1987 U.S. sales of 2.08 million 8086 and 8088-based computers, compared to 1.42 million 80286 machines and 150,000 80386s. The proportions will shift in favor of the higher technologies in coming years, but new versions of the older technologies will continue to appear in 1988, says Goldberg, who predicts that they

"will sell like hotcakes." Sales of these limited-use computers have gotten a boost from the growth of the IBM-compatibles work-at-home market, says Ed Juge, vice president of marketing for Tandy Corporation, which sells more IBM compatibles than any other vendor. "The home market is changing," observes Juge. "People who buy computers for their homes today have work to do." ●

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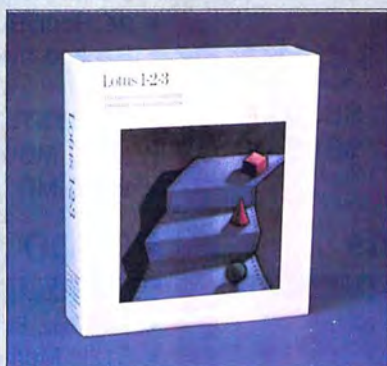
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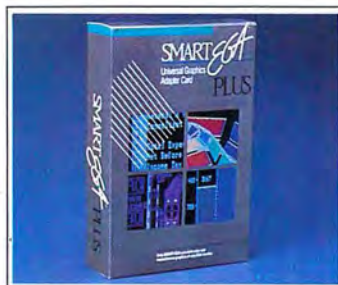
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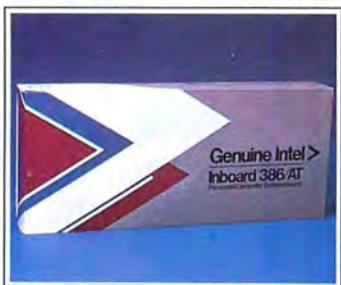
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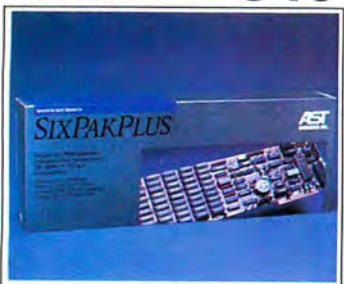
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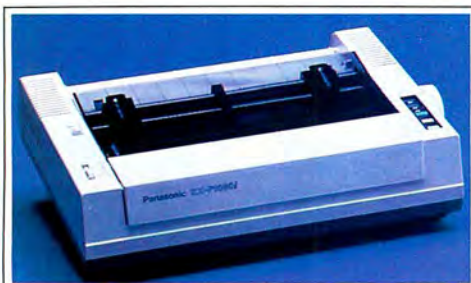
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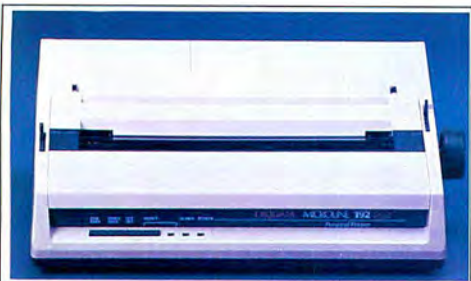
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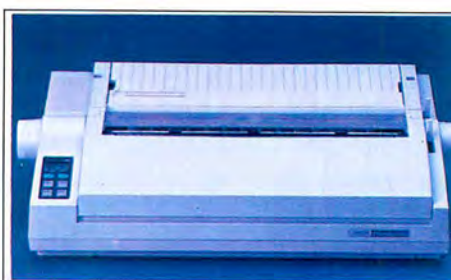
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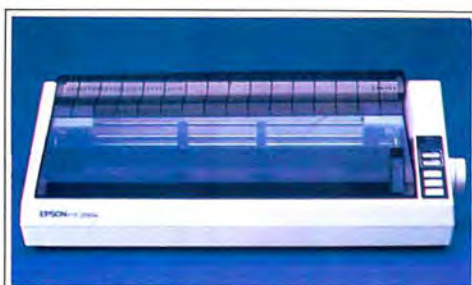
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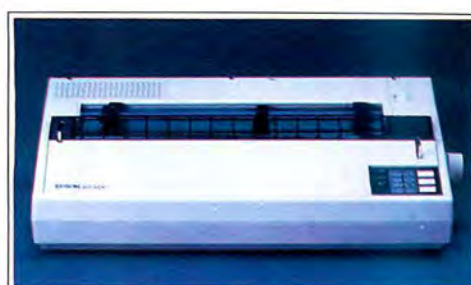
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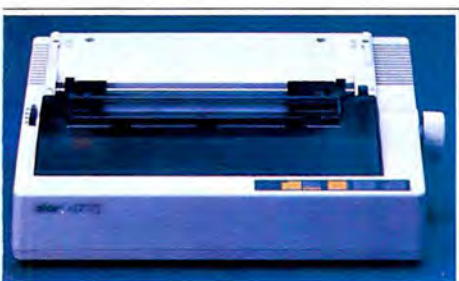
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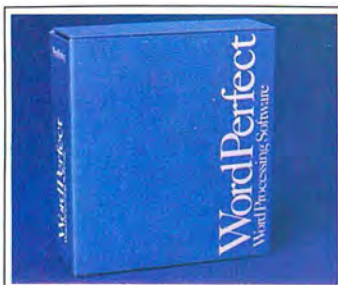
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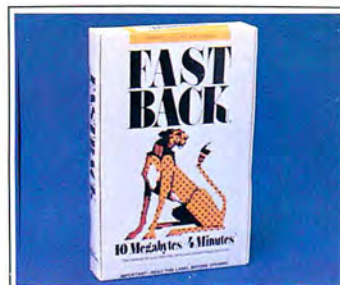
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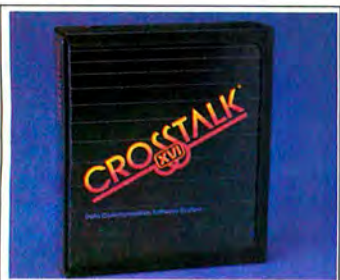
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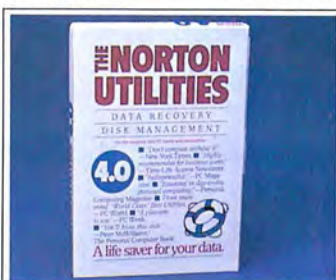
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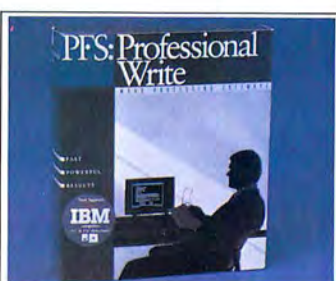
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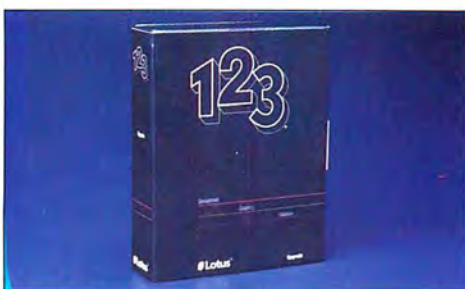


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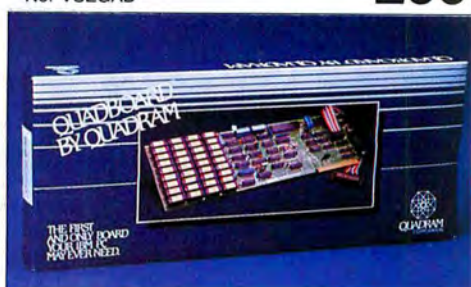


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Industry Outlook

Edited by Eric Bender

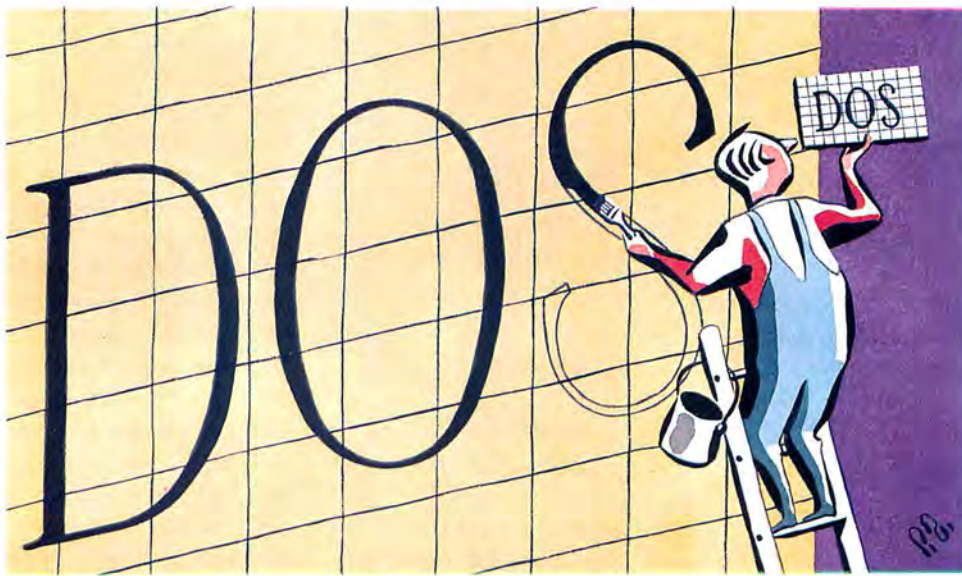
BEYOND THE 640K LIMIT

It's an old DOS, but it's not yet ready for pasture. Rather than quietly fading away as its successor approaches the gate, Microsoft's venerable operating system is gathering some powerful assistance that should help it remain the best bet for many customers.

Some DOS upgrades are coming from Microsoft and manufacturers like Compaq, which collaborated with the operating system supplier on a DOS 3.30 that broadens hard disk drive partitions from 32MB to 512MB. Some upgrades are industrywide collaborations, like the Lotus/Intel/Microsoft expanded memory specification (EMS) 4.0, which lays a foundation for juggling multiple applications and memory-resident packages in up to 32MB of memory. And some upgrades come from left field.

"There seems to be quite a cottage industry springing up of people doing extensions to DOS," notes Tom Spalding, president of A.I. Architects in Cambridge, Massachusetts. His firm and several others are offering tools that enable software authors to quickly redo DOS applications for high-performance trips across the 640K barrier. Ansa's *Paradox* and a host of computer-aided design (CAD) packages will be

(continues)



DOT'S ALL, FOLKS

Laser printers are quick, flashy, and growing cheaper by the month, but there's a lot of life still left in dot matrix printers. "You're going to see a shift to nonimpact printers, but it won't happen overnight," comments Bhanu Bhattasali, head of Dataquest's printer group.

Dataquest analyst Gary Jensen notes that dot matrix technology continues to evolve. "Incremental improvements in resolution are being achieved by increasing the number of wires [or pins] in the printhead," he says. Nine-pin technology yielded to 24-wire devices,

and Apple recently introduced its 27-pin ImageWriter II.

But the most substantial technological change, in Jensen's opinion, is NEC's introduction of a piezoelectric head. (This head moves the pins by applying current to a crystal, rather than by using a solenoid.) Piezoelectric devices, released only in Japan so far, can print at least 400 characters per second, Jensen notes. They also promise to reduce manufacturing costs by requiring fewer components.

While lasers offer flashier technology and several times the speed, people still buy more dot matrix machines, and analysts don't

expect that to change anytime soon.

CAP International of Marshfield, Massachusetts, estimates that 2.4 million dot matrix printers were sold last year and that the number will grow to 4.9 million by 1992. Dataquest says nearly 4 million dot matrix machines will be sold in 1987, growing to more than 4.5 million in 1991.

By contrast, Dataquest anticipates almost 600,000 laser printers being sold this year, compared to CAP's estimate of 328,000. CAP says about 1.1 million lasers will be sold in 1991, while Dataquest expects 1.5 million.

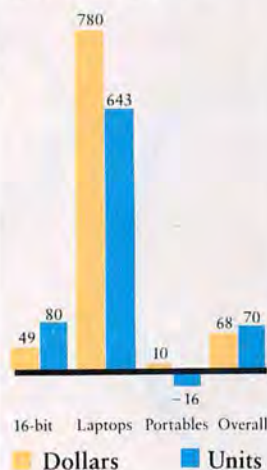
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GROWTH AT RETAIL

Computer-store purchases from hardware vendors soared in the first half of 1987, compared to the same period in 1986, according to an IMS America report. Overall unit sales of microcomputers rose 70 percent. Sales of 16-bit machines (primarily IBM systems and compatibles) rose 80 percent. Laptop sales soared 643 percent, but portables dropped 16 percent. IMS surveyed about one-tenth of the 5100 computer stores in the United States.

Computer Retailer Purchases

(percentage growth)



Growth in purchases by computer retail stores, first half of 1986 compared to first half of 1987

Source: IMS America

BEYOND 640K

(continued)

among the first enrolled in this DOS-extension school.

Improvements in throughput are "amazing" when large amounts of memory are exploited, claims Spalding. "People have known that [disk accesses] are slow, but they haven't realized how slow." Also, unlike the upcoming OS/2 operating system, DOS extenders tailored to 80386 machines permit applications to take advantage of 32-bit processors, boosting speed two and a half times on some crucial benchmarks. "Until a 32-bit OS/2 comes out, the DOS extensions will be vastly faster," Spalding says.

While applications must be modified to tap the larger

memory, that task represents little work compared to modifying an application for use with an OS/2 port, he comments. Some CAD applications are "about as complicated as anything that's been done on the PC," but companies typically rewrite them in less than three months.

Like Spalding, Phar Lap Software's Richard Smith claims that redoing an application with his company's tools is far simpler than writing for OS/2 because developers build on DOS, rather than replace it. Some customers for Phar Lap's 386/DOS Extender work in both environments, notes Smith, who is president of the Cambridge firm. "They're ready to go to beta with DOS Extender, while they're still trying to make the OS/2 product work."

A few other firms have taken proprietary routes around DOS limits. The leader in this effort is Oracle Corporation, which introduced an expanded-memory version of its data base management system earlier this year.

All these suppliers seek to reassure customers that their products are DOS allies rather than incompatible upstarts. Customers willing to accept that argument will see some dramatic results on their desktops, says Quarterdeck Software president Terry Myers. She gives one example: 386-based PCs using her firm's *Desqview* will simultaneously run several very large and very fast applications that include the Phar Lap technology. In short, DOS is ready for many more trips around the track. —E. B.

DOT'S ALL, FOLKS

(continued)



Dot matrix devices remain substantially less expensive, emphasizes CAP's Steven Kreindler. Additionally, "they can do four-color with special ribbons at a small increase in price. They can still accommodate multipart forms. And they offer multiple paper-handling techniques" such as sheet feeding and continuous and wide form printing.

Even noise is coming under control. Epson, the leading manufacturer, is selling products with a maximum noise level of 55 decibels, as opposed to the old level of 60 db. "Fifty-three decibels is getting to the point where it's about accept-

able," Kreindler says.

"You can have your printer sitting next to you operating and still talk to a customer on the phone."

Currently, low-end dot matrix printers cost in the vicinity of \$500, with the better ones selling for around \$1000. Costs are dropping slowly—but note that NEC, Toshiba, Citizen America, and the other major players are all Japanese firms, which may increase prices to compensate when the value of the yen drops against the dollar. —Daniel J. Rosenbaum

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SOFTLY CREEPING UP

While software vendors keep offering more for the money, "Everybody's creeping up on prices if they possibly can," says *Soft-letter* publisher Jeffrey Tarter. The trend's showing up not just in list prices for new software but in street prices for established packages, according to Wohl Associates. During the past year "the current favorites have not gone down any," says Wohl senior consultant John Murphy. "They've actually increased a bit."

Different application categories do show varying trends. In spreadsheets, costs remain stable under Lotus's thumb. Inexpensive contenders such as Paperback Software's *VP Planner* haven't taken off, and most major entries like *Microsoft Excel* meet at 1-2-3's \$495 level.

Similarly, fees for data base packages are pegged to Ashton-Tate's *dBASE* line. The fees have altered little in the past year, but that may change if the upcoming *dBASE IV* doesn't emerge strongly and soon.

For significant price flexibility, "watch the desktop publishers," Murphy suggests. Street prices for both Aldus's *PageMaker* and Xerox's *Ventura Publisher* dropped significantly a few months after they shipped, he says.

"Word processing certainly is one of the most volatile markets," adds Peter Hansen, marketing vice president at Corporate Software, a reseller. With Ashton-Tate, Microsoft, and WordPerfect banging heads, customers are grabbing bargains, he explains.

Rather than being volatile, the market for OS/2 software does not yet exist. "Vendors are trying to set the tone that prices will be more expensive," says Maureen Fleming, editor of *Software Industry Bulletin* in Stamford, Connecticut. "High-end companies will try to support that, until someone like Borland comes along."



A key here, in Hansen's view, is whether OS/2 applications are considered upgrades or full-fledged products. "There's real interest from the vendor's point of view in calling

them new products, and there's just as much interest from the corporate point of view in calling them upgrades." —E. B.

RAISING WINDOWS

Despite Microsoft's gritty persistence with *Microsoft Windows*, until a few months ago it was unclear whether the operating environment had gained much ground in the real world.

On the plus side, IBM was merging *Windows* into OS/2, although customers would reap no benefits for well over a year. *Windows* clearly had captured desktop publishing, the hottest new horizontal application. And over a million *Windows* copies had shipped.

On the other hand, almost four years after it was first announced, only a handful of applications had appeared. And only Aldus's *PageMaker* was a best-seller.

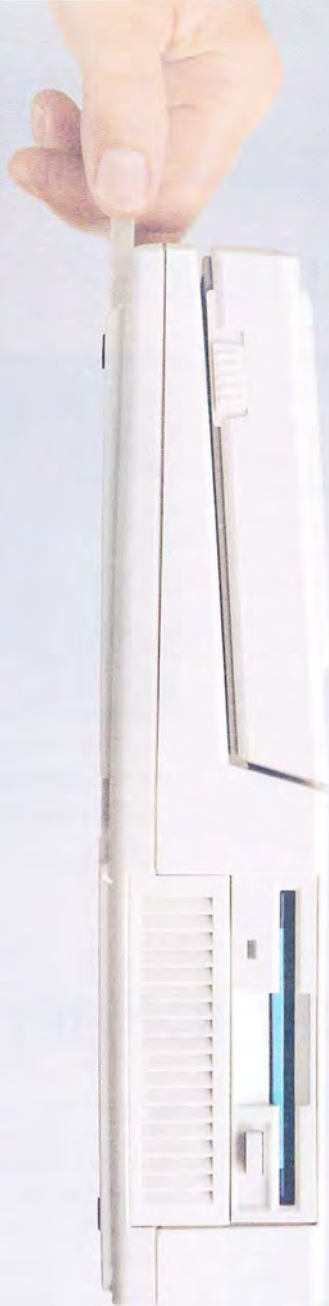
But another *Windows* wave came along this past fall, led by *Windows/386*. This package was co-developed by Compaq and bundled with its new top-of-the-line machines (although Compaq emphasized the program's multitasking benefits rather than its graphics user interface). Other manufacturers ranging from AT&T to

Zenith also endorsed *Windows/386*.

At the same time, dozens of applications exploiting the new *Windows 2.0* debuted, although none came from the largest vendors. And soon afterward Microsoft threw *Microsoft Excel*, its first major *Windows* application, into a frontal attack on the 1-2-3 fortress.

Microsoft chairman Bill Gates now proclaims that 80 percent of personal computers will run a graphics user interface within three years—but the claim is met

(continues)



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PAYING FOR EXPERIENCE

Alex Randall, who once studied with anthropologist Margaret Mead and considers himself an information scientist rather than a retailer, has established himself as king of the heap in used PCs.

Randall's Boston Computer Exchange arranges hundreds of sales every week, matching buyers and sellers. The Exchange, which takes a 10 percent commission on every sale, handled more than \$3 million of business last year.

Many of the machines sold through the exchange come from huge corporations, and most of them go to far smaller operations. Small-business owners should consider buying a used PC if their budget is tight and the business can survive without state-of-the-art equipment, Randall suggests.

Although cutting-edge machines like the PS/2 series trickle into the used market within weeks after they debut, prices do not fall appreciably until the equipment ages a little. The best values are machines that have outlived their original warranty yet have not reached obsolescence.

A quick scroll through the Boston Computer Exchange data base offers buyers a good introduction to market prices. Randall posts the data base on CompuServe and Boston

Citinet and offers the list for \$10. To make a purchase, a buyer calls the exchange at 800/BOCOEXX. A broker there locates a suitable seller, then leaves the two parties to work out a deal.

Because most used PCs have outlived their warranties, Randall recommends the exchange's \$25 escrow service, which provides limited protection. Randall will not release payment to the seller until the PC arrives at its destination in good

(continues)



Richard Howard

Used IBM PCs may represent very good bargains, says Alex Randall.

RAISING WINDOWS

(continued)

with almost universal disbelief. "It would be very difficult to retrofit the DOS world with *Windows* or *Presentation Manager*," says *Soft-letter* publisher Jeffrey Tarter. "You'd simply baffle the poor 1-2-3 users." And the performance degradation that comes with any graphics environment still looms large in all but 80386-based machines. —E. B.

ACQUIRING SOFTWARE SYNERGY



Jerry Spagnoli

Symantec chief executive Gordon Eubanks presides over a diverse collection of packages and people.

Since launching *Q&A* two years ago, Symantec has made its way onto the list of the top ten micro software houses by cobbling together a diverse mixture of packages—and industry hotshots. "I'm very dispensable," says Gordon Eubanks, president and chief executive officer of the Cupertino, California, firm. "I don't think you could say that at other software companies."

Q&A, Symantec's bread-and-butter product, is a file management program with a slick natural-language interface and a word processor. In mid-1985 the Turner Hall subsidiary began publishing add-ons for 1-2-3 and other packages. This year, Symantec has acquired Breakthrough Software,

makers of the *Time Line* project management program; *Living Videotext*, which produces outline processing software; and *THINK Technologies*, which offers Macintosh communications and language products. Symantec now turns a profit and employs over 130.

"We have a broad base of people who've been in the industry since day one," says Eubanks, a former vice president at Digital Research. The group also features chairman Vern Raburn, a former senior executive at Microsoft and Lotus; Spencer Layton, who was second in command at Borland International until

(continues)

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DIRECTORY ASSISTANCE

Electronic mail has become so popular that your modem-equipped PC can reach out and instantly touch the mailboxes of almost 1 million other public service subscribers—if you can find them. E-mail users are spread across more than 20 systems, each with its own address scheme.

But the National E-Mail Registry's electronic White Pages directory can help bridge the gap. The Trevoze, Pennsylvania-based firm offers an on-line list containing the names and E-mail

addresses of more than 14,000 users.

The directory software prompts you for the last name of the party you seek, then narrows the search by adding parameters such as first name, company, city, and state. The service costs 20 cents for each name found and is sold in blocks of 50 searches—a \$10 fee that can be charged to a major bank credit card. High-volume E-mail users may engage in unlimited searching for \$95 per year. You still pay the telephone connect charges. And you still must subscribe to the

E-mail system you are trying to reach, or have a way to connect to the system.

Having collected names and addresses since the beginning of the year, the E-Mail Registry is now adding 1500 a month. E-mail users can register free by electronically calling 800/622-0505. On-line registration takes about 5 minutes. Each user receives a unique White Pages access code and calling instructions about two weeks following registration and address verification.

—Mike Hogan

PAYING FOR EXPERIENCE

(continued)

working order. Most customers opt for this escrow arrangement.

Randall acknowledges that a buyer can purchase a high-quality, brand-new PC XT clone for the same price that a used IBM PC XT commands on the exchange: about \$1300. Still, he says, buyers get a better deal with used IBM equipment.

For one thing, used machines typically come configured with a good selection of software and peripherals. They also arrive without bugs. "Used hardware, in general, is more reliable than new," Randall feels. "And a used IBM is always better than new clones." He acknowledges, though, that hard drives, floppy drives, and print-heads start to fail after two years of normal use.

—Becky Batcha

ACQUIRING SOFTWARE SYNERGY

(continued)

last summer; Rod Turner, formerly vice president of sales and marketing at Ashton-Tate; and Gary Hendrix, a leading artificial intelligence researcher. "Any one of these people could run a company this size," says Hendrix, who founded Symantec in 1982.

Managing the egos of so many hotshots is "a difficult challenge," Eubanks acknowledges. Operating each division like a separate company has minimized friction so far.

Symantec also takes a thoughtful approach to expansion, says Turner, vice president and general manager of the Breakthrough division, which handles *Time Line*, *Q&A*, and *Q&A Write*. "We buy a company because it's a going concern, and we keep the team together."

"For someone like [Living Videotext's] Dave Winer, merging with Symantec is a more attractive option than being acquired by some of the larger companies," Turner adds. "It's easy for a big company to go out and buy a small company, take the company name or product name and two of the engineers, and shut it down."

Who's next? "We'll look for more strategic acquisitions, more effect on the bottom line," says Eubanks.

But he doesn't plan to enter markets that are already overcrowded. "We prefer to be the dominant player," he explains. *Q&A*, for example, competes primarily with Software Publishing's *pfs* series, letting others fight it out in the *dBASE* market.

In the early years, Symantec burned large bundles of venture capital in an effort to commercialize artificial intelligence technology. While today there's intense concentration on practical business products, "We are driven by technology, not an M.B.A. approach," says Eubanks. "We're really involved in figuring out where things are going to be in two years, and reacting to that." —Mark J. Welch

Becky Batcha is a writer based in Boston, Mike Hogan is PC World's news editor, Daniel J. Rosenbaum writes about computers and communications, and freelancer Mark J. Welch is studying law at the University of California at Berkeley. ●

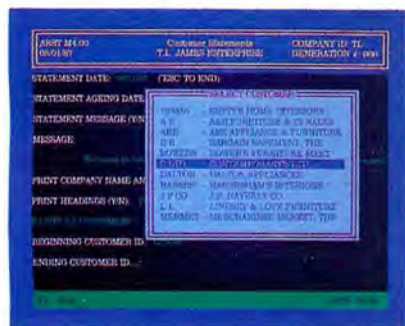
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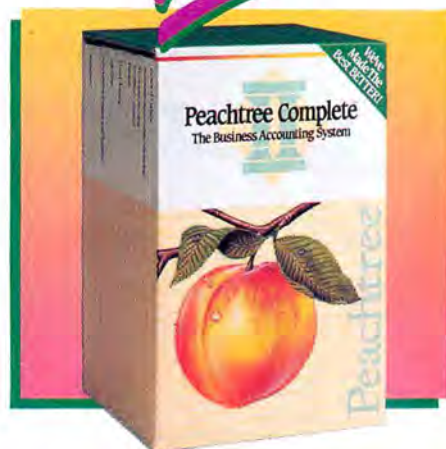
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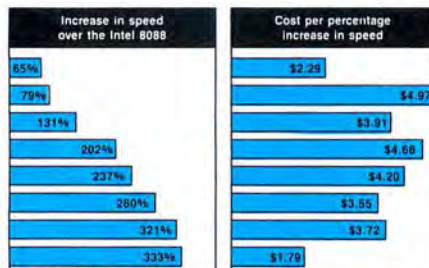
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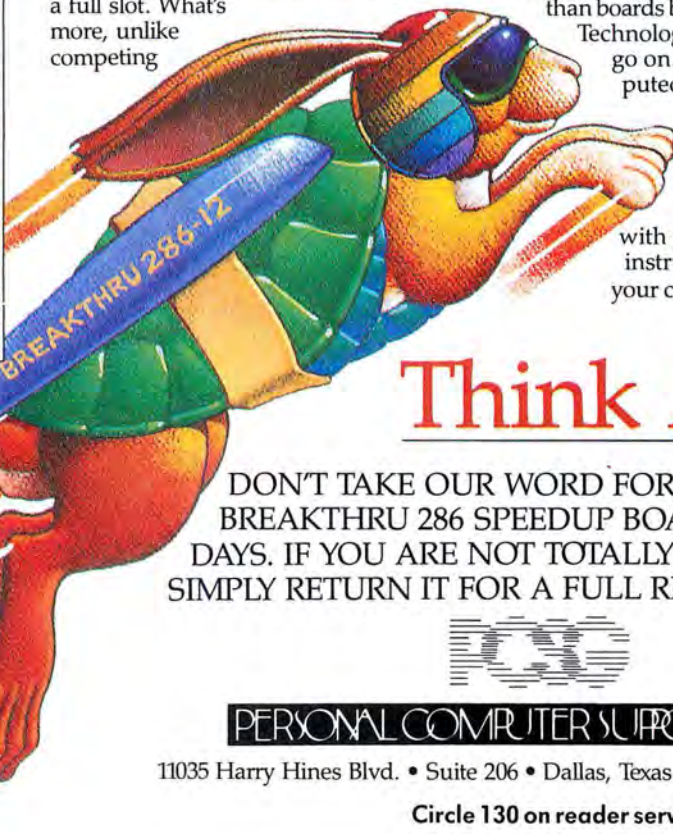
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*News
you can use
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PC product
announcements
and upcoming
releases*

Mike Hogan

Bridging the Micro Channel

While the multitasking enhancements of IBM's PS/2 Micro Channel Architecture (MCA) are enticing, it could be a while before many peripherals are developed that take full advantage of the new bus. On the other hand, AST Research has a bridge computer that offers the speed of 32-bit memory but postpones the date for saying good-bye to your favorite 16-bit AT-compatible boards, monitors, and storage devices.

The **Premium/386** is an 80386-based microcomputer that runs at a brisk 20 MHz with zero to one wait states. Its unique triple-bus architecture offers a 20-MHz, 32-bit channel to give you the fastest possible access to memory. A separate pathway is devoted to the under-10-MHz transmission speeds typical of the current wealth of AT-compatible peripherals, including expansion boards. Yet another channel performs *multimaster arbitration*—that is, like the Micro Channel bus in PS/2 Models 50, 60, and 80, it can accept microprocessor-equipped expansion boards that operate independently of the system CPU. Taking advantage of this capability, AST offers an option of up to

1MB of high-speed memory caching and an intelligent disk controller.

One caveat: The Premium/386 has only one 32-bit slot, and that must be devoted to a 20-MHz memory board. IBM's PS/2 Model 80, on the other hand, boasts three 32-bit slots that can accept any intelligent device as well as memory boards. Still, AST is the only manufacturer other than IBM to announce a bus capable of juggling multiple requests from intelligent devices like graphics and communications subsystems that are anticipated for the future.

The Premium/386 comes in standard configurations of either 1MB or 2MB of 32-bit, static-col-

umn RAM expandable to 13MB on the memory board. In addition to a 1.2MB floppy drive, you can add a 40MB, 70MB, or 130MB hard disk. Besides its one 32-bit slot dedicated to memory, it includes three 8/16-bit, AT-compatible slots capable of multimaster arbitration, one 8/16-bit slot without that capability, and two 8-bit XT-compatible slots. The Premium/386 has a 101-key keyboard and supports MDA, CGA, EGA, VGA, and Hercules graphics standards. The 40MB-equipped version without monitor sells for approximately \$5600. AST offers a 14-inch monochrome monitor for \$195 and a 14-inch EGA-compatible color monitor for \$695. AST Research, 2121 Alton Ave., Irvine, CA 92714-4992; 714/863-1333.

The Premium/386 offers you the speed of 32-bit memory calls without sacrificing compatibility with the large installed base of AT-compatible peripherals.



High End of the High End

A little more than a year ago, Compaq Computer was telling us that we need the 4-million-instructions-per-second (MIPS) processing power of a small mainframe on our desktops. Apparently we do, because Compaq hasn't been able to keep its 80386-based Deskpro 386s on store shelves. Now the company is back with a faster CPU (7.2 MIPS), more main memory, and bigger hard disks to make sure that no one usurps its place at the high end of the high end.

Compaq's new 80386-based Deskpro 386/20 is aimed straight at power users who want larger spreadsheets and data bases, faster accounting operations, or a platform for CAD/CAE and artificial intelligence that easily rivals that of a minicomputer. It's a 20-MHz, no-wait companion to the company's 16-MHz Deskpro 386, the first 386 on the market last fall.

The Deskpro 386/20 features an Intel 82385 cache memory controller chip that provides a 25 percent increase in performance over noncached machines and a 50 percent increase in throughput over the Deskpro 386. Its dual-channel bus separates 20-MHz memory calls from the I/O data

This is a scanning electron micrograph of common dust, magnification X80.

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transmissions of the current crop of 8-MHz AT peripherals. (However, the machine does not have the arbitration capability of the AST Premium/386.) The Deskpro 386/20 comes with 1MB of 80ns 32-bit RAM expandable to 16MB on its memory board and the Compaq Expanded Memory Manager, which enables applications following the Lotus/Intel/Microsoft (LIM) expanded memory specification to break the 640K barrier and address up to 8MB of memory. It also has an asynchronous serial port, a parallel port, and a socket for a 20-MHz 80387 coprocessor or Compaq's newly offered Weitek numeric coprocessor board (which also has an 80387 socket).

The Deskpro 386/20 has room for four half-height storage devices. It comes in three configurations—the Model 60, with a 30ms 60MB hard disk, for \$7499; the Model 130, with a 25ms 130MB hard disk, for \$9499; and the Model 300, with a 20ms 300MB hard disk, for \$12,499. Compaq DOS 3.30 breaks the 32MB limit on hard disk addressability, so any of these can be configured as a single drive. The Model 60 has two 8-bit and four 8/16-bit expansion slots, while Models 160 and 300 both use one of those 8/16-bit slots to hold the ESDI hard disk

controller. Compaq will offer a 3½-inch floppy drive option but will ship 1.2MB 5¼-inch floppy drives as standard. Compaq Computer Corp., 20555 FM 149, Houston, TX 77070.

cross between an Xtree-like DOS shell and *Microsoft Windows*. The Visual File Manager uses on-screen colors in subtle ways to inform you of program status and provides numerous advanced

Compaq's new 80386-based Deskpro 386/20 is aimed straight at power users who want larger spreadsheets and data bases, faster accounting operations, or a platform for CAD/CAE and artificial intelligence that easily rivals that of a minicomputer.

Surpassing 1-2-3

Nowadays, a PC spreadsheet has to be fast, integrated, and capable of linking worksheets. Most of all, it must provide complete file and command compatibility with 1-2-3. Users may be willing to step up to a better spreadsheet, but would-be spreadsheet purveyors know better than to ask for too great a leap forward.

Surpass Software Systems has followed the plan to perfection with its speedy little 1-2-3 clone called *Surpass*. The start-up's first product includes a spreadsheet, a flat-file manager, a few charting improvements, and text editing capabilities. Its principal virtue lies in the clean and easy way it implements those features. That efficiency is due to the product's Visual File Manager, which is a

copy, cut and paste, and other utility functions. It also supports an unlimited number of linked worksheets in on-screen windows. While *Surpass* has the same 256-column-by-8192-row dimensions as 1-2-3, worksheet size is irrelevant given the spreadsheet's ability to create hot links between the cells of different worksheets. Hot links can be embedded in formulas or in the spreadsheet's macro language and can refer to worksheets that are not loaded. The easiest way to use *Surpass* macros—which are identical to those in 1-2-3 release 2.01—is to build a library worksheet and call them from there using hot links. You can perform extensive what-if analyses among worksheets and



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then go instantly back to your originals using the program's Undo command.

Although *Surpass* uses dependency-based recalculation, which limits recalcs to those cells affected by changes, chief designer Robert Warfield claims that his

Power of 3

Now that more of us reach up into mainframes for data, we sometimes forget that they all don't have IBM labels on them. With \$9 billion in annual sales, Unisys Computer Corporation has

Surpass includes a spreadsheet, a flat-file manager, a few charting improvements, and text editing capabilities. Its principal virtue lies in the clean and easy way it implements those features.

product is 30 percent faster than 1-2-3 even during a global recalc, thanks to *Surpass*'s background recalculation between keystrokes.

Surpass is keystroke- and file-compatible with 1-2-3 release 2.01, reading and writing to both .WKS and .WK1 files while using 1-2-3 commands in pop-up dialog boxes. It has comparable data base management and graphics functions. But unlike 1-2-3, you needn't leave your worksheet or create a .PRN file to print. *Surpass* supports CGA, EGA, VGA, and Hercules extended column mode. The \$495 program requires DOS 2.00 or a later version, 512K of main memory, and 1MB of hard disk space. Surpass Software Systems, 14 Commercial Blvd. #131, Novato, CA 94949; 415/382-8840.

installed more than its share of large systems and now is bringing out three new IBM-compatible computers supported by boards and software that will make it easier to talk to its mainframes.

The product of the Burroughs/Sperry marriage and of "Power of 2" ad fame, Unisys is introducing the new **Personal Workstation/2** line. At the top of the line is the 80386-based Series 800, with either a 16-MHz or 20-MHz processor with no wait state and 1MB of RAM. Its AT-compatible bus is equipped with one 32-bit, four 8/16-bit, and two 8-bit expansion slots. One of the 8/16-bit slots must be dedicated to a disk controller, and, as is typical, the 32-bit slot requires its maker's own boards. The system board is equipped with a parallel printer port, an asynchronous/synchronous serial port, and an asynchronous serial port.

The 80286-based Series 500/12, which replaces the former Sperry PC/IT and PCmicro/IT, features a user-selectable CPU speed of 6, 8, or 12 MHz with one wait state. The system board comes with 640K and a hard/floppy disk controller. A daughterboard can hold up to 1MB in 256K-bit RAM chips or up to 4MB using 1-mega-bit RAM chips. There are two 8-bit and three 8/16-bit I/O slots, one of which must be devoted to the disk controller. The system board houses a Centronics parallel port and a synchronous/asynchronous serial port.

The Series 300/10 replaces the 8088-based PC/HT and is intended for use as an intelligent workstation in multiuser environments. It has an 80286 CPU that runs at 6, 8, or 10 MHz. The standard system board configuration includes 640K of RAM expandable to 1.5MB, a floppy disk controller, a parallel port, and an asynchronous serial port. The 300/10 has two 8/16-bit I/O slots available—a third contains an EGA.

All units have a 101-key keyboard, with 12 function keys and separate cursor and numeric keypads. Unisys offers you a choice of 3½-inch or 5¼-inch floppy drives for all of its systems. With the Series 800 you can choose a 40MB, 69MB, or 117MB hard disk; with the Series 500/12 and 300/10, you can choose either a 20MB or a

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Additionally, Unisys manufactures a series of boards and software for PCs and compatibles that

speed you need but also extends the useful life of your PC by letting you take advantage of the new advanced software that requires at least AT-class processor speed. The Mach 20's 80286 pro-

of OS/2 in the future, and now comes equipped with an expanded memory driver for programs like *Windows 2.0* that support the LIM 4.0 expanded memory specification.

The \$99 Mach 20 Disk Plus controller supports both 360K and 1.2MB 5¼-inch floppy drives and 720K and 1.44MB 3½-inch floppy drives.

The complete Mach 20 system gives you a faster processor, disk control, expanded memory, and input device capability using only the slot now occupied by your PC's disk controller. The list price for the Mach 20 is \$495. Microsoft Corp., Customer Service Department, P.O. Box 97017, Redmond, WA 98073-9717; 206/882-8080.

Microsoft's Mach 20 lets your old IBM PC, XT, or compatible shift into the fast lane of AT-level operations and ensures upward mobility to OS/2.

provide both synchronous and asynchronous terminal emulation and file transfer to and from Unisys mainframes and between DOS and UNIX systems.

Prices vary widely, depending on the model and the system configuration. Unisys Corp., P.O. Box 500, Blue Bell, PA 19424; 800/547-8362.

Running at Mach 20

When OS/2 arrives, do you have to leave your PC behind? Not necessarily, says Microsoft Corporation. With true insider's insight it has introduced the **Mach 20**, a new coprocessor board that lets your old IBM PC, XT, or compatible shift into the fast lane of AT-level operations and ensures upward mobility to OS/2.

The Mach 20 system is equipped with an 80286 processor that not only gives you the

processor runs at 8 MHz, increasing the speed of program execution two to six times so that your old PC can keep up with programs like *AutoCAD*, *PageMaker*, and even *Microsoft Windows 2.0* and OS/2. Added oomph is achieved with a 16K on-board memory cache. Simple speed-selection software lets you switch back in two keystrokes to the 8088 pace for timing-dependent versions of older software.

The Mach 20 has a connector that accepts a Microsoft Disk Plus floppy disk controller, enabling the Mach 20 to replace the system's current disk controller. It also has interfaces for the Mach 20 Memory Plus expanded memory option and for InPort-equipped input devices such as the Microsoft Mouse. The \$395 Memory Plus option comes with 512K of expanded memory upgradable to 3.5MB for software that requires more than 640K, such as the forthcoming OS/2 (which needs 1.5MB). It will even be available with a custom version

Scan by Hand

Despite many data input options available today beyond the QWERTY keyboard, most text or data input into any size computer still depends upon fingertip power. TransImage Corporation has an optical character recognition device that should provide some respite for tired (or bored) touch-typists.

The **TransImage 1000** is a hand-held scanner capable of reading in 480 words per minute at a resolution of 1000 dots per inch. Special rollers on the bottom



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The secret behind Magic Mirror is its ability to automatically edit and reformat data while it's transferring. That's significant because the way one program displays information is usually not the way another program will accept it. No problem.

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keys, and watch as your budget is automatically entered into the right cells — in the proper format — as though you were typing the information yourself at a blinding speed.

With Magic Mirror it's easy. Without Magic

data look and act just like it was entered for the program you're sending it to.

Plus, it remembers everything it does — from the way it captures data, to the way it edits and reformats, to the way it transfers data. So it's simple to repeat Magic Mirror operations instantly. Or set up routines that others can use with ease.

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—B.T. Elliot, P.E., Birmingham, Alabama

"A RAM-resident gem that accomplishes what I heretofore believed was impossible: [integrating] data between virtually any two programs."

—Jack Stone, PhD, Government Computer News

of the device aid in straight-line scanning. The scanner reads fixed pitch and proportionately spaced characters and typeset, typewriter, near letter quality, and laser-generated documents, including glossy magazines. The system accommodates variations in character sizes and typefaces without special instructions. It also can be trained to learn special characters and fonts and recognize ill-formed or broken typefaces.

The TransImage 1000 can input information directly into most popular software packages, including *WordStar*, *WordPerfect*, *MultiMate*, *1-2-3*, and *dBASE III*. Data from the device appears exactly like keyboard data to the computer and so is transparent to the application. You may use the keyboard while using the Trans-

Image 1000, since the latter requires only 6K of main memory and 1.5 amps of system power. Six soft-function buttons on the scanner can be set for keyboard functions such as cursor control, delete, or enter. The TransImage 1000 system consists of a handheld scanner that connects directly to a 68000-based coprocessor board and system software.

It retails for \$2595, far more than other hand scanners. However, company president Fred Snow maintains that other products don't have the font independence of the TransImage 1000, a capability usually associated with \$30,000 products. Requirements include a hard-disk-based IBM compatible and DOS 2.00 or a later version. TransImage Corp., 910 Benicia Ave., Sunnyvale, CA 94086-2887; 800/227-1817.

The TransImage 1000 is a handheld scanner capable of reading 480 words per minute at a resolution of 1000 dots per inch from material printed in a variety of typefaces and on different paper surfaces.



Son of D

Buying a Leading Edge computer means never having to wonder if all the necessary components are included in the single low price. The company sold more than 300,000 Model D computers that way and is now practicing the philosophy in the AT-compatibles market. Its \$1495 Model D2 comes fully configured with everything you need to get up and running.

Built by Korean giant Daewoo Corporation, the Model D2 is equipped with an 80286 microprocessor that runs at 6, 8, or 10 MHz, has 640K of RAM expandable to 1MB on the motherboard, and uses a 5¼-inch, 1.2MB floppy drive. The floppy disk controller is built onto the motherboard and supports both 5¼-inch and 3½-inch formats.

The D2 has four 8/16-bit and two 8-bit expansion slots, an 80287 coprocessor socket, a 200-watt power supply, a Centronics parallel printer port, and an RS-232C serial port. An EGA card comes standard with automatic mode selection supporting MDA, CGA, EGA, and Hercules graphics standards.

Also included in the price is a 12-inch Hercules-compatible monochrome monitor; a 101-key keyboard with LED lights on <CapsLock>, <ScrollLock>, and <NumLock>; MS-DOS 3.20; and GW BASIC 3.2. The D2's footprint is slightly larger than the Model D's but 30 percent

Program in the fast lane with Borland's new Turbo Pascal 4.0!

Our new Turbo Pascal® 4.0 is so fast, it's almost reckless. How fast? Better than 27,000 lines of code per minute.* That's more than twice as fast as Turbo Pascal 3.0.

4.0 Technical Highlights:

- Compiles 27,000 lines per minute
- Includes automatic project Make
- Supports > 64K programs
- Uses units for separate compilation
- Integrated development environment
- Interactive error detection/location
- Includes a command line version of the compiler
- Highly compatible with 3.0

For the IBM PS/2™ and the IBM® and Compaq® families of personal computers and all 100% compatibles



4.0 breaks the code barrier

No more swapping code in and out to beat the 64K code barrier. Designed for large programs, Turbo Pascal 4.0 lets you use every byte of memory in your computer.

4.0 uses logical units for separate compilation

Pascal 4.0 lets you break up the code gang into "units," or "chunks." These logical modules can be worked with swiftly and separately. 4.0 also includes an automatic project Make.

4.0's cursor automatically lands on any trouble spot

4.0's interactive error detection and location means that the cursor automatically lands where the error is. While you're compiling or running a program, you get an error message *and* the cursor flags the error's location for you.

Sieve (25 iterations)

	<i>Turbo Pascal 4.0</i>	<i>Turbo Pascal 3.0</i>
<i>Size of Executable File</i>	2224 bytes	11682 bytes
<i>Execution speed</i>	9.3 seconds	9.7 seconds

Sieve of Eratosthenes, run on an 8MHz IBM AT

Since the source file above is too small to indicate a difference in compilation speed we compiled our CHESS program from Turbo Pascal 4.0 to give you a true sense of how much faster 4.0 really is!

Compilation of CHESS.PAS (5469 lines)

	<i>Turbo Pascal 4.0</i>	<i>Turbo Pascal 3.0</i>
<i>Compilation speed</i>	12.1 seconds	35.5 seconds
<i>Lines per minute</i>	27,119	9,243

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*To qualify for the upgrade price you must give the serial number of the equivalent product you are upgrading.

Please check box(es)

	<i>Suggested Retail</i>	<i>Upgrade Price†</i>	<i>Serial No.</i>
<input type="checkbox"/> Turbo Pascal 4.0 Compiler	\$ 99.95	\$ 39.95	_____
<input type="checkbox"/> Turbo Pascal 4.0 Developer's Library (Includes Turbo Pascal Tutor and all Toolboxes; must be ordered with compiler)	395.00	150.00	_____
<input type="checkbox"/> Turbo Pascal Tutor	\$ 69.95	\$ 19.95	_____
<input type="checkbox"/> Turbo Pascal Database Toolbox	99.95	29.95	_____
<input type="checkbox"/> Turbo Pascal Graphics Toolbox	99.95	29.95	_____
<input type="checkbox"/> Turbo Pascal Editor Toolbox	99.95	29.95	_____
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*In US please add \$5 shipping for each product ordered or \$15 for the Compiler and Developer's Library. Outside US please add \$10 shipping and handling for each product ordered or \$25 for the Compiler and Developer's Library.

smaller than most AT systems', claims Leading Edge.

A second version of the D2 includes a 1.2MB floppy drive and a 30MB hard disk with a 60ms access time for \$1995. There is room for still another vertical half-height storage device in the system. Whereas the Model D was intended for home and small-business users, Leading Edge hopes the Model D2 will reach corporate multiple-unit purchasers and users who have more advanced computing needs. Leading Edge Computer Products, 225 Turnpike St., Canton, MA 02021; 617/828-8150.

Mastering the Practice

Marry the relational power of Microrim's *R:base System V* engine to strong, service-sector accounting routines and you'll have a versatile tool for the small law firm. But Turbo Law Laboratories has done it for you.

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data base to be made available to all of its modules.

Variable field lengths of up to 4096 characters leave plenty of room for case notes or long client lists, which can later be searched by keyword. A handy macro feature speeds data entry by letting frequently used phrases and common fields, such as "2/10/Net 30" billing, be entered as defaults.

The Practice Master tracks accounts receivable, costs, expenses, and hours billed. You can bring in this data, addresses, and other information from the data module to create quick form letters. Choose from a variety of standard invoice formats and management reports that can be customized to your firm's needs—right down to footer comments such as "We accept MasterCard." *The Practice Master* prints its reports as either

ASCII text or data files ready to merge with other popular word processors and data base managers.

Upon product registration, each customer gets a 1200-bps modem, a cable, and communications software for easy access to professional information services such as Lexis. The \$1995 list price includes six months of free telephone support and a copy of Meridian Technology's *Carbon Copy* for linking a customer's PC to that of a Turbo Law support technician over telephone lines. Thereafter, support is charged by the minute or \$500 per year. Turbo Law Laboratories, 23811 Chagrin Blvd. #245, Beachwood, OH 44122; 216/292-3425.



The Leading Edge Model D2 is an AT compatible that comes fully configured out of the box. Its \$1495 price includes a built-in floppy drive controller, a monochrome monitor, a keyboard, and an EGA board.

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Try it like this. Or, try it like this. Our intelligent print formatter gives you great control and flexibility over size and positioning of graphics on the page.

Crystal Clear

Data Technology Corporation has introduced **CrystalPrint VIII**, an 8-page-per-minute laser printer relying on liquid-crystal shutter technology that the company claims enhances reliability and resolution.

VIII's resolution, however, is rated a standard 300 dpi.

Additionally, **CrystalPrint VIII**'s drum cartridge and toner set are separate units, so it isn't necessary to dispose of the more expensive drum cartridge every time the toner needs replacement. The drum has a life expectancy of

Because the image is emitted from an array of shutters rather than from a single rotating mirror, CrystalPrint VIII produces greater uniformity in pixel size and character resolution at the extremes of the optical field, claims Data Technology.

CrystalPrint VIII, which includes a resident printer controller with full Hewlett-Packard LaserJet Plus emulation, comes standard with 1.5MB of memory, three ROM-resident fonts, and both letter- and legal-size paper bins. The printer will accept additional cartridge-based fonts and HP-compatible downloadable fonts.

CrystalPrint VIII's reliability stems from the fact that it has fewer moving parts than conventional laser printers. Also, because the image is emitted from an array of shutters rather than from a single rotating mirror, it produces greater uniformity in pixel size and character resolution at the extremes of the optical field, claims Data Technology. **CrystalPrint**

8000 pages, while the toner set can produce 5000 pages before replacement. **CrystalPrint VIII** lists for \$2495. Data Technology Corp., 2551 Walsh Ave., Santa Clara, CA 95051; 408/727-8899.

Hard Made Easy

While at first blush statistical forecasting made easy may seem like an oxymoron, that is just what a new program from Business Forecast Systems delivers. **Forecast Pro** employs expert-system programming and three popular forecasting techniques to bring the benefits of statistics to the average manager.

No need to dig your college stat textbook out of mothballs. A handful of English commands on **Forecast Pro**'s pulldown menus steps you through the program's three time-series forecasting mod-

els. **Forecast Pro** uses Box-Jenkins for forecasts from broad and stable data, five different kinds of exponential smoothing when data is scarce or more volatile, and dynamic regression on up to 50 different variables. **Forecast Pro** automatically analyzes up to five years of historical data to determine basic characteristics like volatility, seasonality, and correlational complexity. It then turns the information over to a rule-based expert system to determine which forecasting method best fits your data.

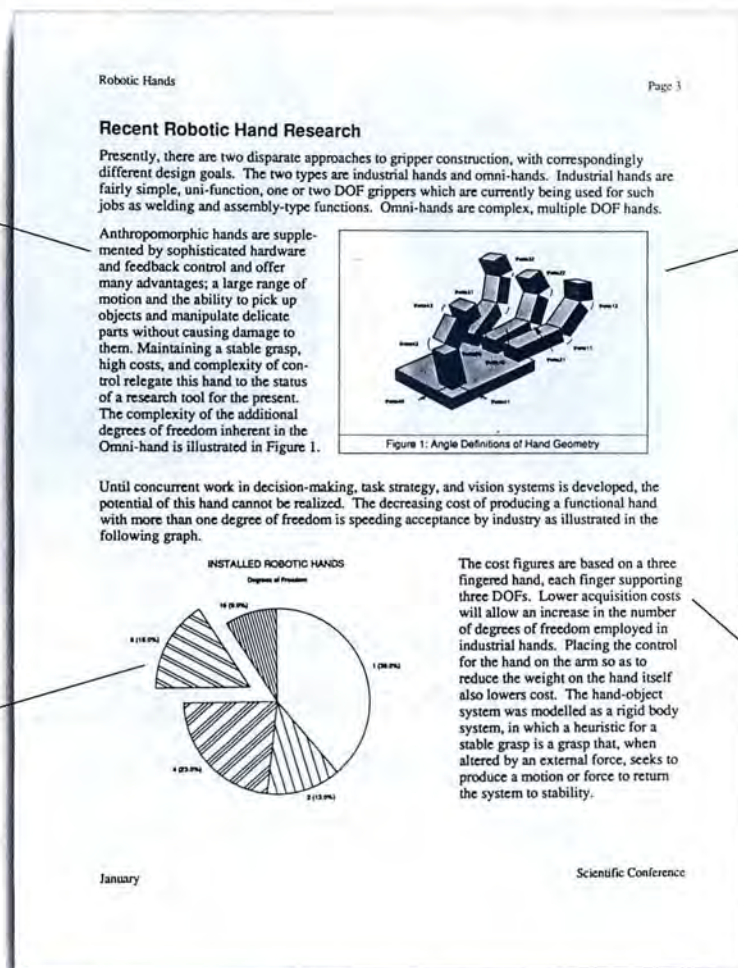
A continuous record documents the process for later review, and data can be graphed and assumptions listed in on-screen windows for easier analysis. **Forecast Pro** doesn't have snapshot macros, but you can program frequently made choices with its command language to speed the menu selection process. You also can take the program off autopilot if you prefer to introduce some assumptions of your own. Data is imported and exported in ASCII format.

Forecast Pro, which supports all standard statistical calculations, requires an IBM compatible with 512K of main memory. An Intel math coprocessor chip and a hard drive are recommended. Suggested list price is \$495. Business Forecast Systems, 55 Wheeler St., Cambridge, MA 02138; 617/354-3745. ●

Today it's almost impossible to communicate fully without text and graphics on the same page.

Lotus Manuscript™ makes it easy to put a column of text and a graphic element side by side.

Spreadsheets, graphics and charts from 1-2-3® and Symphony® can easily be mixed with text on the same page.



You can import sophisticated graphics from Freelance® Plus to enhance the communications value of any written document.

You can throw away your scissors and glue, cut and paste are a thing of the past.

Since early cave drawings, people have found graphics quite effective in communications. Yet in our information-driven society, graphics have taken a back seat to the written word. From typewriters

to word processing, graphical elements have been treated like afterthoughts, relegated to "exhibit on next page" or "cut and paste" status.

Lotus Manuscript is the first word processor that is truly a complete document creation system. It's ideal for the needs of technical writers and writers of long complex documents.

Manuscript allows you to easily mix text on the same page as graphics; elements from 1-2-3 and Symphony, graphics from Freelance Plus, or diagrams and scanned images from other sources.

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Briefly Noted

ALR 386/220

Advanced Logic Research has introduced a 20-MHz 80386-based CPU. The \$2495 **ALR 386/220** comes standard with 1MB of 80ns 32-bit memory expandable to 2MB on the system board and supports the Lotus/Intel/Microsoft expanded memory specification 3.2. The standard configuration comes with a single 1.2MB 5¼-inch floppy drive, two proprietary (memory-only) 32-bit expansion slots, four 8/16-bit slots, and two 8-bit slots. Also included are serial and parallel ports on the floppy disk controller card, which requires an 8-bit expansion slot and a 101-key keyboard. Neither a monitor nor a video adapter is included. The unit has a standard AT-compatible bus, and a BIOS and Control/386 software from Phoenix Technologies for disk caching and print buffering. The smallest hard disk configuration is the **ALR 386/220 Model 40** with 2MB of main memory on the system board, a hard disk controller board in an 8/16-bit slot, and a 30ms 40MB hard disk for \$4485. The same system configuration is available in two other models: The **Model 80** has a 70MB hard disk and sells for \$5185, and the **Model 130** has a 130MB hard disk and sells for \$7794. Advanced Logic Research, 10 Chrysler, Irvine, CA 92718; 714/458-0863.

AST TurboLaser/PS

AST Research has introduced an under-\$4000 laser printer that includes Adobe Systems' PostScript page description language. The \$3995 printer delivers PostScript on a controller board that is also available at \$1995 for retrofitting other AST TurboLaser printers. AST's current TurboLaser controller, which provides HPGL and other emulations, remains resident in the computer, while the PostScript controller resides in the **TurboLaser/PS**, enabling you to switch between the two environments at will. The PostScript board also includes an AppleTalk port to permit connection to Apple Macintoshes. The new Motorola 68000-based controller board gives you access to 35 PostScript

fonts resident in ROM. It runs at 12.5 MHz and has 3MB of RAM and 1MB of ROM. The TurboLaser/PS is equipped with a Ricoh 4081 printer engine, which prints at 8 ppm and 300 dpi. The printer has a life expectancy of 600,000 pages. AST Research, 2121 Alton Ave., Irvine, CA 92714; 714/863-1333.

4Views

4Views puts the emphasis on a little-noticed feature of 1-2-3, its data base. The new add-in from Turner Hall enables you to analyze and create reports from 1-2-3 data bases without leaving your worksheet. It adds four new views—a classic forms view for



The **ALR 386/220** is a 20-MHz 80386 computer that offers a single floppy drive and 1MB of 32-bit RAM for under \$2500.

data entry, a table/list view similar to the worksheet format for easy reading of multiple records, a report/print view, and a cross-tabulation view for data analysis. The report/print view enables you to generate mailing labels and forms while in your worksheet. *4Views* also has a modest relational data base feature that allows you to relate data ranges to one another in the cross-tabulation view. *4Views* has a suggested list price of \$99.95. Turner Hall Publishing, 10201 Torre Ave., Cupertino, CA 95014; 408/253-9600.

DB Graphics

Microrim has introduced a presentation graphics program that lets you perform spreadsheetlike analysis on data read directly from its *R:base* data base manager or from *dBASE III*. *DB Graphics*

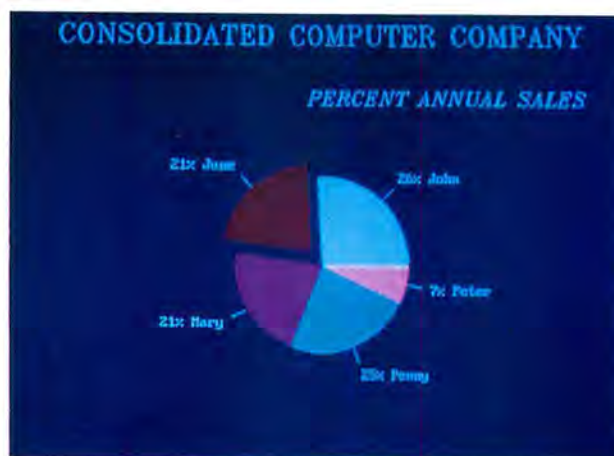
can perform more than 40 mathematical, trigonometric, logical, and financial operations and graph the results in one of eight chart types. You can choose from pie, bar, high/low, scatter, area, mixed, column, and line charts and use up to 16 colors drawn from a palette of 256. Data is imported directly from *R:base* and *dBASE III* without the use of a conversion utility. Data from other data bases and spreadsheets will be accepted after translation to these formats or the ASCII file format. Users can sort and group fields, create new variables for graphing, and make use of conditional operators in data selection. *DB Graphics* can also be used as a stand-alone presentation graphics package with data input directly from a worksheet. Graphs can be displayed on screen simultaneously in up to 32 split-screen windows. *DB Graphics'* menu system is similar to that found in Microrim's *R:base* products. *DB*

Graphics' device drivers support MDA, CGA, MCGA, EGA, VGA, and Hercules display control standards. Requirements include a PC or compatible with a hard disk drive, MS-DOS 2.00 or a later version, and 512K of main memory. Microrim, 3925 159th Ave. NE, Redmond, WA 98073-9722; 206/885-2000.

GEM Scan

You can read and edit scanned images under both *GEM* and *Windows* operating environments with Digital Research's *GEM Scan*. The \$95 desktop publishing utility provides direct control of popular scanners from companies such as Hewlett-Packard, Canon, and Princeton to bring printed images, photographs, or drawings onto the computer screen. *GEM Scan* controls line-art and half-tone scanning, variable brightness and resolution, scaling, sizing, and other scanner capabilities during the scanning process, maintaining a resolution of 300 dpi. You can edit an image without loss of resolution by manipulating individual pixels or by rotating, inverting, or flipping it. The customized image can be sent directly to an output device, saved on disk, or imported into a document

Microrim's *DB Graphics* lets you perform spreadsheetlike analysis on *dBASE* and *R:base* data and then present the results in a variety of colorful charts.



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without a desktop publishing program. *GEM Scan* supports IMG and TIFF file formats as well as all popular graphics standards, including the MCGA and VGA modes of IBM PS/2 computers. Requirements include 512K of RAM, DOS 2.00 or a later version, a graphics interface such as *GEM Desktop* or *Microsoft Windows*, and a hard disk. Digital Research, 60 Garden Ct., Box DRI, Monterey, CA 93942; 800/443-4200.

VAST

Emerald Systems has introduced a \$6995 tape backup subsystem that provides from 250MB to 2.2 gigabytes of storage capacity on a tape the size of a pocket calcula-

tor. VAST, an acronym for virtual archival storage technology, includes a built-in controller and stores information on application-specific 8mm tape cartridges that come in capacities of 250MB, 500MB, 1 gigabyte, and 2.2 gigabytes. The cartridges come in kits of five with a 3½-inch or 5¼-inch disk containing installation and utility software for \$250 to \$325, depending on tape storage capacity. The drive uses a helical-scan recording technique that enables it to back up 15MB of data per minute with error-correction of a burst of up to 264 bytes of data in each kilobyte block. You can back up all the files on a hard disk, a few selected files, selected directories, or only files changed since last backup. Emerald Systems Corp., 4757 Morena Blvd., San Diego, CA 92117; 619/270-1994.

Emerald Systems' new tape backup unit employs videotape helical-scan recording techniques in order to fit up to 2.2 gigabytes of data on an 8mm tape cartridge the size of a pocket calculator.



The Complete Answering Machine

The Complete Answering Machine (CAM) brings the convenience of call screening—long enjoyed at home via answering machine—to the PC for \$349. Plugged into a slot in a single hard-disk-equipped PC or compatible, CAM provides personal voice-mail and advanced messaging capabilities for up to 25 office workers. Using its on-board processor, CAM digitizes callers' voices and stores them on the computer's hard disk. CAM runs in the background, performing its duties without disturbing yours, until called by its hot key. A small signal at the bottom of your screen alerts you to incoming calls. CAM will forward urgent messages to another in-house extension or an outside number and is reprogrammable from any off-site touch-tone telephone. You can deliver your own message to a list of recipients, specifying the date and time and even requesting a return receipt. A true work-group tool, CAM provides password-protected voice mailboxes for up to 25 office members but can be used on only one touch-tone telephone line at a time. Other requirements include DOS 2.10 or a later version, a hard disk, and 256K of RAM dedicated to its operations. The Complete PC, 521 Cottonwood Dr., Milpitas, CA 95035; 408/434-0145. ●

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MAKE 1-2-3. EASY AS 1, 2, 3,

Funk Software, the creators of the original SIDEWAYS software program are pleased to introduce three new Lotus 1-2-3 "add-in" programs.

1. NEW SIDEWAYS version 3.2 runs as a Lotus 1-2-3 add-in application, allowing you to print directly from 1-2-3 or Symphony. SIDEWAYS can also create continuous page printouts from project schedulers, databases, and wordprocessors. \$45.
2. NOTEWORTHY documents your 1-2-3 or Symphony worksheets by allowing you to attach notes to individual cells. Noteworthy is an excellent tool for recording assumptions made while creating a worksheet or for creating help screens for templates. \$59.
3. INWORD allows you to create letters, memos, and reports inside Lotus 1-2-3. Data from the worksheet can be easily copied into an InWord document or active links between the worksheet and document can be set. \$79.

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```

DECLARE FUNCTION Filter$ (Txt$, FilterMask$)

' ===== STRTONUM =====
' Convert a number that contains non-numeric characters to
' a clean number.
' =====
' Input a line:
line INPUT "Enter a number with commas: "A$(error 1)
' Look for only valid numeric characters (0123456789.-) in the
' input string:
cleanNum$ = Filter$(A$, "0123456789.-")
' Convert the string to a number:
PRINT "The number's value = "; VAL(cleanNum$)
END

' ===== FILTER =====
' Takes unwanted characters out of a string by
' comparing them with a filter string containing
' only acceptable numeric characters
' =====
FUNCTION Filter$ (Txt$, FilterMask$(error 2))
(error 3) TxtLength = LEN(Txt$)
FOR I = 1 TO TxtLength%
(error 4) C$ = MID$(Txt$, I, 1) ' Isolate each character in
                                ' the string.
    ' If the character is in the filter string, save it:
    IF INSTR(FilterMask$, C$) <> 0 THEN
        Temp$ = Temp$ + C$
    END IF
NEXT I
Filter$ = Temp$
END FUNCTION

```

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In our program, for example, Microsoft QuickBASIC 4.0's instant syntax checking will find the missing ";" (error 1) the instant you type in the line.

Of course, other BASICs will catch errors like this. Eventually. But none will catch the fact that integer variable *FilterMask%* (error 2) should be a string variable.

Let alone give you the incredible ability to edit and continue. For example, you can step through the FOR loop,

go back and correct *TxtLength*'s missing "%" (error 3), then resume execution from that very statement.

Or allow you to monitor the changing value of *Temp\$* until you locate the especially subtle error number 4—the proper function call is *MID\$(Txt\$, I, 1)*—and, via our on-line help, confirm the fix by displaying *MID\$*'s syntax at the touch of a key.

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2. Winners will be selected in a random drawing by an independent judging organization about January 15, 1988. Winners will be notified by mail and may be required to sign an affidavit of eligibility and liability publicity release within 21 days of notification. Travel companions of winners will be required to sign releases. All taxes are the sole responsibility of winners. Odds of winning depend on number of entries. All prizes will be awarded. No transfers of prize and no substitutions except by original due to prize unavailability.

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EVERYONE'S A WINNER See inside for details.

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Microsoft Mouse

Microsoft's mouse has been ergonomically redesigned for greater comfort and ease of use, and it now includes a modular interface for compatibility with both IBM PC compatibles and PS/2s. Microsoft has repositioned the track ball of the mouse farther forward so that you can more easily move the mouse with only your fingertips and wrist rather than your whole arm. In addition, the left button of the mouse, which is the most frequently used, has been made larger than the right and a slight ridge added for quick recognition by touch alone. Six new basic mouse menus enhance its use with popular applications like *dBASE III Plus*. The new **Microsoft Mouse** comes in three versions, each with a different software package. The \$150 version includes *Microsoft PC Paintbrush*, with a variety of menus for users from novice to expert. The \$200 package offers the full version of *Microsoft Windows 2.0* for those using the *Windows* environment. The third version, for \$175, includes *EasyCAD* from Evolution Computing. The Microsoft Mouse is compatible with the MDA, CGA, EGA, VGA, and Hercules graphics adapters. Microsoft has instituted a new

lifetime warranty policy for its mouse. It will replace or repair a mouse free for up to two years after purchase or, after two years, for a small handling charge. Microsoft Corp., 16011 N.E. 36th Way, Redmond, WA 98073-9717; 206/882-8080.

QuickBASIC

Microsoft has released version 4.0 of **QuickBASIC**, a compiler-debugger-interpreter that is ten times faster than version 3.0. QuickBASIC compiles up to 150,000 lines of code per minute, permits program modification and debugging without overt recompilation, and has an editor that checks syntax as you type. The program, which is fully integrated with a subset of Microsoft's CodeView debugger, has multiple-module programming support, enhance-

ments to the BASIC language, and a multifile/multiwindow editor that supports *WordStar* commands. QuickBASIC version 4.0 lets you make changes to a running program and then continue running it without recompiling the entire program. It automatically recompiles only that portion of the program that has been changed. A single keystroke initiates debugging at any time during program development. Multiple modules may be maintained in memory and in on-screen windows for simultaneous editing of two modules. QuickBASIC version 4.0 is priced at \$99. Requirements are 384K of RAM and DOS 2.00 or a later version. Microsoft Corp., Customer Service Department, P.O. Box 97017, Redmond, WA 98073-9717; 206/882-8080.



The new Microsoft Mouse has its trackball positioned farther forward, making it easier to use, and a larger left button for recognition by touch.

Desqview 2.01

Quarterdeck Office Systems is among the first publishers to update its software to take advantage of the capabilities of the new Lotus/Intel/Microsoft expanded memory specification (EMS) 4.0.

sold separately for \$59.95. If you have an earlier version of QEMM-386, you can upgrade for \$19.95. QEMM-50/60 version 4.0 for PS/2 Models 50 and 60 is \$59.95. Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405; 213/392-9851.

405 Science Dr., Moorpark, CA 93021; 800/556-1234, 800/441-2345 in California.

pfs:first choice version 2.0 now has presentation-quality graphics in addition to word processing, spreadsheet, file manager, and telecommunications modules. Its speed has been enhanced and file conversion facilities added for accepting data from other pfs:professional series programs.

pfs:first choice

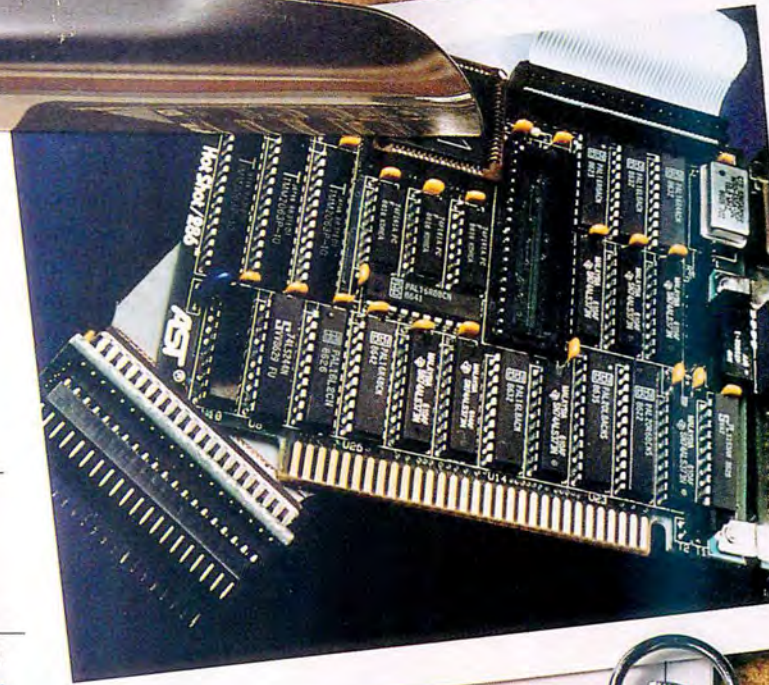
Software Publishing Corp. has added graphics, enhanced file transfer, and a 20,000-word thesaurus to its best-selling integrated package for new users. *pfs:first choice* version 2.0, which began shipping in mid-October, now has presentation-quality graphics in addition to four other modules—word processing, spreadsheet, file manager, and telecommunications. Its speed has been enhanced and file conversion facilities added for accepting data from other *pfs:professional series* programs, ASCII files, 1-2-3, and dBASE III. Other additions include a 35-function pop-up calculator, a sorted mail merge capability, and the ability to print multiple-across labels or 250-character-wide output. The original *first choice*, which has sold more than 100,000 copies and established a new market for entry-level integrated software, recently has been challenged by *WordPerfect Executive* and *Microsoft Works*. The new *first choice* will carry the same \$149 price tag, although the original package has been widely discounted to below \$100 since its introduction. Software Publishing, 1901 Landings Dr., Mountain View, CA 94039-7210; 415/962-8910.

Desqview 2.01 has been rewritten to permit, among other things, the entire operating environment to reside in expanded memory, thereby leaving more room for other applications in main memory. Other enhancements facilitate the context-switching capability of *Desqview 2.01*. Additionally, Quarterdeck has upgraded its multitasking control program for 80386-based systems, *Quarterdeck Expanded Memory Manager-386* (QEMM-386), to take advantage of the EMS 4.0 specification. It also has introduced QEMM-50/60 version 4.0 for IBM PS/2 Models 50 and 60. *Desqview 2.01* will sell for \$129.95. Upgrades for current *Desqview* users are available for free. QEMM-386 version 4.0 is

Ad-PAC

Previously, you had to own a Tandon Pac 286 to take advantage of Tandon's unique Personal Data Pac, a 30MB removable hard drive. But now Tandon has introduced a new hard disk subsystem, the Ad-Pac, that lets the Data Pac be used with any PC or compatible. The Ad-Pac attaches to the host via a controller card and a shielded cable and provides a receptacle for the 40ms Data Pac. The Ad-Pac features high-speed disk caching, and a second unit can be added without adding another controller card. The \$499 Ad-Pac Model 1 consists of a Data Pac receptacle, a cable, and a controller card that will accept two Ad-Pac receptacles. The Model 2 provides another receptacle and cable for \$199. Tandon Corp.,

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Xtree Pro

To cope with ever-larger hard disks, Executive Systems has introduced **Xtree Pro**, an upgrade to its **Xtree** hard disk management utility. **Xtree Pro** reduces logging-on time by a factor of seven, supports up to 26 drives, increases file and directory capacity to 16,000 files, and adds text-file editing. **Xtree Pro** enables you to quickly access, delete, rename, view, move, list, or copy any combination of files within any or all directories on any logged drive by selection with the cursor. **Xtree Pro** also has an ASCII text editor with a **WordStar**-like command structure. It costs \$129.95. Executive Systems, Inc., 15300 Ventura Blvd. #305, Sherman Oaks, CA 91403; 818/990-8395.

PC-Write

Quicksoft has added a document content architecture (DCA) file-conversion utility to its **PC-Write** word processor. DCA is a language used to define formatted documents, enabling files to be transferred between **PC-Write** and other word processors that support the format without losing their formatting descriptions, as well as enabling **PC-Write** documents to be sent to IBM mainframes. Like **PC-Write** itself, the DCA conversion utility is share-

ware and can be copied and given to others for evaluation before purchase. It is sold with a printed DCA Conversion Guide for \$29 or alone for \$10. Users can register their **PC-Write** copies for \$89. Quicksoft, 219 First N #224, Seattle, WA 98109; 206/282-0452.

ry Expansion Option. Borland's software driver takes advantage of the 286 Memory Expansion's bank-switching capability to deliver high-speed management of up to 8MB of memory. The price is \$725. Ansa Software, 1301 Shoreway Rd., Belmont, CA 94002; 415/595-4469.

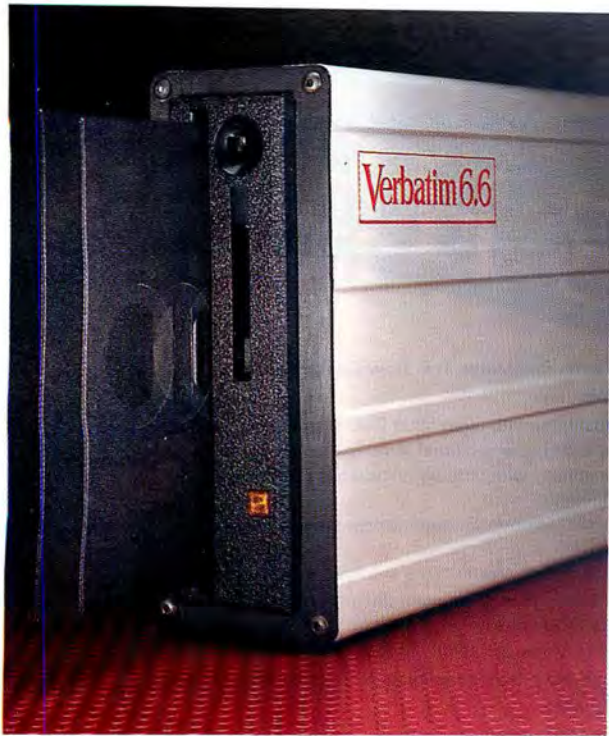
One of the first results of Ansa Software's acquisition by Borland International is the addition of Borland's expanded memory specification driver in Paradox version 2.01.

Paradox Version 2.01

It has been barely six months since the **Paradox** data base manager was last upgraded. But one of the first results of Ansa Software's acquisition by Borland International is the addition of Borland's expanded memory specification driver in **Paradox** version 2.01. The upgrade means that **Paradox** version 2.01 can reside in the expanded memory of IBM PS/2 Model 50s and Model 60s equipped with IBM's 286 Memo-

QuadEGA ProSync

Quadram offers a \$10 upgrade kit that will add the VGA graphics capability introduced by IBM on its PS/2 line to any of Quadram's **QuadEGA ProSync** graphics boards. The kit comes with a BIOS upgrade, installation instructions, and software drivers for **WordPerfect**, **WordStar**, **AutoCAD**, **GEM**, and **1-2-3**. Also included is a menu-driven utility that aids display mode selection for these software packages. Quadram, One Quad Way, Norcross, GA, 30093-2919; 404/564-5567. ●



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- 16 MISSILE LAUNCH RAIL
- 17 NAVIGATION LIGHT
- 18 WING FOLD HINGE JOINT
- 19 AILERON
- 20 FLAP VANE
- 21 FLAP
- 22 HYDRAULIC RESERVOIRS
- 23 STROBE LIGHT
- 24 RUDDER HYDRAULIC ACTUATOR
- 25 NAVIGATION LIGHT
- 26 RADAR WARNING ANTENNA
- 27 FUEL JETTISON
- 28 MOVING TAIL PLANE
- 29 ECM ANTENNA
- 30 RADAR WARNING ANTENNA
- 31 FORMATION LIGHTING STRIP
- 32 AFTERBURNER NOZZLE

- 33 AFTERBURNER NOZZLE ACTUATORS
- 34 MOVING TAIL PLANE
- 35 TAIL PLANE PIVOT MOUNTING
- 36 TAIL PLANE HYDRAULIC ACTUATOR
- 37 TURBOFAN ENGINE
- 38 AILERON HYDRAULIC ACTUATOR
- 39 WING FOLD ACTUATOR
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- 48 LEADING FLAP DRIVE MOTOR
- 49 MAIN RETRACT ACTUATOR
- 50 FORWARD RETRACT ACTUATOR
- 51 LIQUID OXYGEN CONVERTER
- 52 BOARDING LADDER
- 53 FORWARD LANDING GEAR
- 54 CATAPIULT LAUNCH STROP
- 55 CONTROL COLUMN
- 56 RUDDER PEDALS
- 57 AMMUNITION FEED CHUTE
- 58 ANGLE OF ATTACK SENSOR
- 59 PILOT HEAD
- 60 FORMATION LIGHTING STRIP
- 61 RADAR EQUIPMENT BAY
- 62 FORWARD ECM ANTENNA
- 63 RADAR PIVOT MECHANISM
- 64 RADAR SCANNER



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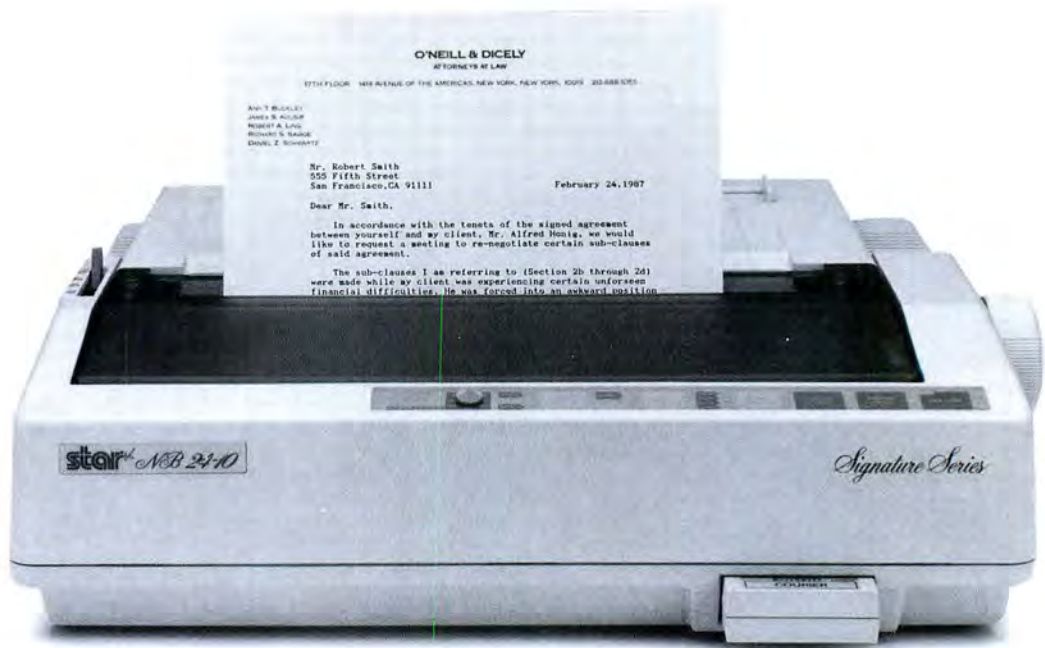


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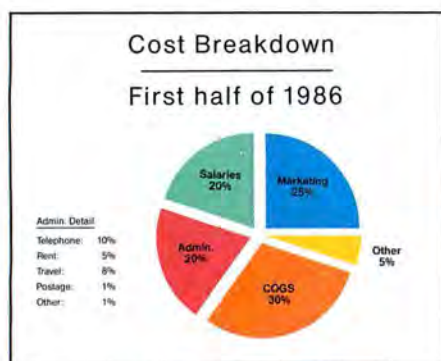


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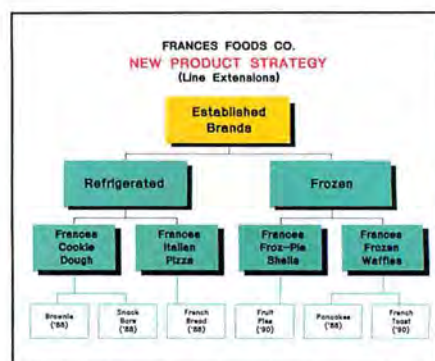


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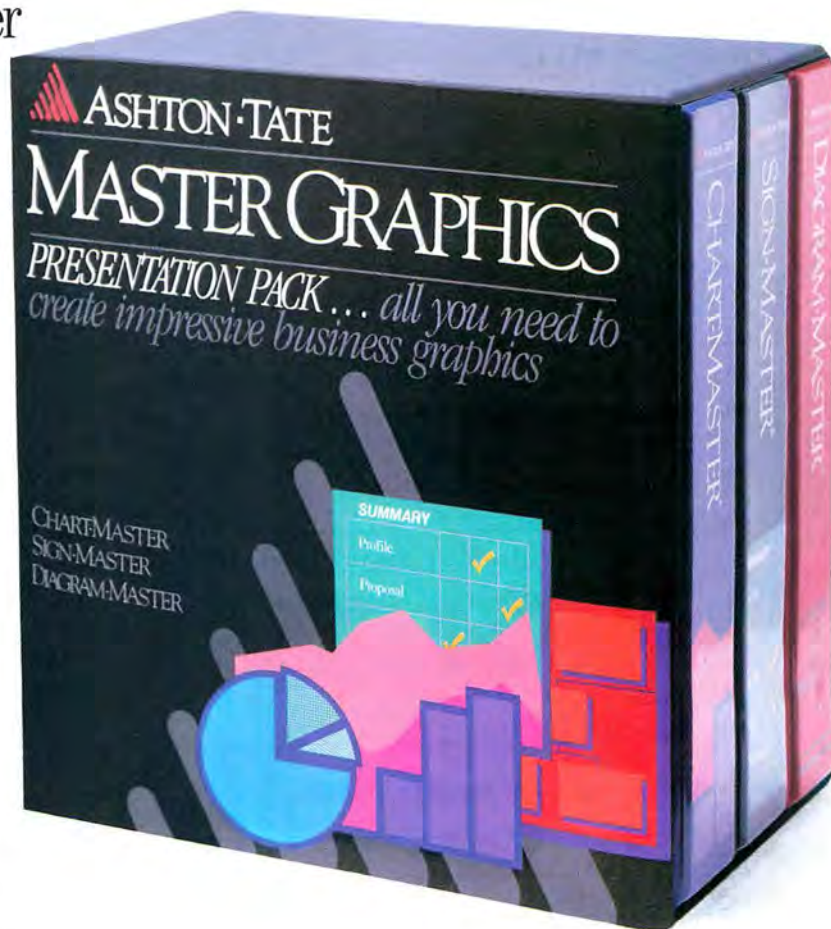
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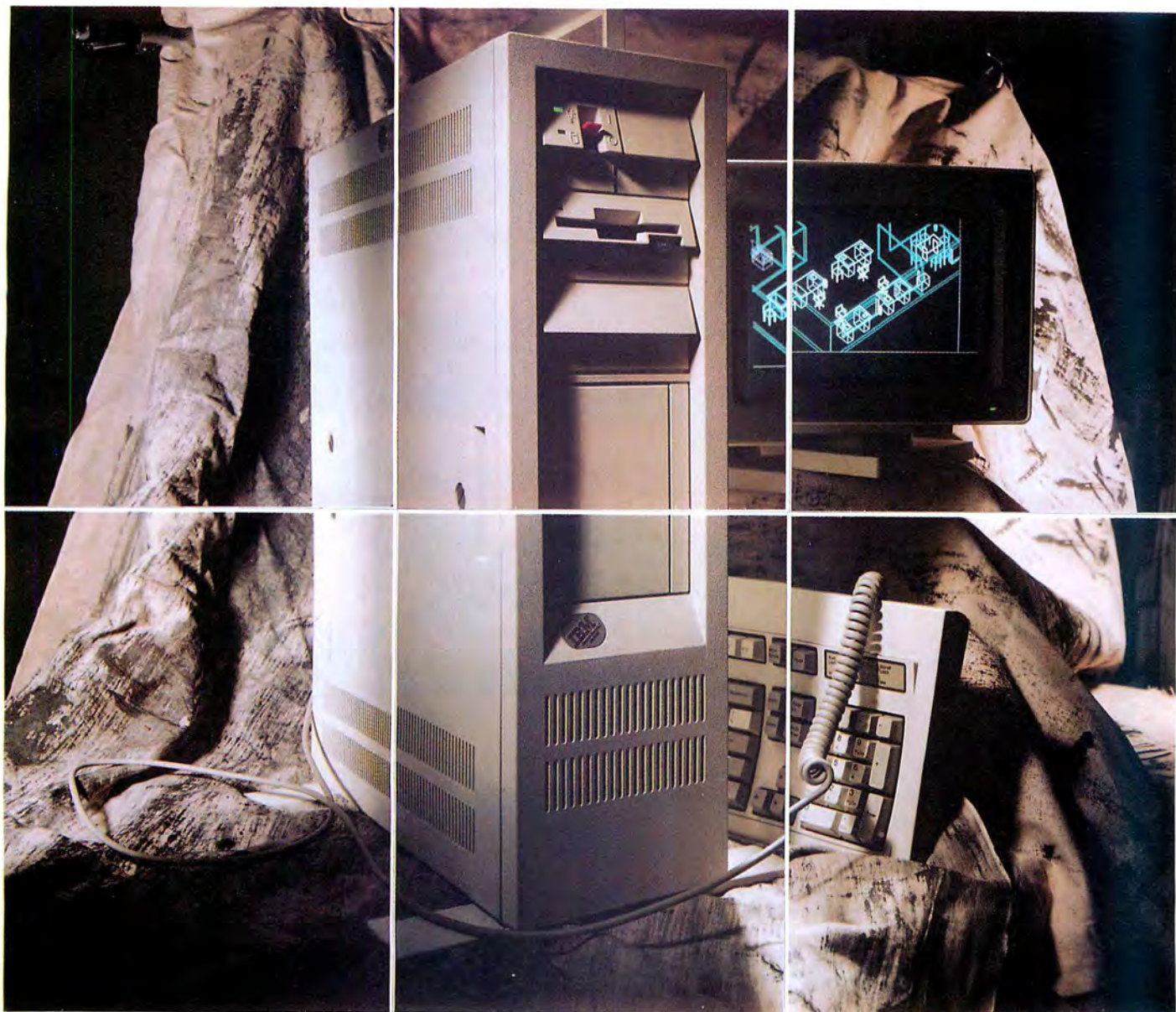
179 REMEDY REMOVABLE WINCHESTER

A Model for the '80s

You've heard about the speed and innovative design of IBM's first 80386-based computer, the PS/2 Model 80. But the real key to IBM's vanguard system is its anticipation of tomorrow's hardware and software.

Eric Knorr

 In true *PC World* tradition, I'd like to poke fun at the big guys and say, "IBM tried to make the hottest 80386 machine, but they blew it." It would be a kick, but it would be a lie. This time the PC establishment—including Microsoft's Bill Gates—is dead right (see "Gates on Systems/2," *PCW*, July 1987). You can't top the PS/2 Model 80 for overall performance, expansion potential, and ergonomic design.



As everyone points out, however, the best isn't cheap. With 1MB of RAM, a 44MB hard disk, and IBM's least expensive PS/2-compatible color monitor, this paragon of personal computers weighs in at \$7590. That's a hefty chunk of change, but surprisingly enough, the Model 80 is actually \$307 *cheaper* than a comparably equipped Compaq Deskpro 386 with an EGA display.

The most valuable return an investment in the Model 80 brings is longevity. In decreasing order of

importance, the Model 80 carries three new standards: Micro Channel Architecture, compatibility with 3½-inch disks, and the Video Graphics Array (VGA). The first two of these should be around for a long, long time. And though the VGA represents a rather timid attempt at a new graphics standard, it still improves on the EGA's resolution by about 27 percent.

The Model 80 also supports more 32-bit memory than any other 80386 machine. It holds up to 4MB on the motherboard, and with three 32-bit slots free, the system can satisfy RAM demands that don't even exist yet—more than the 16MB maximum that Microsoft's much-anticipated operating system, OS/2, will be able to address directly. IBM clearly has the future in mind.

It's the present that troubles many people. Although the Micro

PC World Evaluation

IBM PS/2 Model 80

	WordStar Professional	seconds
PC's Limited 386 ¹⁶		69
IBM PS/2 Model 80		71
Compaq Deskpro 386		72
Acer 1100		79
Kaypro 386E		82
ALR 386/2		86

	dBASE III Plus	seconds
IBM PS/2 Model 80		47
Compaq Deskpro 386		54
PC's Limited 386 ¹⁶		122
Acer 1100		132
Kaypro 386E		138
ALR 386/2		140

	1-2-3	seconds
PC's Limited 386 ¹⁶		20
Acer 1100		21
IBM PS/2 Model 80		22
Compaq Deskpro 386		22
Kaypro 386E		25
ALR 386/2		25

	AutoCAD	seconds
Compaq Deskpro 386		87
IBM PS/2 Model 80		88
Acer 1100		103
PC's Limited 386 ¹⁶		129
ALR 386/2		131
Kaypro 386E		162

	Lattice C Compiler	seconds
IBM PS/2 Model 80		54
Compaq Deskpro 386		54
PC's Limited 386 ¹⁶		65
Acer 1100		73
Kaypro 386E		77
ALR 386/2		82

Although IBM's PS/2 Model 80 lags slightly in some tests, it's still the fastest 16-MHz 80386 system overall.

WordStar Professional Although disk access plays a small part in the *WordStar* benchmark, processing and memory access speeds are the most significant factors.

The benchmark measures the time required to perform four operations on a 15,364-word document. All occurrences of the word *tomorrow* are replaced with *today*. A 13-line paragraph is copied from the beginning to the end of the document. The spelling checker is used to check the document for spelling errors (the file contains no errors, so the program does not stop for incorrect words). Finally, the first page of the document is printed.

dBASE III Plus Disk access speed is the most significant performance factor for the *dBASE III Plus* benchmark.

This benchmark measures the time required to produce a report based on a three-file join, select, and sort. The report includes calculated fields and subtotals. The benchmark uses a data base consisting of a customer file, an invoice file, and an item file. The customer file contains 500 customer records. The invoice file contains 1000 records, with one item record per invoice, or 1000 records in the item file.

The benchmark produces a report showing the companies delinquent in payment. For all invoices with merchandise shipped before a specified date and for which payment status is N, the company name, part number, quantity, price, and total cost (a calculated field that is the product of quantity times price) are printed. The report is sorted by state, with quantity and total cost subtotaled for each state and totaled for the entire report. All systems were tested with a math coprocessor installed.

1-2-3 Because no disk access is required, the *1-2-3* benchmark depends almost entirely on the pro-

cessing and memory access speeds of the systems.

In this benchmark, a 1-2-3 macro executes a series of recalculations within a 50-by-50-cell matrix. The macro enters a number into the first cell of the matrix, enters into the adjacent cell a formula that performs a calculation using that number, and copies the formula to the rest of the matrix. The spreadsheet is recalculated three times, each time with a different number entered in the first cell of the matrix. This procedure is repeated using five different formulas: one each for addition, subtraction, multiplication, division, and exponentiation. After the mathematical operations are performed, the macro executes a block move and then erases the entire matrix.

AutoCAD Disk access, processing speed, and memory access all contribute to the performance of the *AutoCAD* benchmark. However, the speed and type of math coprocessor used by the system are the most important determining factors.

The benchmark uses the sample office drawing provided with the program and measures the time required to perform four functions: retrieving and displaying the sample drawing; zooming in on a small detail within the drawing; zooming out to reveal the entire drawing; and printing the entire drawing. The office drawing contains six two-dimensional and seven three-dimensional predefined views, all of which are displayed during the third step of the benchmark. All systems were tested with a math coprocessor installed.

Lattice C Compiler In the Lattice C Compiler test, the sequential disk access rate is the most important determining factor. Applications such as file managers commonly rely on this kind of disk access.

The benchmark measures the time required to compile and link two 1000-line programs. The test is performed automatically using a DOS batch file.

Data based on tests designed and conducted by National Software Testing Laboratories (NTSL), Philadelphia, PA. All rights reserved.

Channel's superiority over the AT's bus architecture is undeniable (see "Why Buy a PS/2?" in this issue), creating a new, smaller form factor for expansion boards seems almost meager. You have to wonder whether the reduced electromagnetic interference justifies incompatibility with costly existing hardware.

The compatibility problems don't stop with hardware. When National Software Testing Labs (NSTL) tested the Model 80 with *Microsoft Word 3.0* in character mode, the program showed its dissatisfaction with the VGA by putting squiggly vertical lines all over the screen. Be forewarned: Other software written directly to CGA or EGA hardware may have similar difficulties with the VGA.

Incompatibilities aside, the Model 80 is faster overall than other 16-MHz machines on the block—mostly due to its superior disk caching. Interestingly, IBM de-emphasizes the Model 80's slight speed advantage in favor of praising the machine's forward-looking architecture. The real performance edge, the company argues, will emerge when OS/2 multitasking applications arrive, enabling the Micro Channel to overcome congestion that would gridlock a standard bus.

■ Welcome to Tomorrowland

From the outside, the Model 80 looks just like the Model 60 (see "Personal Systems Revealed," *PCW*, August 1987). The system unit is a floor-standing affair measuring 23½ inches high by 6½ inches wide by 19 inches deep. It has retractable feet to hold it up-

right, a front-mounted power switch, and a single 3½-inch disk drive (with a bay beneath to hold an additional disk drive). Below the second drive bay is another, bigger bay designed to accommodate a full-height device that needs external access, such as IBM's 3363 Optical Disk Drive.

As with all PS/2 computers, the graphics, 3½-inch drive controller, and circuitry for one serial and one parallel port are built into the motherboard. The mounting rack that traverses the system unit accommodates two full-height, 5¼-inch mass storage devices. With the hard disk controller occupying a 16-bit slot, the expansion bus can hold seven additional option boards: four of them 16-bit and three 32-bit. A special extension on one 16-bit slot provides VGA output to a video expansion adapter, such as the 8514/A. In short, as with the Model 60, IBM has bred the Model 80 for big-time expansion.

Where Models 60 and 80 diverge the most is in CPUs and memory. With the 80386 CPU complemented by three free 32-bit slots, the Model 80 can hold 22MB of 32-bit RAM—6MB more than OS/2 can address—using currently available IBM boards.

Tallying up memory options for the Model 80 can get complicated. To begin with, two special motherboard slots (not included in the eight-slot total) can each accommodate either a 1MB or 2MB board. One 1MB board is provided with the basic Model 80, and a second can be purchased for \$695. The 2MB memory boards go for \$1295 apiece.

If 4MB of 32-bit motherboard RAM isn't enough, for \$1595 you

View Configuration	
Total System Memory	
Installed Memory	1024 KB (1.0 MB)
Usable Memory	1024 KB (1.0 MB)
Built In Features	
Installed Memory	1024 KB (1.0 MB)
Diskette Drive A Type	1.44MB 3.5" ■
Diskette Drive B Type	Not Installed ■
Math Coprocessor	Not Installed
Serial Port	SERIAL_1 ■
Parallel Port	PARALLEL_1 ■
Slot1 - Empty	
Slot2 - Empty	
Slot3 - Empty	
Esc=Quit	
F1=Help	
↓ End PageDown	

The IBM Reference Diskette's elegant setup routine detects your current configuration, including the number and type of expansion boards—a readout especially useful for the slot-heavy Model 80.

can buy IBM's Memory Expansion Adapter, which comes with 2MB of 32-bit RAM and fits into any of the three 32-bit slots on the expansion bus. Two 2MB add-on modules (at \$1295 apiece) bring the adapter to its full 6MB capacity. If you're still counting, two fully loaded 6MB boards and 4MB on the motherboard add up to OS/2's 16MB limit.

Implicit in this RAM-o-rama is a groundbreaking concept: the "standard" 32-bit slot. All other 80386 motherboards have proprietary 32-bit slots designed for memory only. The Model 80 has special slots for memory *plus* the three 32-bit slots on the expansion bus. You could pack all three with RAM, but you'd need two 6MB boards at most, and probably only one. So why the free 32-bit slots? The answer lies in the architecture of the Micro Channel itself.

The Bus Stops Here

Contrary to popular belief, there's nothing spooky about the Micro Channel. Still, there are important differences between it and standard buses.

In most 80386 machines, such as the Deskpro 386, you'll find two buses: a 32-bit one for memory and an 8/16-bit one for expansion boards. The speed of the memory bus is limited only by the speed of the RAM chips—I/O expansion boards generally can't function in a bus that fast, so a separate, slower bus prevents them from imposing an artificial speed limit on memory access.

In the Model 80, there's only one bus. When IBM created a

Executive Summary

IBM PS/2 Model 80

80386-based computer

With its Micro Channel, breakneck speed, and new graphics and disk standards, the Model 80 stands as the top-of-the-line 80386 system. Its biggest advantage over the competition is support for future 32-bit expansion boards. Weak spots include high pricing and incompatibility with 8- and 16-bit boards that use the AT's form factor.

IBM

Information Systems Group
900 King St.

Rye Brook, NY 10573

201/358-5689

List price: Model 80-041 with 16-MHz 80386, 1MB, one 1.44MB 3½-inch disk drive, 44MB hard disk \$6995; Model 80-071 with 16-MHz 80386, 2MB, one 1.44MB 3½-inch disk drive, 70MB hard disk \$8495; Model 8580-111 with 20-MHz 80386, 2MB, one 1.44MB 3½-inch disk drive, 115MB hard disk \$10,995; Model 8580-311 with 20-MHz 80386, 2MB, one 1.44MB 3½-inch disk drive, 314MB hard disk \$13,995; Model 8503 12-inch monochrome monitor \$250, Model 8512 14-inch color monitor \$595, Model 8513 12-inch color monitor \$685, Model 8514 16-inch color monitor \$1550, Model 8514/A graphics adapter \$1290; 1MB system board expansion module \$695, 2MB system board expansion module \$1295, 2MB memory expansion adapter

\$1595, 2MB module for expansion adapter \$1295; 3½-inch internal disk drive \$170, 3½-inch external disk drive \$395, 5¼-inch external floppy disk drive \$335, Data Migration Facility \$33; 44MB hard disk \$1395, 70MB hard disk \$2395, 115MB hard disk \$3495, 200MB 3363 Optical Disk Drive Model A11 \$2950; 16-MHz 80387 math coprocessor \$795, 20-MHz 80387 math coprocessor \$1195; 300/1200-bps internal modem \$395; mouse \$95

new standard for expansion boards, it not only demanded new connectors, it also assumed that Micro Channel boards would run faster. With three standard 32-bit slots, the door is opened to speedy devices—such as network controllers—that beat a full 32-bit data path to the CPU.

This wide data path complements the Micro Channel's ability to handle multiple processors. A Model 80 could hold, say, an 80386-based network board and a 68020-based laser printer controller, either of which could function independent of the Model 80's CPU. As many as 15 of these future coprocessing devices—termed *bus masters*—could be supported simultaneously.

With so many processes occurring at once (which is, after all, the promise of OS/2), a standard bus would start to resemble a Los Angeles cloverleaf at rush hour. The key to the Micro Channel's

traffic management is the way it arbitrates requests for resources. A standard bus waits until one request has been fulfilled, putting all subsequent requests on hold. The Micro Channel can interleave processes, oscillating between them so that they (in effect) execute concurrently.

In a standard bus, requests are first come, first served. The Micro Channel, in contrast, lets board makers set an *arbitration level* that determines what priority a board's process will be accorded. IBM expects Micro Channel board makers to adhere to arbitration-level standards for each kind of device. Moreover, IBM's system setup software enables you to change the arbitration level of each board to resolve conflicts.

Clearly, IBM isn't bluffing when it crows about the Model 80's enormous potential. The question is how third-party manufacturers—and IBM's own engineers—will exploit the machine's 32-bit I/O capacity.

■ Immediate Gratification

Forget about the future. Even with seven empty slots, the Model 80 has significant advantages over other 80386 machines. In particular, the ergonomic features that span the PS/2 line outdo those of all the Model 80's competitors.

Volumes have been written about those clever hardware twists: Thumbscrews secure expansion boards; cableless disk drives slip in and out like yuppie car radios; and for the few cables that endure, edge connectors replace ornery pin connectors. As with the Model 60, a quarter unscrews the two bolts on the Mod-



The Model 80, IBM's top-of-the-line PS/2 computer.

el 80's system unit cover, which has a keylock to prevent unauthorized entry.

The setup software on IBM's Reference Diskette, however, is the real ergonomic triumph. The configuration screen shows how much RAM is installed and how much is usable, as well as the number and type of drives and ports and whether a math coprocessor is present. Best of all—especially for the Model 80—is a list indicating what kind of device is in which slot and what arbitration level has been set for each device. If there's a conflict between

PC World Evaluation

IBM PS/2

Model 80

<i>Without disk caching</i>	
WordStar Professional	seconds
Compaq Deskpro 386	80
IBM PS/2 Model 80	81
dBASE III Plus	
	seconds
Compaq Deskpro 386	127
IBM PS/2 Model 80	136
1-2-3	
	seconds
Compaq Deskpro 386	22
IBM PS/2 Model 80	22
AutoCAD	
	seconds
IBM PS/2 Model 80	94
Compaq Deskpro 386	96
Lattice C Compiler	
	seconds
Compaq Deskpro 386	75
IBM PS/2 Model 80	76
<i>With disk caching</i>	
WordStar Professional	seconds
IBM PS/2 Model 80	71
Compaq Deskpro 386	72
dBASE III Plus	
	seconds
IBM PS/2 Model 80	47
Compaq Deskpro 386	54
1-2-3	
	seconds
IBM PS/2 Model 80	22
Compaq Deskpro 386	22
AutoCAD	
	seconds
Compaq Deskpro 386	87
IBM PS/2 Model 80	88
Lattice C Compiler	
	seconds
IBM PS/2 Model 80	54
Compaq Deskpro 386	54

IBM's claim that the Model 80 is optimized for disk caching appears to hold true. Without caching in either system, the Deskpro 386 takes the lead. With caching, the Model 80 is the clear winner.

WordStar Professional Although disk access plays a small part in the *WordStar* benchmark, processing and memory access speeds are the most significant factors.

The benchmark measures the time required to perform four operations on a 15,364-word document. All occurrences of the word *tomorrow* are replaced with *today*. A 13-line paragraph is copied from the beginning to the end of the document. The spelling checker is used to check the document for spelling errors (the file contains no errors, so the program does not stop for incorrect words). Finally, the first page of the document is printed.

dBASE III Plus Disk access speed is the most significant performance factor for the *dBASE III Plus* benchmark.

This benchmark measures the time required to produce a report based on a three-file join, select, and sort. The report includes calculated fields and subtotals. The benchmark uses a data base consisting of a customer file, an invoice file, and an item file. The customer file contains 500 customer records. The invoice file contains 1000 records, with one item record per invoice, or 1000 records in the item file.

The benchmark produces a report showing the companies delinquent in payment. For all invoices with merchandise shipped before a specified date and for which payment status is N, the company name, part number, quantity, price, and total cost (a calculated field that is the product of quantity times price) are printed. The report is sorted by state, with quantity and total cost subtotaled for each state and totaled for the entire report. All systems were tested with a math coprocessor installed.

1-2-3 Because no disk access is required, the 1-2-3 benchmark depends almost entirely on the processing and memory access speeds of the systems.

In this benchmark, a 1-2-3 macro executes a series of recalculations within a 50-by-50-cell matrix. The macro enters a number into the first cell of the matrix, enters into the adjacent cell a formula that performs a calculation using that number, and copies the formula to the rest of the matrix. The spreadsheet is recalculated three times, each time with a different number entered in the first cell of the matrix. This procedure is repeated using five different formulas: one each for addition, subtraction, multiplication, division, and exponentiation. After the mathematical operations are performed, the macro executes a block move and then erases the entire matrix.

AutoCAD Disk access, processing speed, and memory access all contribute to the performance of the *AutoCAD* benchmark. However, the speed and type of math coprocessor used by the system are the most important determining factors.

The benchmark uses the sample office drawing provided with the program and measures the time required to perform four functions: retrieving and displaying the sample drawing; zooming in on a small detail within the drawing; zooming out to reveal the entire drawing; and printing the entire drawing. The office drawing contains six two-dimensional and seven three-dimensional predefined views, all of which are displayed during the third step of the benchmark. All systems were tested with a math coprocessor installed.

Lattice C Compiler In the Lattice C Compiler test, the sequential disk access rate is the most important determining factor. Applications such as file managers commonly rely on this kind of disk access.

The benchmark measures the time required to compile and link two 1000-line programs. The test is performed automatically using a DOS batch file.

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

arbitration levels, the software marks this with an asterisk. Detailed diagnostics, from identifying a bad controller to flagging an uninstalled speaker assembly, help put the Reference Diskette's ingenuity in a class by itself.

Other programs on the Reference Diskette enhance system performance. To begin with, there's a so-called fast keyboard mode that more than doubles the speed of cursor movement. More important—and better publicized—is the disk caching software. IBM's menu-driven caching program enables you to set the size and location of the cache buffer, as well as the size (in sectors) of the cache page. Compaq promises better caching software by the time you read this, but IBM's currently has the speed advantage.

One other performance factor bears mention. The Model 80 accommodated the 16-MHz 80387 math coprocessor from the start—a component most other 80386 system manufacturers have supported only recently, if at all. The first run of the Deskpro 386, as well as those machines bearing the early Intel 80386 motherboard, support the slower, less powerful 80287. The kind of coprocessor employed has substantial impact on calculation-intensive operations, especially CAD.

The Once and Future Clones

As usual, the most unpleasant part of the IBM deal is the pricing scheme. The base model, the 80-041, may sell for less than its Deskpro 386 equivalent, but it's still about \$2500 more than a comparably equipped 80386 clone.

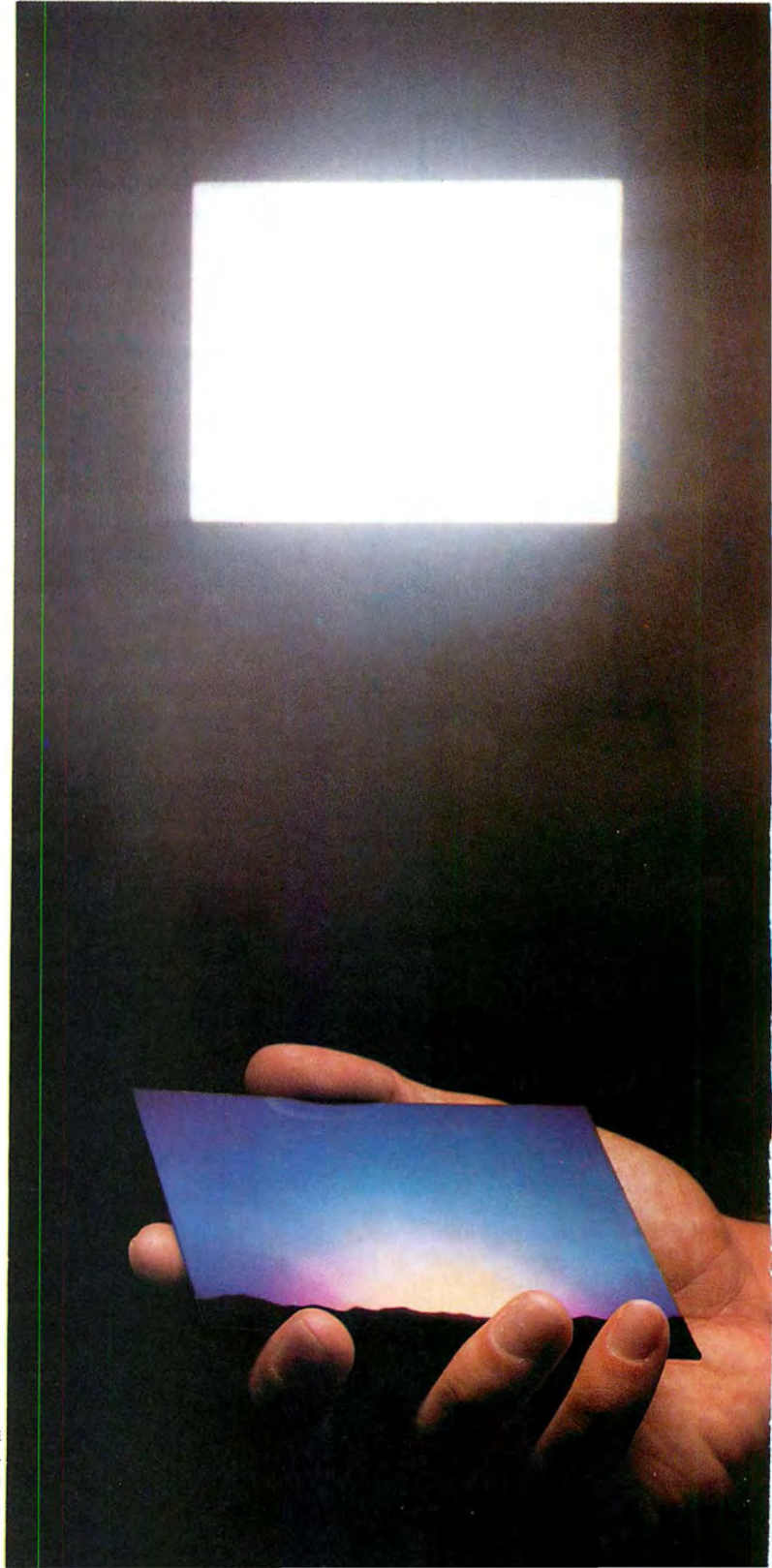
Move up to the 70MB hard disk Model 80-071 and you're paying \$8495 for a machine without a display. Due to IBM's quirky view of the market, you also get 2MB of 32-bit RAM with the Model 80-071 whether you want it or not. Worse, IBM's 20-MHz models, the 8580-111 and 8580-311 (due to ship by the end of this year), must be purchased with 115MB and 314MB hard disks, and sell for \$10,995 and \$13,995, respectively. Will there ever be a 20-MHz model for the same price (and with the same smaller hard disk) as the low-end Model 80-041? Knowing IBM, probably not for a long time.

Whether you need a network server or simply yearn for high-performance computing with colossal multitasking potential, it may be worth waiting for a faster clock speed and a slightly better price. By then, there will likely be Micro Channel boards, software that fully exploits the VGA, and (if you're lucky) OS/2 applications that take advantage of the Micro Channel's special talents.

Of course, by that time, there may also be compatible machines that use the Micro Channel's 32-bit connectors *along with* standard 8/16-bit slots. IBM may have proven itself once again to be the leader in personal computer technology, but if you can get the Micro Channel's 32-bit I/O and traffic management talents for less—without snubbing AT-style, 16-bit boards—go for the future clones. ☉

Eric Knorr is a senior editor for PC World.

Multitasking Now!



Charles Kemper

Want multitasking, context switching, cut and paste, and keys to unlock the 386? A refurbished Desqview offers a piece of the future today.

Craig Stinson

When Quarterdeck Office Systems' *Desqview* first arrived on the scene a few years back, it quickly won a reputation as the Avis of integrating environments. Where IBM's *TopView*, brought to market six months or so ahead of *Desqview*, had been big, unforgiving, and slow, *Desqview* was svelte, permissive, quick on the draw (and the redraw), and cheaper, to boot. Now a more mature offering, the latest edition of *Desqview* is snappier and more supple than its predecessor, with a raft of features to please the power-hungry.

Although *Desqview* is surely bucking the trend toward graphics interfaces, it remains the class act of character-based environment managers. The program enables

you to run multiple off-the-shelf applications in screen subdivisions called windows. Data can be transferred from one application to another, and applications that are well behaved (that is, that obey the standard DOS and BIOS screen and keyboard conventions) can run concurrently.

A stable of screen drivers (called loaders) enables *Desqview* to tame certain irascible applications—like *1-2-3*, *Crosstalk*, *WordPerfect*, and *dBASE*—that write directly to the screen. Like version 1.3, *Desqview 2.0* also works as an 80386 control program; through the program's support for the chip's virtual 86 mode, scores of 8086 applications can run side by side with absolute safety.

For power users who have had to juggle full-size programs, *Desqview* provides immediate gratification; now they can deftly edit a word processing file, for example, while downloading a missive on MCI Mail. And it's a terrific convenience never having to wait for a print job before getting on with business. *Microsoft Windows* may be a glittering promise that tomorrow's software will keep, but *Desqview* shines today. Similarly, though it doesn't do multitasking in the way that OS/2 will, *Desqview* does it now, using existing applications.

Clearing Your Desq
Desqview begs for a fully loaded system and then some. Unless you rely solely on diminutive applications and small data files, using the program with less than 640K makes little sense; for optimal performance you'll probably want at least 1MB of expanded memory. To coax the best from *Desqview*, you'll also want that expanded memory to conform to the AST/Quadram/Ashton-Tate Enhanced Expanded Memory Specification (EEMS), a superset of the Lotus/Intel/ Microsoft (LIM) specification.

That's because *Desqview* possesses a special affinity for EEMS RAM. When applications and data overflow main memory, *Desqview* automatically swaps code, data, and video screens to expanded memory—and applications can continue to chug along. Although *Desqview* still swaps programs and data to LIM expanded memory, extended memory, or a hard disk, it suspends program execution until the given application again takes center stage. Version 2.0 supports up to

8MB of expanded memory on 286 machines and a full 16MB on 386 systems. (*Desqview 2.01*, not reviewed here, includes a driver for the new LIM 4.0 specification, which supports up to 32MB of expanded memory.)

Quarterdeck has made it easy to get started with *Desqview*. The program's hard disk setup routine scans the disk for the 70-odd programs on its default list and automatically installs as many as it finds. The auto-install roster includes 1-2-3, *dBASE*, *Framework II*, *Microsoft Word*, *WordPerfect*, *WordStar*, *SideKick*, *Sideways*, and *The Norton Utilities*, among others. But getting *Desqview* to run the way you want it to—particularly when you'd like to add programs to the system's repertoire—requires patient experimentation.

Whether or not a program is on that list, *Desqview* can run just about everything in sight. Although it initially balked at *Framework II*, *Desqview* handled *Dollars and Sense*, *Norton Commander*, *XyWrite III*, and *Lotus's Manuscript* with aplomb. *Desqview* windows can even host *Windows*, *GEM*, and, scarce though they may be, *TopView*-specific programs. (*Desqview* version 2.01 will reportedly coexist even with *Lotus's Signal* and *Metro*.)

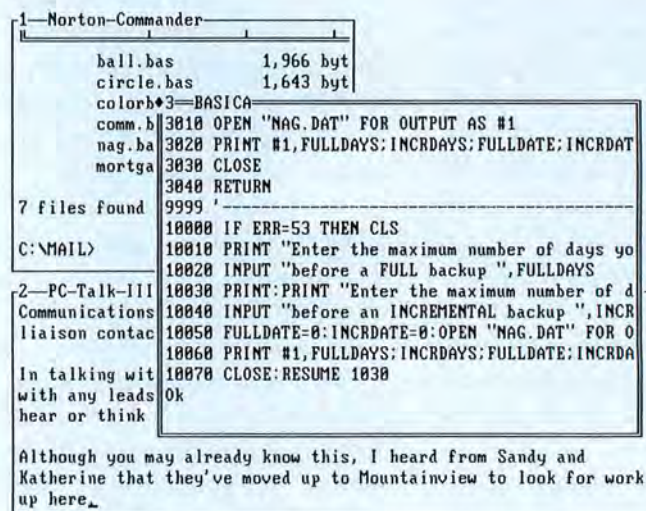
On a 640K machine free of memory-resident software, *Desqview* can run as many programs as you can stuff in about 535K; the exact amount of available RAM depends on the version of your DOS, the contents of your *CONFIG.SYS* file, and the type of

your video adapter. On ATs, 386 machines, and PS/2 Models 50 and up outfitted with extended or expanded memory, *Desqview* can now park 60K of its 145K kernel in RAM above 1MB. Unfortunately, if you don't have the extra memory, you'll be stuck with a slightly smaller work space than *Desqview 1.3* affords, owing to a marginal increase in program overhead.

With *Desqview 2.0* you can have up to 255 programs active at once, although 60 is the practical maximum—still a dramatic improvement on the program's previous 9-window limitation. Your system's storehouse of RAM will obviously preclude you from running all 60 programs concurrently, but you can activate any with a mouse click or a keystroke or two. Lest you lose your bearings, *Desqview's* Switch command

displays a numbered list of windows; to move about, you simply type the appropriate number.

Desqview pulls off the concurrency trick by apportioning minute intervals of time among the various active applications on a round-robin basis. The application that you're currently using—dubbed the foreground task—gets the lion's share of clock ticks; each of the various background tasks gets a smaller share. By default, *Desqview* grants nine clock ticks to the foreground application, three each to any active background application, nine more to the foreground program, and so on. Using a setup routine, you can effortlessly modify priorities—that is, clock ticks—for foreground and background tasks.



The screenshot shows a window titled "1-Norton-Commander". It contains a file listing on the left and a BASIC program on the right. The file listing shows:

File Name	Size
ball.bas	1,966 byt
circle.bas	1,643 byt
colorb*3=BASICA	
comm.b	
nag.ba	
mortga	

Below the listing, it says "7 files found" and "C:\MAIL>". The BASIC program on the right starts with "10000 IF ERR=53 THEN CLS" and ends with "Ok".

Below the window, there is a text block: "2-PC-Talk-III Communications liaison contac In talking wit with any leads hear or think Although you may already know this, I heard from Sandy and Katherine that they've moved up to Mountainview to look for work up here."

Programs can run under *Desqview* either in a window or the full screen. You size and position windows with the *Rearrange* command; *Zoom* lets them take over the full screen.

Fond Memories

Desquiew's magic lies in its slick memory management capabilities. On a 386 machine equipped with the \$60 QEMM-386 (*Quarterdeck Expanded Memory Manager*)—one of five *Desquiew Companions*—*Desquiew* operates the entire system in the 80386's virtual 86 mode. (That goes as well for Deskpro 386s running *Desquiew* and CEMM, Compaq's expanded memory driver.)

Unless you're running software written to exploit expanded memory, you're still limited to 640K for any individual program's code and data, but you needn't worry about expanded memory boards: The system will use all the memory you have. Better still, applications need not be put to sleep; *Desquiew* draws on the hardware protection offered by the virtual 86 mode to permit foreground and background tasks to run concurrently.

For many users, *Desquiew's* prowess as a fast context switcher will prove even more attractive than its multitasking capability. What's nifty about *Desquiew* as a switcher is its ability to restore your exact working context when you move from one program to another. While a rare program like *Microsoft Word* can recall the last file edited, precious few can put you back where you left off.

If you try to keep a large number of programs active at once, you'll want to take advantage of *Desquiew's* new Freeze command, which prevents background tasks from bogging down those in the foreground. Many programs—1-2-3 included—gobble up processor time even though they are

only waiting for your next keystroke. Fortunately, *Desquiew* permits you to turn off concurrency on a program-by-program basis.

As a memory manager, *Desquiew 2.0* demonstrates a special feel for graphics images. The program supports the PS/2's MCGA and VGA graphics standards. Version 2.0 can also operate in the EGA's 43-line mode and the VGA's 30-, 50-, and 60-line modes, and it incorporates a custom ANSI screen driver. A new Scroll command lets you view any portion of a program's underlying "virtual" full screen, and the new image remains visible until you key in fresh data. This capability comes in handy on a 386 system running *Desquiew* and the QEMM-386 driver; you can run CGA programs in windows of any size, and they can live as background applications. (Note that *Desquiew* coupled with CEMM isn't quite as versatile as the program paired with Quarterdeck's own QEMM driver; CGA applications can't operate as background tasks, and context switching reportedly is quicker under QEMM.) Although EGA programs can't run concurrently, EGA images can be frozen and scaled for window display.

Perhaps the greatest tribute you can pay a program like *Desquiew* is to note that it doesn't draw attention to itself. With two or three applications running concurrently, performance degradation is minimal. Screen updating and program switching are vir-

tually instantaneous, assuming applications aren't disk-intensive. If you're a whiz at the keyboard, you may note a few dropped keystrokes now and again. With the background frozen in a context-switching situation, performance is even more impressive.

Those who need to move data from one context to another—say,

Executive Summary

Desquiew 2.0

Operating environment

Desquiew 2.0, a major revision of Quarterdeck's character-based window manager, enhances productivity by enabling users to run multiple applications concurrently, switch between applications instantly, and easily transfer data between them. In addition to providing a larger command repertoire, the new version has upped its support for simultaneous open windows, improved its graphics handling, and trimmed system overhead for users with expanded memory. Nonetheless, extracting a virtuoso performance from the product requires technical expertise.

Quarterdeck Office Systems
150 Pico Blvd.

Santa Monica, CA 90405
213/392-9851

List price: \$129.95; QEMM-386 \$59.95; *Desquiew Companion* \$99.95

Requirements: 640K, DOS 2.00 or later version, two disk drives (hard disk recommended); Microsoft-compatible mouse optional; available on 3½-inch media
Not copy protected

from electronic mail to a spreadsheet—will find *Desqview*'s Mark and Transfer capability a vast improvement on retyping, if not a perfect solution. You can shuttle data between applications, and you can automate the process via *Desqview*'s built-in keyboard macro facility, but the program is limited to transferring screen images. Nonetheless, Quarterdeck has beefed up that cut-and-paste routine in version 2.0. You can now mark an entire block of numbers and transfer data a block at a time—not merely item by item, as in version 1.3. You can also mark multiple screens of data, not simply a single full screen.

Like *TopView*, *Desqview* offers Scissors—an intelligent transfer facility that can move formulas as well as data—in addition to the image cut and paste. But Scissors requires that both the sending and the receiving programs be *Desqview*-specific—that is, written for the *Desqview* Application Programming Interface (API). Given the current tenor of the marketplace, it's likely that Scissors will be a cutting-edge feature chiefly for in-house programmers.

Developers' Delight

In-house developers building turnkey systems are indeed the big beneficiaries of this *Desqview* overhaul. In offering support for 60 concurrent programs, for example, Quarterdeck clearly had developers in mind, since programs not written specifically for *Desqview* or *TopView* can't open subordinate windows. The *Desqview* API also offers improved

support for intertask communications. Developers can even obtain a run-time version of the product.

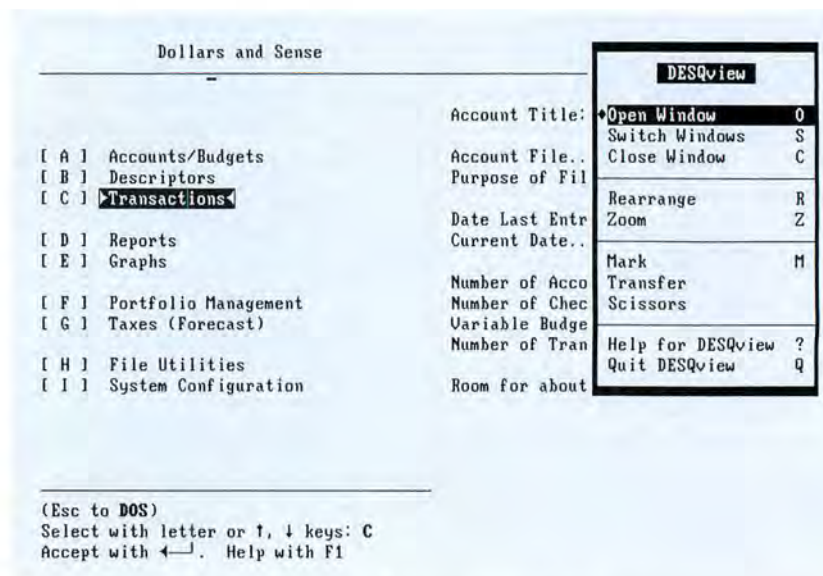
The program's macro facility has come of age. Version 1.3 allowed you to create some "scripts" specific to individual applications as well as others that operated strictly within *Desqview* menus. Only the latter, however, could execute automatically. You can now write program-specific auto-execute macros as well. These macros allow you to design a system that proceeds directly from start-up into an application within *Desqview*—and then runs a specific sequence when it gets there.

Macros can be loaded from disk anytime during a *Desqview* session. You can also redefine both the "learn" key that initiates macro definition and the "quoting" key—the prefix that temporarily removes a key's macro assignment. Unfortunately, editing *Desqview* macros is still a chore;

you must convert a binary file to ASCII and then reconvert it after you've made changes.

The menus on which you supply vital application-specific information to *Desqview* have been restructured and expanded. One option lets you set the maximum (and minimum) memory to be allocated to a program—a *TopView* feature from day one. *Desqview* determines the optimum memory allotment if resources are available and enables you to run the program even if they aren't.

Desqview 2.0 is graced by small, thoughtful improvements throughout. For example, you can now manage competition for printer resources among different tasks. The program will create and supervise a print queue, arbitrating between output generated by foreground and background applications. *Desqview 2.0* also lets you specify the speed of its



Unlike Windows, *Desqview* includes a main menu that makes it easy to start new applications or move between them.

new auto-dialer and blanks the screen after a specified period of inactivity.

Commands issued through *Desqview*'s DOS shell can run in the background; in version 1.3 such commands monopolized the system. Slicker still, *Desqview* menus are graphics context-sensitive. That is, the program senses the current graphics mode and redraws its own menu in that mode, enabling you to view both the menu and the active graphics window.

Power and Its Price

Quarterdeck has taken an already powerful integrating system and made it even more useful. The company respects user intelligence and appears to have instructed *Desqview* to stay out of the way. Certain warnings, however, still apply.

You can prevent *Desqview* from closing an application's window and thus ensure that the application's normal shutdown prompts are issued on termination. Reassuring though that option may be, it addresses a key hazard of program usage. You quit an application in any of three ways: by the normal exit routine, apart from *Desqview*; by closing the program's window; or by quitting *Desqview*. If you try the second or third approach and unsaved data remains in RAM, the relevant application won't issue a warning.

Desqview always asks for confirmation when you close a window or quit the program, but, as many a 1-2-3 user knows, such prompting is scarcely better than no prompts at all. The new 'Don't

close' option on *Desqview*'s Add a Program menu should be welcomed by those who set up systems for others to use—as well as by users who don't trust themselves to save before quitting.

For many users, Desqview's prowess as a fast context switcher will prove even more attractive than its multitasking capability.

The program's image cut-and-paste facility requires that you fly blind, to an extent. You can see the data you're marking as you mark it, but if you don't remember the exact contents of the marked block, you're out of luck; you can't back up to view the highlighting. On a smaller scale, the DOS Services option simply repackages DOS commands in a perfunctory way. Quarterdeck should have taken its cue from other DOS shells, replacing DOS's TYPE command with a View command—or, better yet, a mini-editor.

Desqview's menus are few, and—with the notable exception of the necessarily complex program information menu—fairly easy to understand. You don't have to decipher any cryptic icons and you don't need a mouse, though you're welcome to use one. But when things go awry, *Desqview* can't always tell you why or what to do about it. Quarterdeck's otherwise lucid and thorough 200-page manual is partly to blame. It covers everything from elementary DOS operations to graduate-level memory management, but separate sections for novices and pros would have served everyone's

needs more effectively. The manual includes a fairly comprehensive troubleshooting appendix; however, you may need to leapfrog through several cross-references to make sense of it.

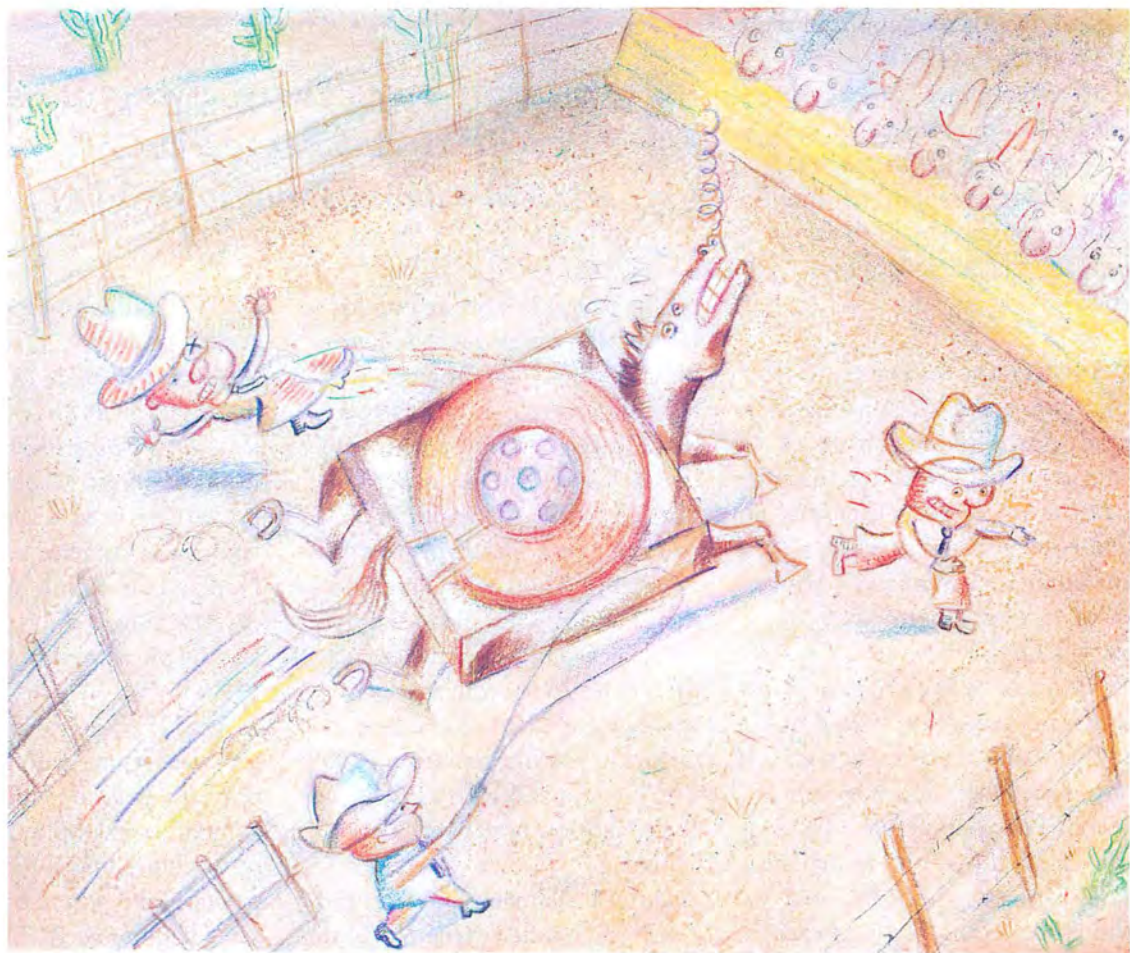
Window of Opportunity

Desqview 2.0 is an elegant, sophisticated piece of software, made all the more compelling by a suite of *Desqview*-specific desktop utilities. Quarterdeck's separately priced *Desqview Companions* consists of Datebook, Calculator, Notepad, and Link modules, plus QEMM-386. QEMM-386 can also be purchased singly for \$59.95.

At \$129.95, *Desqview 2.0* is the productivity bargain of the year, provided your system is large enough to accommodate it, you possess reasonable technical competence, and you're willing to tinker when the need arises. Although it may not be flawless, *Desqview 2.0* clearly reflects Quarterdeck's continuing resolve to try harder. ●

Craig Stinson is a technical writer and the former editor of Softalk for the IBM Personal Computer.

Mass-Storage Muscle



Andrew Skurba

With hard disk drives, bigger and faster doesn't necessarily mean easier. PC World takes a first look at high-capacity drives that crack the 100MB barrier.

Robert Luhn

||||| In the storage game, the garlands typically go to the latest and greatest technology. In the early seventies, bubble memory was all the rage; today, CD ROM grabs the spotlight. Through it all, the reliable, ubiquitous hard disk has continued its steady evolution.

The archaeological evidence is close at hand. Flip through a 1983 issue of *PC World*, for example, and you'll find *cheap* 54-millisecond (ms) 40MB internal hard disks advertised for \$3700. Thumb through the issue you're holding right now, and chances are you'll discover mail-order houses selling 28ms 40MB drives for a mere \$600.

Super hard disks—those with formatted capacities exceeding 100MB—can't quite match this \$15 per megabyte value. But with the release of high-speed AT compatibles and 80386-based systems, the rising cry for bigger, faster, and cheaper drives has compelled both original equipment manufacturers (such as Micropolis) and system integrators (such as Alloy) to offer truly massive storage to the masses at reasonable prices. Accordingly, this first look focuses on internal, high-capacity drives for the AT and compatible systems

from Alloy, Core, Micropolis, and Priam. In forthcoming issues we will examine units from Everex, Fujitsu, IDEAssociates, Maxtor, Microscience, Sunol Systems, and others.

■ Hard Disk Life-Styles

The rise of the moderately cheap super hard disk was well timed. Anyone involved in large-scale data management—the personnel director managing an ever-growing employee data base, the full-time desktop publisher, the designer using CAD software, or the manager of a departmental local area network—knows how quickly a 20MB hard disk can fill up. Of course, if your budget is slim and you're willing to compromise, alternatives abound. File-squeezing programs from *SQZ* to *Cubit* can free up a couple of megabytes of hard disk acreage; depending on the drive, some run length limited (RLL) hard disk controllers can nearly double available disk space (see "The 50 Percent Solution," *The Upgrade Path*, PCW, May 1987).

But consider this: A two-page *PageMaker* newsletter can easily soak up 200K of disk space; if you electronically paste in a half-page, 300-dpi scanned image, kiss another 500K good-bye. A floor plan generated with *AutoCAD* can consume just as much. In a

small local area network, performance and electronic elbowroom are even more critical. Yet the hub of many four- or five-workstation LANs is often an AT with a 20MB or 30MB hard disk—not the swiftest repository for order entry systems, parts catalogs, mass-mailing lists, or similar disk-intensive applications.

■ What You Get

Of course, for \$2000 and up, you might rightly ask what else a super hard disk offers besides an extra 80MB or so. Significant performance gains, for one thing. If you install one of the units reviewed here, your system will whip through tough disk-intensive chores in double time. These super hard disks are made to keep pace with high-speed 80286 and 80386 CPUs, turbo boards, graphics coprocessors (such as Intel's 82786), and other ramjet peripherals. They're also designed with special applications in mind. You can set up any of these disks with a mix of different-size "logical" drives or, conversely, create a single 100MB

partition for that monster data base. And though these super hard disks are a bit more vulnerable to shock than their smaller counterparts, mean time between failure (MTBF) rates of 50,000 hours are not unknown—some-

Notes for the Common Buyer

Most super hard disk vendors are used to dealing with engineers, DP managers, and other technical folk; the workaday PC user is a new animal. So when you sift

Formatting one of these beasts—which includes creating partitions, patching DOS, and so on—can take hours, largely because of inadequate, incomplete, or misleading user manuals.

thing even the Hardcard can't match.

Still, don't be lulled by model numbers and spec sheets. You might think, for example, that the Alloy ID-160 offers 160MB of storage, when in fact only 128MB of *formatted* disk space is available. Spec sheets for the Micropolis 1374 are also misleading, listing "typical" formatted storage at 115MB. Unfortunately, *typical* applies only to PCs using non-DOS operating systems; DOS users have to make do with 110MB. When in doubt about what you're getting, grill the vendor about total formatted storage as it applies to the computer, disk controller, and version of PC-DOS or MS-DOS you plan to use.

through product literature and talk to vendors, don't be surprised if you have to slog through a blizzard of cylinder specs, head-settling times, spindle speeds, and other bits of technical fluff. When you go shopping for a super hard disk, forget such minutiae and focus on the important factors that relate to a drive's speed, formatted storage, versatility, and reliability.

As always, a vendor's good reputation, a generous warranty, and a hefty MTBF rate indicate that a super hard disk can take a lickin'. On the performance side, look for a low interleave ratio (1:1 is the fastest setting) and a fast average-access time. Although these values are hardly absolutes, you can safely assume that a 15ms drive with a 1:1 interleave will cross the finish line ahead of a 40ms drive with a 3:1 setting.

Performance and versatility are also functions of the hard disk controller. In this realm, Microp-

olis's high-speed SCSI controller merits attention because it can support as many as seven separate devices, which means fewer slots crammed with boards. Better still, the SCSI controller shuttles data to and from the hard disk at 10 megabits per second—double the rate of the AT's standard disk controller. Although National Software Testing Laboratories' (NSTL) benchmarks illustrate that a SCSI controller won't necessarily make a difference with currently available programs, it may hedge your bets for the future. OS/2 and its brood will probably be very I/O intensive, because they'll use virtual memory schemes that treat disk space like RAM. In this environment, a SCSI controller and drive could make a big difference.

The Configuration Shuffle

Unless you've installed a few hard disk drives and have fussed with the likes of FDISK, FORMAT, and the AT's setup program, don't configure any of these super hard disks without seasoned help. Granted, removing the AT's hard disk, sliding in a new one, and attaching two disk controller ribbon cables, a power plug, and a ground wire can be a straightforward procedure—but only if the user manual is well illustrated and precise and no steps are omitted. Alas, this is seldom the case with the drives under review.

Formatting one of these beasts—which includes creating partitions, patching DOS, and so on—can take hours, again largely because of inadequate, incomplete, or misleading user manuals and configuration software. When installing a Micropolis or Core drive, for example, you'll have to fathom contradictory directions, menu-driven setup programs that seem to go nowhere, and prompts like 'initialize disk table? (y/n)'. Buy a Priam, however, and formatting the disk, setting up multiple logical drives, and updating setup information in the computer's clock/calendar chip can take all of 5 minutes.

The Way They Are

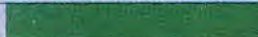




If all the super hard disks reviewed here were as easy to install as the Priam, your buying decision would boil down to how much you can spend and which drive in your price range offers the lowest cost per byte stored. These are always key factors, but the headaches involved in setting up a super hard disk can't be ignored. In preparing this review, I played out one of the most common installation scenarios: removing the 30MB hard disk in a 512K IBM PC AT and replacing it with the various super hard disks. Ponder these tales before you buy.

Alloy ID-160. When you slip the ID-160 out of the box, don't be surprised by the Maxtor logo—Alloy doesn't manufacture disk drives, it merely repackages them with software and controllers.

PC World Evaluation

High-capacity hard disk drives

	dBASE III Plus	seconds
Priam ID130-AT		172
Alloy ID-160		173
Core HC150		177
Micropolis Model 1374		178
IBM PC AT Model 339 (8 MHz)		205

	Lattice C Compiler	seconds
Core HC150		121
Priam ID130-AT		123
Alloy ID-160		123
Micropolis Model 1374		123
IBM PC AT Model 339 (8 MHz)		126

And the winner is? Despite different controllers, varying average access times, and wildly disparate prices, the super hard disks reviewed ran neck and neck in performance tests.¹

¹Tests were performed with each drive installed in an 8-MHz IBM PC AT with 640K RAM, EGA and Enhanced Color display, a 1.2MB floppy disk drive, and a 360K floppy disk drive. The Alloy and Priam drives were tested with the AT's disk controller, the Micropolis with a Future Domain SCSI controller, and the Core with a Core ESDI controller. The IBM PC AT tests were run on the same system with the system's standard 30MB drive installed.

NSTL Torture Test

NSTL conducted a day-long "torture test" to evaluate the mechanical reliability of each drive. The test, employing a compiled Microsoft C program, forced each drive to perform 100 random writes and then 100 random reads continuously for 24 hours, resulting in an estimated 1 million reads and writes. All four drives were tested in a 640K IBM PC AT and ran without failure.

dBASE III Plus Disk access speed is the most significant performance factor for the *dBASE III Plus* benchmark. This benchmark measures the time required to produce a report based on a three-file join, select, and sort.

Lattice C Compiler In the Lattice C Compiler test, the sequential disk access rate is the most important determining factor. Applications such as file managers commonly rely on this kind of disk access.

The benchmark measures the time required to compile and link two 1000-line programs. The test is performed automatically using a DOS batch file.

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

Table 1: Super hard disk drive features compared

	Alloy ID-160	Core HC150	Micropolis Model 1374	Priam ID130-AT
List price	\$5995	\$4995	\$1995	\$3320
Formatted capacity	128MB	150MB	110MB	133MB
Cost per megabyte stored	\$47	\$33	\$18	\$25
Maximum number of volumes	24	4	24	25
Volumes exceeding 32MB?	◆	◆	◆	◆ ¹
Entire disk as one drive? ²	◆	◆	◆	◆
Seek time (in milliseconds)				
Average	28	17	23	20
Track to track	4	4	5	5
Maximum seek	54	40	50	45
Factory interleave	3:1 ³	1:1	1:1	2:1
Interleave changeable?	◆	◆	◆	◆
Drive RLL compatible?	—	—	—	◆
Number of platters	8	5	4	8
Read/write heads	15	9	6	15
Controller				
Type	AT	ESDI	SCSI	AT
Price	N/A	\$495	\$400	N/A
Data transfer rate (megabits/second)	5	10	10	5
Hard disks supported	2	2	2	2
Floppy disks supported	2	2	4	2

(continues)

Since the drive relies on the AT's hard disk controller, the critical element here is Alloy's menu-driven *IPF* software, which thankfully makes formatting the drive a relatively simple task.

Alloy's generally straightforward manual is a little fuzzy in spots. Illustrations are few and far between, and particulars on setting jumpers to indicate the drive

number aren't clearly spelled out. Once past this hurdle, you can slide the unit into a full-height bay and connect the necessary cables.

To format the ID-160, you first run the AT's setup program on the Diagnostics disk (or your compatible's equivalent) and indicate that one fixed drive has moved in. You then run *IPF* and map out the logical drives you want by indicating volume number, label, and size in megabytes from the configuration menu. The first volume (C:), which will be formatted with DOS later so the hard disk can

boot, can't exceed 32MB, but additional volumes (D:, E:, and so on) can be as large as the disk permits. Save the settings, run *IPF*'s Initialization program, and low-level formatting is complete. Once done, you exit *IPF*, slip a trusty DOS disk into drive A:, and format drive C:. Since DOS can't recognize partitions larger than 32MB, you must patch it with a supplied utility, copy a special sys-

Table 1 (continued)

	Alloy ID-160	Core HC150	Micropolis Model 1374	Priam ID130-AT
Tape drives supported	0	0	1	0
Supports AT's hard disk?	◆	◆	—	◆
Buffer size (in K)	N/A	8	16	N/A
Mean time between failures (in hours)	16,000	50,000	30,000	20,000
Shock rating (in g's)				
Operating	2	2	2	2
Nonoperating with heads parked	10	32	20	20
Head parking				
Automatic with power off?	◆	◆	◆	◆
Head locking?	◆	◆	◆	◆
Power requirements (in watts)				
Startup	54	63	61	64
Average	10	28	38	35
Drive kit includes				
Drive rails/brackets	◆	◆	—	◆
Enhanced disk drivers	◆	◆	◆	◆
Configuration software	◆	◆	◆	—
Warranty				
Drive	6 months	3 years	1 year	1 year
Controller	N/A	1 year	1 year	N/A
Free technical support?	◆	—	—	◆

¹Using DOS 3.10 or later version.

²A small, bootable DOS volume must be the first partition on the disk.

³In a 6-MHz PC AT; in an 8-MHz system, interleave may be set at 2:1.

tem file to drive C:, and reference it in CONFIG.SYS.

That's it. Restart the system, and the ID-160's built-in speaker burps to let you know that it's awake and ready to roll. But the drive's pricey \$5995 bottom line—\$47 per megabyte stored—may give you pause. So will the drive's reliance on the AT's slugabed controller, its low MTBF rating, and the company's puny six-month warranty. As one unnamed company source admitted, hard disks

aren't Alloy's primary interest. This shows in the lack of aggressive pricing and innovative features.

Core HC150. At first glance, Core's drive is a spec-sheet dream. The unit offers 150MB of storage, relies on a swift ESDI controller capable of pushing data out at 10 megabits a second, and has a MTBF rating of 50,000 hours.

The ESDI controller can run other drives in the Core line, and Core's *Gigafile* setup software permits three nonbootable volumes of any size up to 1 gigabyte. Of course, for \$4995 you'd expect this much and more. But in use, the Core just doesn't deliver on its promise. As NSTL's benchmarks show, the HC150 is no faster than drives costing thousands less.

To make matters worse, installation is a nightmare, thanks to Core's convoluted and confusingly illustrated documentation—de-

signed to serve customers buying any 1 of 13 different Core drives. Core exacerbates the confusion by spreading information about the drive, controller, and setup software across three different manuals. More often than not, you find yourself hip deep in one procedure when you're directed to an appendix, which in turn points you to another manual. This Tin-kers-to-Evers-to-Chance approach will drive most users batty—as will the manuals' contradictions and vague instructions.

For example, if you are replacing an AT's hard disk and controller with the HC150 and Core's ESDI board, you're directed to the Fixed Disk manual. Reading the

first paragraph, you discover that you must configure and install the Core controller before doing anything else. This tedious procedure involves setting eight jumpers that indicate everything from drive

peripheral needs the same "channel" to the computer's microprocessor. Once the controller is configured, you attach three cables to the board (two for the hard disk, one for the system's floppy disk drive)

As NSTL's benchmarks show, the Core HC150 is no faster than drives costing thousands less.

type to such esoterica as "base memory address." Of course, versatility is the point, and with the proper settings you can add three additional Core controllers and six hard disks, or change I/O ports in the event another internal pe-

and push it into a 16-bit slot. If you plan to run the HC150 and a non-Core drive (such as the AT's) from the ESDI controller, be prepared to literally cut out portions of the latter drive's ribbon cable.

Configuring the drive itself is far simpler—you just set a single jumper on the back to indicate whether it is the first or second hard disk in the system, slide the drive in, and attach the appropriate cables. Since the HC150's ESDI controller is not recognized by the AT or most compatible systems, when you run the computer's setup program you must specify that *no* fixed disk drives are installed.

Turning the HC150 into the system's bootable drive takes 5 minutes, tops. Run FDISK from the DOS disk and create the first partition (which acts as drive C:), then format the partition with `FORMAT C: /S/V`. To divvy up the remaining 118MB into usable (though nonbootable) drives, you copy a special driver onto drive

9/09/1987

I. P. F.
Version 1.0 (C) 1986
ALLOY COMPUTER PRODUCTS, INC

Space Available = 0.00 Mbytes

VOL #	START(CYL)	END(CYL)	SIZE(CYL)	VOLUME LABEL	VOLUME SIZE
0	0	255	256	DOS	31.87 Mbytes
1	256	511	256	ALLOY - 001	31.87 Mbytes
2	512	767	256	ALLOY - 002	31.87 Mbytes
3	768	1023	256	ALLOY - 003	31.87 Mbytes
4	0	0	0		0.00 Mbytes
5	0	0	0		0.00 Mbytes
6	0	0	0		0.00 Mbytes
7	0	0	0		0.00 Mbytes
8	0	0	0		0.00 Mbytes

Enter volume number to have configuration altered..[CR = done]..X

CYLINDER : 0 HEAD : 0 STATUS : ok

With Alloy's IPF software, you have nearly total control over the allocation of volumes. The first volume is limited to 32MB, but successive volumes can be as large as space allows. IPF keeps track of remaining space.

C:, reference it in the system's CONFIG.SYS file, and run Core's *Gigafile* utility. *Gigafile* is practically a carbon copy of FDISK and FORMAT, except in this case you can create partitions exceeding DOS's 32MB limit or one huge partition soaking up most of the disk. In fact, because the HC150 is curiously limited to a maximum of four partitions, you must create at least one oversize drive to allocate all of the disk's formatted storage.

Sound complicated? It is. And the end result is hardly hassle-free. Whenever you restart the system, the message '162-System Options Not Set - (Run SETUP)' flashes on the screen, and everything grinds to a halt. You must press <F1> to keep things going. Core claims that a recently released ROM for the ESDI controller and a revised *Gigafile* smooth out this wrinkle.

Given the preceding, the HC150 hardly seems worth the struggle. If warranties and reliability (in the form of higher shock and MTBF ratings) are key, the drive is appealing. Its price, however, isn't.

Micropolis 1374. Since 1977, Micropolis has supplied high-capacity hard disks to such well-established minicomputer companies as Digital Equipment, Apollo, and Data General. The PC market, however, is a bit more slippery, what with customers demanding both reasonable pricing and simple installation. With the Model 1374, Micropolis has satisfied the first requirement but failed the second. A 110MB hard disk drive that works in a PC, an AT, and even a Tandy 1000 and

(with a SCSI controller) costs \$2395 is hard to beat. But figuring out what it takes to configure the drive can be as nerve-racking as it is with the Core.

Small wonder. The hard disk manual is "directed to service personnel...field service engineers or repair technicians" and is larded with pin-assignment diagrams, schematics, and other technical verities. However, after sweating over discussions of jumper settings and interface terminators, you discover the drive is sealed tight and there's nothing to set. All you do is slide it into the system's empty drive bay and connect the appropriate cables.

The \$400 SCSI controller kit, which includes the board, cables, *Maestro* setup software, and user manual, is provided by Future Domain. The manual boldly states that installing the controller and configuring the drive is a "plug and play" affair. "Sweat and swear" is more like it. The manual is just as schizoid as the Core's—steps are out of sequence or simply missing, explanations are vague, and there's no index. With a little effort you can set the few DIP switches on the controller and pop it in a slot. But try to connect the drive and the controller, and you'll notice that the cable connectors aren't properly keyed and that the manual neglects to note their correct orientation.

Executive Summary

ID-160

High-capacity hard disk drive

Alloy's super hard disk's primary asset is its menu-driven configuration software. The drive is otherwise far too expensive and, based on MTBF and shock ratings, not likely to be as reliable as its peers.

Alloy Computer Products, Inc.

100 Pennsylvania Ave.
Framingham, MA 01701
617/875-6100

List price: \$5995

Requirements: DOS 2.00 or later version, standard AT controller

HC150

High-capacity hard disk drive

Among those reviewed, the Core is the only drive that relies on a high-speed ESDI controller. Other pluses: substantial MTBF and shock ratings and a three-year warranty, which indicates this is one drive that will last. Key disadvantages: The drive is very expensive, and configuration can be excruciating.

Core International
7171 N. Federal Hwy.
Boca Raton, FL 33431
305/997-6055

List price: \$4995, ESDI controller \$495

Requirements: DOS 2.00 or later version, ESDI controller

Trying to format the disk is like playing a quick round of Clue. If you take the manual's advice and run *Maestro's* "automatic installation" program, you have to plow through a series of terse menus and answer such obvious questions as 'Enter, Edit, or Load Defect List?' If you have the patience and expertise to wade through the manual's custom installation procedures, however, you can successfully partition the disk, format

it (in about 3 minutes), and copy over the necessary drivers. But many detours and dead ends lie in wait for even the experienced user.

Micropolis apparently is aware that the Model 1374 is a bear to install. The company is hurriedly rewriting its manual, creating a separate installation manual for the rest of us, and replacing *Maestro* with Storage Dimensions' *SpeedStor*, an able and comprehensible setup program. If Micropolis makes good on these changes, this inexpensive, SCSI-

Executive Summary

Model 1374

High-capacity hard disk drive

This bargain-basement super drive almost has it all: a great price, top-notch performance, and a SCSI interface that can support seven devices, including a tape drive. The manual and configuration software, however, are ludicrous, and installation is torture. Rewritten manuals and *SpeedStor* software may make this criticism moot.

Micropolis Corp.
21123 Nordhoff St.
Chatsworth, CA 91311
818/709-3300

List price: \$1995, SCSI controller \$400

Requirements: DOS 2.00 or later version, SCSI controller

ID130-AT

High-capacity hard disk drive

Except for price, the Priam drive is the best deal going. Installation and formatting can be done in minutes; the drive also works with other controllers, including RLL controllers. However, its MTBF rating is the second lowest of the group reviewed.

Priam Corp.
Systems Division
20 W. Montague Expwy.
San Jose, CA 95134
408/434-9300, ext. 4370

List price: \$3320

Requirements: DOS 2.00 or later version, standard AT controller

PRIAM EDISK - Disk Manager Release 3.13
(c) Copyright PRIAM Corporation 1986

LIST VOLUMES

DOS Version 3.1 Running

Drive 1 Volume(s)

#	Label	Boot?	Type	Start	End	Megabytes
1	id1v1	Y	DOS 3.1	0	256	33.5
2	id1v2	N	DOS 3.1	262	513	32.9
3	id1v3	N	DOS 3.1	514	770	33.5
4	id1v4	N	DOS 3.1	771	1017	32.2

Total Disk Space : 132.9 Megabytes
Assigned Space : 132.1 Megabytes
Available Space : 0.8 Megabytes

Press <Esc> to return to Previous menu

Like Alloy, Priam's InnerSpace software presents a straightforward table for setting up hard disk volumes. However, with InnerSpace you have the option of creating as many as 24 volumes. But creating any volume beyond 32MB can be a chore.

equipped drive could be the super hard disk bargain.

Priam ID130-AT. In this battle of the storage titans, Priam's drive is clearly a winner, if only on the basis of ease of installation and setup. The drive uses the AT's existing controller and its interleave is set at 2:1. But you can easily change the interleave to 1:1 using a Western Digital controller, or you can boost storage by 50 percent with an RLL controller from Adaptec. The ID130-AT will even work in an XT if you replace a chip on the XT's hard disk controller or use Priam's InnerSpace controller. Priam's hardware and software installation manuals are generally lucid and well illustrated, although both lack indexes.

There are certain limitations and quirks to contend with. Because the Priam soaks up a hefty 64 watts at start-up, any other hard disk in the system must pack its bags and hit the road when this drive is put in place. The company also insists that the drive be installed in the leftmost full-height bay. The location doesn't make a world of difference—whenever the drive is accessed, it sounds like a Porsche in need of a new clutch.

The Priam's simplicity of configuration may nonetheless sway you. If you loathe fiddling with FDISK, FORMAT, and the AT's setup program, Priam's *Inner-*

Space software is for you. To automatically format and create four volumes, you take a formatted floppy disk containing COMMAND.COM and the DOS system files, copy the *InnerSpace* programs onto it, and reboot the

Micropolis's manual is just as schizoid as the Core's—steps are out of sequence or simply missing, explanations are vague, and there's no index.

computer with the disk in drive A:. Answer one prompt and the program is off and running; in a few minutes, the drive is formatted and ready to use, with logical drives C:, D:, E:, and F: in place.

Creating as many as 24 volumes of varying size (but less than 32MB) involves a bit more work. You run Priam's menu-and-prompt-driven EDISK utility, delete all but the first (bootable) volume, then create and name new volumes as you wish.

If you need volumes exceeding DOS's 32MB limit—or want the entire disk turned into a single huge drive—you must patch DOS's default sector size with the supplied PSIZE utility. Priam doesn't recommend the practice, for good reason: Managing a drive this big is no mean feat, and more disk space is consumed because the sector size is changed. This is one piece of advice the user should take seriously.

■ What Price Storage?

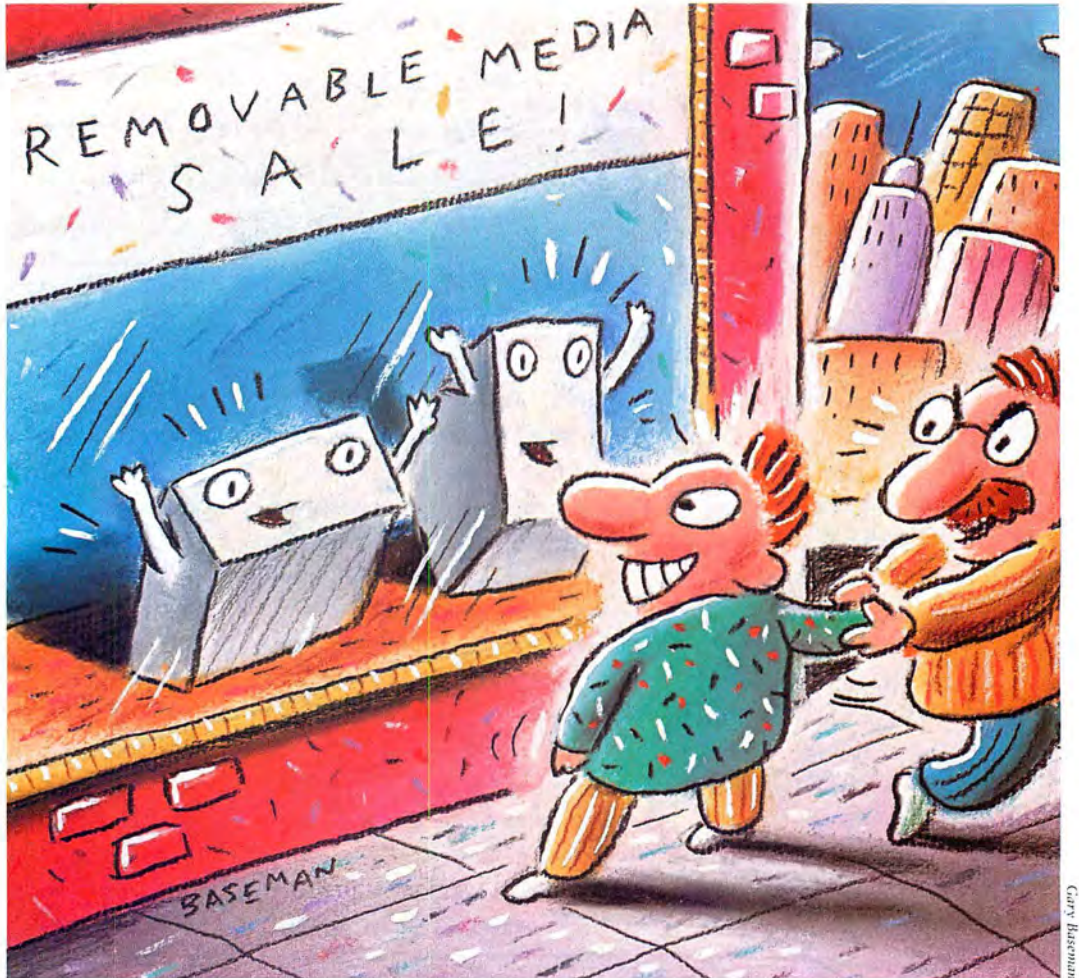
If money's not your top concern and skilled technical assistance is unavailable, the \$3320 Priam ID130-AT should be your first choice. The drive is versatile enough and a snap to install. The

Micropolis Model 1374, however, is too good a deal to ignore. Installation is a pain, but the price, performance, and SCSI controller make it hard to pass up.

Whatever drive you buy, remember that super hard disk vendors aren't selling Hardcards. They expect a relatively sophisticated customer who's willing to put up with spotty technical assistance and occasionally indecipherable manuals. If such obstacles don't faze you, just remember: When you own a super hard disk, you'll eventually have to back it up. But that's another article. ☹

Robert Luhn is a senior editor for PC World.

Removable Resources



Five alternative storage devices offer new twists on high-density, removable-media technology. But

with high prices and relatively slow speeds, they're not for everyone.

Michael Goodwin

||||| Even the biggest hard disks fill up eventually, and while floppies may be small, when one fills up you can always stick a new one in the drive. Combine the speed and capacity of a hard disk with the convenience of a floppy, and you have the best of both worlds.

Iomega's Bernoulli Box, introduced in late 1984, was the first popular high-density, removable-media drive. It provided unlimited storage in the form of portable 10MB cartridges—for backups, for archiving or shipping very large data files, or as “safe-deposit boxes” that you could lock away in your bottom drawer or secure off-site. Although eminently reliable and outrageously popular, the Bernoulli Box was also big, expensive, and fairly slow. Consequently, users shared the Box; few employed it as their only mass storage device.

Since the advent of the Bernoulli Box, a raft of other removable storage media products has emerged. Five of the latest entries are the Pelican 6.6, Systems Peripherals' Remedy Removable Winchester, Mountain Computer's 20MB Micro Bernoulli, Sygen's DuraPak, and IDEAssociates' Diskit 2. All of these units

are smaller, faster, and cheaper by the megabyte than their Bernoulli ancestor.

To give you an idea of the kind of performance you can expect, National Software Testing Laboratories (NSTL) tested the speed of five devices. Three of these units—the Pelican 6.6, the Remedy Removable Winchester, and the DuraPak—perform at speeds rivaling that of a hard disk. Of the three, the Pelican is the fastest, with the Remedy (which is actually a removable *hard disk*, drive mechanism and all) close behind. Both the Pelican and the DuraPak use disk caching to enhance their performance.

NSTL also conducted a day-long “torture test” to evaluate the mechanical reliability of each drive. Using a compiled Microsoft C program and a 640K IBM PC AT, the test forced each drive to perform 100 random writes and then 100 random reads continuously for 24 hours, resulting in an estimated one million reads and writes. Four of the drives passed, but toward the end of this marathon the Remedy broke down. At

the very least, this failure indicates poor quality control by the vendor.

With the exception of the Diskit 2, whose slim chassis slips between monitor and system unit, all of the devices can be installed

Designed around Kodak's high-capacity drive, the Pelican 6.6 uses a Verbatim 384-tracks-per-inch, 5¼-inch floppy disk to achieve its 5.5MB formatted capacity.

internally, leaving your desk free of extraneous hardware. However, whether you'd want to use any of these products as your only mass storage device is an open question. With fast 40MB hard drives selling for under \$500 (controller included), it could be tough to justify spending from one-and-a-half to six times as much for a removable—especially when you might end up paying a pretty stiff speed penalty.

The market for these devices, then, is still fairly specialized. Users who crave room for large amounts of data—such as CAD users who archive large drawings, desktop publishers who ship entire issues on cartridge, or administrators who regularly swap massive data bases—can make excellent use of the elbowroom. For the rest of us, sharing external versions of these alternative devices is the most practical way to go.

■ Pelican 6.6

Strictly speaking, the Pelican 6.6 is not a hard disk drive at all. Designed around Kodak's high-capacity drive, it uses a Verbatim 384-tracks-per-inch, 5¼-inch floppy disk to achieve its

5.5MB formatted capacity. The average access time of the Pelican is only a poky 225 milliseconds (ms). However, a high-performance 512K cache controller brings the unit's performance right up to hard disk speed. As an extra convenience, the Pelican offers the ability to read (but not write) standard 360K and 1.2MB floppy disks. The unit cannot be used as a start-up drive.

PC World reviewed the external Pelican, a sleek, silvery box roughly twice the size of a modem, with a built-in cooling system and power supply. (An internal version is also available.) At first, installation seems simple. Set a few jumpers on the controller board, place the board in a vacant slot, connect a cable from the port

at the rear of the controller to the drive, and plug the drive into the wall. Copy driver software from a floppy disk to the start-up disk, run a simple setup program, and when the Pelican comes up as drive D:, you're ready to work.

The only problem was that PC World's review unit, installed in a standard IBM PC AT, refused to perform at all, except to produce an impressive series of error messages. A Pelican representative recommended changing a series of interrupt numbers and I/O addresses—all to no avail. Finally, another drive was received that refused to work unless the disk was ejected and reinserted imme-

Executive Summary

Pelican 6.6

Removable-media hard disk

The fastest and least expensive of the removables reviewed, the Pelican 6.6 uses Verbatim 5¼-inch floppies, which offer 5.55MB of formatted capacity. Disk caching pushes the drive to near hard disk speeds for some operations. However, installation is difficult and the unit tested was buggy.

Pacific Micro Systems, Inc.
160 Gate 5 Rd.
Sausalito, CA 94965
415/331-2525

List price: internal \$695, external \$895, box of five Verbatim 384-tpi disks \$100, additional controller boards \$125 each

diately after start-up. Thereafter, as long as the computer was powered up, the drive worked perfectly. Turning off the computer and restarting it, however, sent the Pelican right back into failure mode.









Despite the installation problems (which Pelican insists are atypical and ultimately solvable), disk caching makes it the fastest unit tested. However, for the Pelican's cache controller to work effectively, the DOS VERIFY command must be turned off; otherwise performance is degraded by between 500 and 1000 percent! This moderately important fact is not mentioned in the documentation.

With 5.5MB of precious data passing from hand to hand on a flimsy Pelican floppy, accidents are bound to happen. How serious are they likely to be?

To find out, a data-filled Pelican disk was frisbeed across the office several times, bent (gently), and dropped on the floor where a heavy office chair was rolled over it. Amazingly, the disk remained readable; no data errors were found.

Backit, an alternate backup utility, is bundled with the Pelican; it performs a 6MB backup in 186 seconds—significantly faster than DOS's BACKUP. At a bargain-basement \$895 (\$695 for an internal model), plus \$100 for five disks, the Pelican provides a fast, economical removable solution—if you can make it run.

Five high-capacity removable-media drives compared. Note that the Remedy is actually a removable hard disk drive, available in several capacities.

	Media capacity	Media price	Start-up capability	Internal and external versions
Pelican 6.6	5.5MB	5/\$100	no	
Remedy Removable Winchester	20-47MB	n/a		
Micro Bernoulli	20MB	\$99		
DuraPak	15MB	\$115		
Diskit 2	10MB	\$99		external only

Remedy Removable Winchester

The 30MB Remedy Removable Winchester is a high-speed, half-height drive that slides into a "docking mechanism" that can be mounted permanently in any vacant half-height PC, XT, or AT drive bay. (An external mount is also available.) When the drive fills up or needs to be removed for any reason, you can slide it out and replace it with a duplicate drive—even with the power on. A convenient lever releases the drive from the docking mechanism.

Installing the Remedy is a job for a professional. Setup involves switching hard-to-reach drive jumpers, removing and replacing terminating resistors on various drives, and connecting and disconnecting drive cables; it may even require drilling holes in the floppy bay to accommodate mounting screws. Instructions provided with the unit are confusing and incomplete.

Once the new drive is in place in an AT, the computer must be told about it via DOS's SETUP routine. Systems Peripherals has made this task unnecessarily difficult by failing to include essential information concerning drive type. The Remedy also requires a low-level format, a DOS partition, and a high-level format. *Speed-Stor*, a low-level formatting utility, is bundled with all Remedy drives larger than 32MB, but for 20MB drives you're on your own.


The Remedy can be driven by virtually any hard disk controller and performs exactly like a non-removable, high-speed Winchester. It can be used to start the computer or installed as a second (nonstartable) hard drive. Both

35ms and 65ms drives are available, as are Western Digital 1003 RLL (run-length limited) controllers offering 50 percent higher transfer rates. *PC World* tested a 35ms, non-RLL unit. It proved the second-fastest drive tested, just a tad slower than the Pelican.

Even with a relatively high shock rating of 80 g's, it didn't seem like a good idea to test the drive by dropping it, but obviously such an accident can happen. More seriously, failing the NSTL torture test says little for the drive's reliability.

Another inconvenience has to do with the fact that the last drive in a computer's drive chain must have a "terminating resistor." Hence, if the Remedy is installed as the last drive, the computer will not operate when the Remedy and its terminator are removed, unless another Remedy (with the terminator installed) replaces it. Two Remedy units may be required.

The Remedy is best suited for workstations that are shared among several users: Just pull out a coworker's unit and plug yours in, and you'll have "your own machine"—personal data, directory structure, and all. Were it not for the drive's breakdown during testing, the Remedy would offer impressive performance at a very reasonable price. Presumably, the manufacturer will replace any defective drives quickly and cheerfully. Nonetheless, the device could be a risky investment.

 **DuraPak**
The dual-drive version of the DuraPak won't win any design awards, but it's functional enough: two doors, two square buttons, two LEDs. You open the doors, slide in the 15MB cartridges, close the doors, and wait 15 seconds while the cartridges come up to speed and the red

LEDs turn green. The doors are a bit sticky; at one point a cartridge refused to eject until the door was pulled open more forcibly than seemed wise.

Installation is simple enough. A recent hardware/software upgrade to version 3.0 requires you to replace two clearly identified chips on the controller. Then you slide the drive into a vacant full-height bay, place the controller in an empty slot, connect data and power cables, install the caching software, and you should be up and running.

The DuraPak can be configured as a start-up drive if desired; otherwise, the two 15MB drives come up as D: and E: (assuming you've already got a start-up hard disk configured as drive C:). They behave exactly like conventional drives; all DOS commands work normally.

Average access time is a leisurely 85ms, but the software installation program offers several different cache-memory schemes to speed up disk access. A cache can be installed in extended, expanded, or standard memory—limited only by available RAM.

A utility called The Optimizer is included to test drive performance at different interleaves and recommend the most efficient setting. After 20 minutes of testing, The Optimizer reported that changing the interleave from 3 to 4 would produce a threefold speed up. However, after the change was made hardly any improvement was noted. Nonetheless, the caching software helped put this entry in third place, right behind the Remedy.

Executive Summary

Remedy Removable Winchester Removable hard disk






The second fastest of the units tested, the Remedy Removable Winchester is actually a removable 30MB hard disk drive; it slips in and out of a dock that installs in a computer's half-height drive bay. The drive is cheaper per megabyte than any other removable reviewed—until you exceed the 30MB limit and have to buy another unit.

*Systems Peripherals
Consultants
9747 Business Park Ave.
San Diego, CA 92131
619/693-8611*

*List price: Model 20L
(20MB, 65ms) \$795, Model
20H (20MB, 35ms) \$995,
Model 30LR (30MB, 65ms,
RLL capable) \$895, Model
30H (30MB, 35ms) \$1195,
Model 30HR (30MB, 35ms,
RLL capable) \$1095, Model
44H (44MB, 35ms) \$1395,
Model 47HR (47MB, 35ms,
RLL capable) \$1495, West-
ern Digital WD 1003 RLL
controller \$175, extra drives
(without docking mecha-
nism) subtract \$175 per
drive; external mounting
bracket \$145*

PC World Evaluation

Removable media

	dBASE III Plus	seconds
Pelican ¹		162
DuraPak		190
Remedy ²		225
Micro Bernoulli		275
Diskit 2		905

¹The Pelican 6.6 was tested with the 512K of RAM on the controller used for caching.






²The Remedy was used with the AT's drive controller.

Pelican and Remedy run neck and neck for top gun, with the Pelican enjoying a slight lead. All benchmarks were performed with an IBM PC AT model 339 (8 MHz) running IBM PC-DOS 3.30.

dBASE III Plus Disk access speed is the most significant performance factor for the *dBASE III Plus* benchmark. This benchmark measures the time required to produce a report based on a three-file join, select, and sort.

Lattice C Compiler In the Lattice C Compiler test, the sequential disk access rate is the most important determining factor. Applications such as file managers commonly rely on this kind of disk access.

The benchmark measures the time required to compile and link two 1000-line programs. The test is performed automatically using a DOS batch file.

	Lattice C Compiler	seconds
Remedy		128
Pelican		158
Micro Bernoulli		158
DuraPak		169
Diskit 2		260

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

The DuraPak seems quite reliable. No matter how badly the cartridges were treated—dropped repeatedly on their corners, kicked under desks, placed under ringing phones—not a single data error cropped up. They come with replaceable, plastic write-protect tabs.

The unit is bundled with several custom utilities, including a high-speed disk duplication program called Hardcopy that copies complete DOS volumes from hard disk to DuraPak, and back. Still, at \$1495 for a single 15MB drive (\$2495 for a dual-drive model), plus \$115 per cartridge, the DuraPak is a bit of an underachiever.


Executive Summary

DuraPak

Removable-media hard disk

A midspeed performer, the DuraPak uses 15MB cartridges and sells for a pricey \$2495 (dual-drive unit). Installing the unit internally requires a full-height bay. Its main advantages are durable cartridges, easy installation, and high reliability. On balance, it is the most impressive of the units tested.

Sysgen Inc.
556 Gibraltar Dr.
Milpitas, CA 95035
408/263-4411
List price: single-drive internal \$1495, dual-drive internal \$2495, dual-drive external \$2695, 15MB DuraPak cartridge \$115

 **20MB Micro Bernoulli**
Mountain Systems' 20MB Micro Bernoulli, manufactured by Iomega, is a direct descendant of the original Bernoulli Box. Like its forebear, the \$1995 Micro Bernoulli is fairly expensive. But the drive's size—svelte enough to slip inside your computer—bears little resemblance to the original Box's monstrous girth.

Unlike with the Pelican and the Remedy, installation is painless. Simply slide the drive into a vacant half-height bay, insert the controller in an empty slot, run a ribbon cable from the controller to the drive, connect one of the computer's power leads to the rear of the drive, and you're in business. Software installation is equally easy. Once the necessary device driver is copied to the start-up drive, running a simple setup routine completes the installation. When the computer is restarted, the Micro Bernoulli comes up as the next available drive letter (usually D:).

The Micro Bernoulli has a few limitations. If your computer already contains a hard disk, you won't be able to use the Micro Bernoulli as a start-up drive. Also, cartridges cannot be removed if the power is off; terrifying instructions (involving pencil erasers and paper clips!) explain how to extract a cartridge from the drive if there's a power failure.

While the Micro Bernoulli, with a respectable 40ms average

access time, doesn't run quite as fast as either the Pelican or the Remedy, it's still adequate. It comes with a high-speed backup utility called RCD Backup that runs significantly faster than DOS's BACKUP.

The cartridges (which cost \$99 each) are rather delicate. When a cartridge was dropped on the floor from normal desktop height, it promptly developed a few bad clusters; when it was dropped again (on its end, this time), it came up with hundreds.

Executive Summary

Micro Bernoulli

Removable-media hard disk

A descendant of the original Bernoulli Box, the Micro Bernoulli uses 20MB cartridges for convenient, portable storage. Installation is simple, and the drive's speed is fairly respectable. Drawbacks include a high price and somewhat fragile media.

Mountain Computer, Inc.
360 El Pueblo Rd.
Scotts Valley, CA 95066
408/438-6650, 408/438-7897
List price: single-drive internal (AT/XT) with adapter \$1995, dual-drive internal (AT/XT) with adapter \$2895, single-drive internal (AT/XT) \$2249, dual-drive internal (AT/XT) \$3095, PC2B-50 Beta Bootable Adapter (needed for all external drives) \$355, Beta Head Cleaning Kit \$95, 20MB Beta Data Cartridge \$99

Given its high price, the Micro Bernoulli's performance and reliability are a bit underwhelming. Still, paying a hundred bucks for a 20MB cartridge is better than shelling out the Remedy's \$795 price for a whole new drive unit. With easy installation and convenient cartridges, the Micro Bernoulli continues the Bernoulli tradition of providing high-capacity, portable storage.

Diskit 2

The Diskit 2 seems to use the same cartridges and drives as the DuraPak—same buttons, same LEDs, same sticky doors. The only difference is that the Diskit 2 gets a mere 10MB of formatted storage per cartridge, whereas the DuraPak gets 15MB.

The installation instructions are admirably clear and easy to follow. It's the familiar hardware drill: Set a few jumpers on the controller board, place it in a vacant slot, attach a cable to the rear port, connect it to the drive, and plug the drive into the wall. The software installation program is extremely friendly, confirming the jumper settings, asking if you'd like to install the Diskit as a start-up drive, and copying all necessary drivers onto the start-up disk.

The Diskit, with an average access time of 90ms, is the slowest removable tested. A custom backup program, IBackup, is provided,

but it doesn't run much faster than DOS's program. Worse yet, it's a "mirror-image" backup program, which means if you've got 6MB of data on a 30MB hard disk, IBackup will need 30MB of media to back up the empty bytes along with the full ones.

All standard DOS commands work. The cartridges are marvelously sturdy; no amount of torture could produce even one data error. Still, it's hard to imagine who the audience for the Diskit 2 might be, since it provides only 20MB of storage for \$2995.

Choosing Among Alternatives

Given the wide-ranging requirements for different removable-media applications, it's tough to select one top unit. If you don't

need start-up capability, the Pelican's speed and economy make it attractive as a backup medium or even—because of its superior disk caching—as a general-purpose drive. Difficult installation, however, makes it a questionable choice. Installation *and* reliability problems plague the Remedy, a drive whose low price, high speed, and broad capabilities would otherwise be tempting.

That leaves the pricey DuraPak as the choice for overall speed and convenience. It places close to the front of the pack for access times, can be configured as a start-up drive, offers true removable-media capability, and its media should be reliable.

If you've got a problem that conventional high-speed, high-capacity media won't solve, it's nice to have so many ways of removing the obstacle. Note, however, that IBM's PS/2 Models 50, 60, and 80 have established a new standard with high-capacity, 1.44MB, 3½-inch disks. Within a year 3½-inch floppy drives will also be off-the-shelf items. If your need for large-capacity, mobile storage media exceeds these limits, then you're a prime candidate for one of these alternative storage devices. Otherwise, you might be better served by a speedy 40MB hard disk and a slow but reliable streaming tape backup. ●

Executive Summary

Diskit 2

Removable-media hard disk

The slowest of all the removables tested, the Diskit 2 uses 10MB cartridges and a drive mechanism similar to that of the DuraPak. While the cartridges appear to be quite reliable, the near-\$3000 selling price makes it the most expensive removable reviewed.

IDEAssociates, Inc.
29 Dunham Rd.

Billerica, MA 01821
617/663-6878

List price: Diskit 2 \$2995,
Diskit 2 Plus (allows data
encryption) \$3595, car-
tridges \$99 each

Michael Goodwin is an associate editor for PC World.


REVIEW
Communications



Penny-Pinching Modems

That no-name “Hayes-compatible” modem with the \$150 price tag may not be such a deal—much less compatible. PC World puts eight me-too modems to the test and finds that not all clones are created equal to the Smartmodem.

Judy Getts

 It looks like a Hayes. It feels like a Hayes. But does it act—and will it last—like a Hayes modem?

These questions nag anyone who's tempted by ads for comely little 1200-bps modems bragging piggy-bank prices and promising “full compatibility” with the venerable (and overpriced) Hayes Smartmodem 1200. But what do you get when you plunk down pocket money for a plastic-cased copycat? More to the point, what can you expect to give up—besides the Hayes logo and the heavy metal armor?

Compatibility with the Smartmodem itself, for starters. Many competitors' claims of Hayes compatibility are based on older versions of the Smartmodem 1200 command set rather than the later, enhanced one. Reliability of data transmission over noisy phone lines is another trade-off. Trials conducted for *PC World* by National Software Testing Laboratories (NSTL) clearly show that many penny-pinching modems can't hack the turbulence on a noisy phone line the way a Hayes can. Sometimes they can't even hack running a popular communications program. You'll also find that many clone makers' technical support ranges from indifferent to incompetent.

PC World scrutinized eight of these cheaper-than-thou Hayes impersonators: the Migent Pocket Modem; Team Technology's MiniTeam 1200 and SmartTeam 1200AT; Practical Peripherals' Practical 1200 Stand Alone; the Qubié 212A/1200E; Anchor Automations' Signalman Express and Volksmodem 12; and the

USRobotics Sportster. All eight are external units, offer 300- and 1200-bps communications, and are tantalizingly priced for as little as \$99. But as you'll see, the differences between these modems and the Smartmodem 1200 run deeper than price.

Meeting the Hayes Standard

As with a Big Mac, you know what you're getting when you buy a Smartmodem 1200. A bank of informative LEDs is up front, line and phone jacks are around back, and the unit is built like a tank. Certain Smartmodem features are regulation and should be givens on any compatible: auto-dialing and -answer functions, voice/data switching, and of course, compatibility with the Hayes AT (Attention) command set.

AT commands, which can be entered by the operator or issued by a communications program, adjust modem settings ranging from transmission speed to the length of a pause. Over the years Hayes has added commands to the basic Smartmodem 1200 collection, but few clone makers have

kept pace. In some cases, that doesn't matter. But if a communications program issues an AT command that a modem doesn't support, the software may go on strike.

Beyond such essentials, certain fine touches distinguish a Hayes: a clearly audible speaker, a heavy metal cover that dissipates circuit heat far better than molded plastic, and a three-pronged electrical plug with grounding all the way to the modem itself. This last feature, which none of the reviewed modems offer, is no luxury. A short circuit can easily fry an ungrounded modem's electronics.

Out of the Box

Would you buy a telephone that you couldn't pull out of its box, plug into a wall jack, and use? Probably not. But some modem manufacturers are wagering that you'll be more open-minded when you wrest their wares from the shrink-wrap.

Like the Hayes, most lacked a serial cable. Some even came with cables ill-suited to the task at hand. For example, the Practical 1200SA is inexplicably supplied with a serial cable equipped with male D-25 connectors. (The serial adapters in the PC and most compatible systems require a female

connector.) The company did offer to supply the proper serial cable if the other was returned—a policy unmentioned in the documentation. The topper, however, is the Volksmodem, which requires a hard-to-find D-12 cable to link it to a serial port. Some Radio Shack stores stock the cable.

The pint-size Migent Pocket Modem poses no connectivity quandaries; it's cleverly designed to snap directly onto a PC's standard 25-pin serial connector. You don't even configure the modem with DIP switches. You merely run a supplied setup program, enter settings from the keyboard,

PC World Evaluation

1200-bps Modem Software Compatibility Compared

Each program's ability to dial and receive calls, issue commands on line, transmit

files, and elicit status messages was tested with each modem.

	Crosstalk XVI	Relay Gold	Softerm PC	Microsoft Access	Smartcom II
Pocket Modem	●	●	●	● ¹	● ²
MiniTeam 1200	●	●	●	● ³	●
Practical 200SA	● ⁴	● ⁴	● ⁴	● ⁴	● ⁵
Qubié	●	●	●	●	●
Signalman Express	● ³	●	●	● ³	●
SmarTeam 1200AT	●	● ³	●	● ³	●
Sportster	●	●	●	● ³	●
Volksmodem 12	●	●	●	● ³	●

¹ Modem can't answer incoming calls

² Unable to switch from pulse to tone dialing or vice versa

³ Modem can't switch from voice to data

⁴ Modem can't send break signal to remote computer

⁵ Modem can't switch from data to voice

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

and store them in the Pocket Modem's programmable ROM chip (a scheme also used with the Practical 1200SA). Since a Pocket Modem fresh from the factory carton is configured only to receive calls and not to send them, the setup program is vital. Unfortunately, the utility wasn't documented in the user manual and, according to Migent's technical support staff, was defective and shouldn't be used. Since the company's staff couldn't predict when a revision would be available, the setup utility was used anyway and—surprise!—the modem worked.

The remaining modems are configured with Smartmodem-like DIP switches. But the user manuals fail to provide application-specific settings, and worse, sometimes provide incorrect settings.

■ AT Command Performance

In keeping with their cut-rate design, these clones pay homage to the basic AT commands that direct a modem to dial a number, answer the phone, display the CONNECT message, and so on, but little more. If you need to fine-tune a modem's operations for more complicated telecommunications tasks, you may be out of luck.

For example, few of the assembled modems can recognize the W or @ dialing commands, which enable a modem to wait for a dial tone or silence before taking action—sometimes essential for making a connection via Sprint or a similar long-distance carrier. Linking up with some remote networks may be particularly difficult with the Practical 1200SA and the

Signalman Express, because neither supports ATC, a key command that communications programs use to switch the modem's carrier on and off.

If dialing up an on-line service or another computer means going through the office PBX, the Volksmodem and the Practical 1200SA may be especially bad choices. Neither modem fully supports the Smartmodem's S registers—a sliver of built-in memory where 16 special operational settings can be stored. (For example, to tell a Smartmodem to answer an incoming call on the first ring, you would load a communications program, enter the terminal mode, and type `ATS0=1`.) The Volksmodem lacks 11 S registers (S6 through S16), so you can't tell it how long to wait for a dial tone or how long to wait before hanging up, or even define the length of a pause. The Practical 1200SA, on the other hand, offers the full range of Hayes S registers but sets the values for S6, S9, S10, and S11 permanently. If these factory settings don't jibe with your company's PBX, the modem may well be useless. Only the Signalman Express accurately re-creates the full complement of Smartmodem 1200 S registers.

■ Compatibility Conundrums

If a cheap modem chokes on your favorite communications program, it's no bargain. Accordingly, NSTL extensively tested each modem's ability to send and receive files, flip between data and voice communications, generate status messages, and handle a variety of other off-line and on-line operations, with *Smartcom II*, *Crosstalk XVI*, *Microsoft Access*,

Relay Gold, and *Softterm PC*. The results are not heartening.

The Qubié 212A was the only modem to get a clean bill of health, running all five programs without faltering. The others managed to stumble at least once. The SmarTeam, for example, was unable to switch from voice to data communications when origi-

Executive Summary

Sportster

External 1200-bps modem

The featherlight Sportster ran all five tested communications programs without error. But the modem fares very poorly over noisy phone lines and does not dial phone numbers reliably.

USRobotics, Inc.
8100 N. McCormick Blvd.
Skokie, IL 60076
800/342-5877, 312/982-5001
List price: \$149

Practical 1200 Stand Alone

External 1200-bps modem

Poor design, quirky software, and minimal AT command support mar this unit. The modem has problems switching from voice to data and can't send break messages with any tested communications program.

Practical Peripherals
31245 La Baya Dr.
Westlake, CA 91362
818/991-8200
List price: \$199

nating a call with *Relay Gold*. The Pocket Modem was even less accommodating, refusing to answer incoming calls with *Micro-soft Access* or to switch between touch-tone and pulse dialing when *Smartcom II* was running the show. (You can, however, dial in one mode or the other if you're willing to reconfigure the modem with Migent's setup program.)

As you go down the list, the compatibility conundrums multiply. The Practical 1200SA couldn't send break messages to a remote system with any of the tested communications packages or switch from data to voice when sending or receiving a call with *Smartcom II*. And though the modem will work with *Crosstalk XVI*, it took several hours of fiddling with configuration settings before success was achieved. The Volksmodem, however, wins the Dubious Achievement Award for refusing to work with *Smartcom II* at all.

Executive Summary

Volsmodem 12

External 1200-bps modem

The people's modem is not aptly named. The unit requires a nonstandard serial cable, fails to support important S registers, and refuses to work with *Smartcom II*. Simulator tests indicate the Volksmodem works reliably over noisy phone lines.

Anchor Automation, Inc.
20675 Bahama St.
Chatsworth, CA 91311
818/998-6100
List price: \$199

Modems on Trial

In telecommunications, nothing is as vexing as data reaching its destination in mutilated form. Two line impairments—white noise and phase jitter—are the primary culprits. Remember that data transmitted over a phone line is essentially encoded in the phase of electromagnetic waves. When a wave travels from one medium to another (such as from copper wire to fiber optic cable), it encounters different electrical properties and may be momentarily knocked out of sync. In short, its phase is shifted, or jittered. Jitter is measured in degrees; the higher the number of degrees, the more turbulent the line.

White noise, the phone system's garden variety impairment, wreaks the greatest havoc, and its sources are as varied as fluorescent lights and telephone switching equipment. This distortion is expressed as a signal-to-noise ratio indicating the difference, in decibels, between the strength of a signal and the noise on the line. The stronger the signal is in relation to noise (the bigger the ratio), the less likely data will be corrupted during transmission.

To gauge each modem's tolerance to these insidious data manglers, NSTL turned to the TAS 1010 Voiceband Channel Simulator. With the 1982-1983 AT&T Bell Labs' *End Office Connection Study* serving as a guide, the simulator was programmed to recreate a grueling range of impairments and quantify each modem's performance. Modems were attached to the TAS system two at a time: on one end, the brand X under examination, and on the other, a Hayes Smart-

modem 2400, to guarantee that the tested modem received a consistent signal. In each test, 10K simulated data files were shuttled between the modems in 100-byte blocks as an impairment was introduced and increased. The erroneous bytes in each block were

Executive Summary

Signalman Express

External 1200-bps modem

This modem does well over noisy phone lines but has difficulty switching from 300-bps to 1200-bps communications. The user manual is very unclear on modem installation and configuration.

Anchor Automation, Inc.
20675 Bahama St.
Chatsworth, CA 91311
818/998-6100
List price: \$299

Pocket Modem

External 1200-bps portable modem

The Pocket Modem is durable and can be snapped directly onto a 25-pin serial port without a cable. However, it lacks LEDs and a speaker, doesn't include the proper setup software, and is one of the most expensive clones around. The company's technical support is disappointing.

Migent, Inc.
865 Tahoe Blvd.
P.O. Box 6062
Incline Village, NV 89450
800/633-3444, 702/832-3700
List price: \$259

counted and the average errors per block calculated.

Keep in mind that these torture tests are designed to push a modem to the limit; they don't strictly reproduce real-world conditions. For example, the signal-to-noise ratio of the noisiest American phone line rarely sinks to 17:1; an average line's ratio is typically 35:1. But if your data happens to be hurtling down the wire when lightning strikes, the noise can spike, dropping the ratio to 6:1. That's when having an overengineered modem pays off.

A quick glance at the white noise tests shows that few of the Smartmodem clones can take a licking like the real McCoy. The Sportster prudently refuses to make a connection, while the Pocket Modem, SmarTeam, and Qubié hang on—even if it means transmitting at a 100 percent error rate. Only the Practical 1200SA, the Volksmodem, and the Signalman Express meet or beat the Smartmodem at its own game.

Confronted with taxing levels of phase jitter (an average line is 5.8 degrees), the MiniTeam, the Practical 1200SA, and the Pocket Modem do remarkably well. But the SmarTeam, the Qubié, and the Sportster take it on the chin, collecting the highest percentage of errors even on lines that their peers weather without fail.

Modems Up Close

Of course, simulator tests tell only part of the story. Wobbly compatibility with the Hayes command set and with popular communications programs should give you pause. And though some modems fare well in simulator tests, they can be inconsistent in

The Sportster is small, stylish, and singularly uninformative. The back of the modem is unlabeled, and the front has only two LEDs.

Which connector is for the phone line, and which for the handset? Only Practical Peripherals knows for sure, since the 1200SA is unlabeled.

day-to-day use. Do any of these cheap modems merit a spot next to your PC? Maybe—if your communications needs are straightforward and you're willing to live with the modem's eccentricities.

Sportster. Palm-size and featherlight, the Sportster looks as if it was conceived as a Walkman. It has a power button and volume knob on the front, plus two status lights, one that flashes green when the modem is on, and another that flickers red when data is being transmitted. Neither is much help when it comes to troubleshooting a communications session.

Turn on the Sportster and it shrieks like a smoke detector; on line, the modem is bedlam at 1200

bps. Connect with another system, and the screen may well drown in a sea of digital gibberish. Worse, the Sportster sometimes locks up and refuses to send or receive data or switch into the command state. The Sportster's manual doesn't address these problems, offering only initial setup directions and a list of AT commands. Finally, if you leave the Sportster on for a spell, the modem frequently dials the incorrect number. Based on laboratory results and personal experience, the Sportster's got a long way to go.

Practical 1200SA. The plastic-encased Practical 1200SA is a good example of how not to design a modem. Phone jacks, volume knob, and power switch are



PC World Evaluation *Smartmodem AT command test*

- Command supported
- Command differs from that in Hayes command set
- ✗ Command defective

Verifying a modem's compatibility with the Hayes line involves more than running *Smartcom II*. NSTL tested every Smartmodem 1200 AT command (including those that set S registers) with every modem under review. All modems were tested on line, running at 1200 bps, connected to a 640K IBM PC using PC-DOS 3.30.

	Pocket Modem	MiniTeam 1200	Practical 1200SA	Qubié 212A	Signalman Express	SmarTeam 1200AT	Sportster	Volks-modem 12
+++ (command state)	●	●	●	●	●	●	●	●
AT (attention)	●	●	●	●	●	●	●	●
<Backspace> key	●	●	●	●	●	●	●	●
A/ (reissue command)	●	●	●	●	●	●	●	●
, (pause)	●	●	●	●	●	●	●	●
; (return to command)	●	●	●	●	●	●	●	●
R (reverse mode)	●	✗		●	✗	●	✗	
W (await 2nd dial tone)	●	●				●		
! (hook flash)		●						
@ (await silence)	✗	●						
ATA (off hook)	●	●	●	●	●	●	●	●
ATB0 (CCITT V.22)		●						
ATB1 (Bell 212A)		●		●				
ATC0 (carrier off)	●	●		●	✗	●	●	●
ATC1 (carrier on)	●	●		●	●	✗	●	●
ATD (dial)	●	●	●	●	●	●	●	●
ATDP (pulse dial)	●	●	●	●	●	●	●	●
ATDT (tone dial)	●	●	●	●	●	●	●	●
ATE0 (commands echoed)	●	●	●	●	●	●	●	●
ATE1 (commands not echoed)	●	●	●	●	●	●	●	●
ATF0 (on-line echo)	●	●	●	●	●	●	●	●
ATF1 (on-line echo off)	●	●	●	●	●	●	●	●
ATH0 (on hook)	●	●	●	●	●	●	●	●
ATH1 (off hook)	●	●	●	●	●	●	●	●
ATH2 (special hook)	●	●	●	●	●	●	●	●
ATI0 (ID code)	●	●	●	●	●	●	●	●
ATI1 (ROM checksum)	●	●	●	●	●	●	●	●
ATI2 (memory test)	●						●	
ATL (speaker volume)		●				●		
ATM0 (speaker off)		●	●	●	●	●	●	
ATM1 (speaker on/carrier)		●	●	●	●	●	●	
ATM2 (speaker on always)		●	●	●	●	●	●	

	Pocket Modem	MiniTeam 1200	Practical 1200SA	Qubié 212A	Signalman Express	SmarTeam 1200AT	Sportster	Volks- modem 12
ATO0 (await carrier)	●	●	●	●	●	●	●	●
ATO1 (remote digital loopback off)	●	●					●	
ATO2 (remote digital loopback request)	●	●					●	
ATP (pulse dial)	●	●	●	●	●	●	●	●
ATQ0 (echo result codes)	●	●	●	●	●	●	●	●
ATQ1 (no result codes)	●	●	●	●	●	●	●	●
ATT (tone dial)	●	●	●	●	●	●	●	●
ATV0 (digit codes)	●	●	●	●	●	●	●	●
ATV1 (word codes)	●	●	●	●	●	●	●	●
ATX0 (Smartmodem 300 codes)	●	●	●	●	●	●	●	
ATX1 (CONNECT XXX)	●	●	●	●	●	●	●	
ATX2 (NO DIALTONE)	●	●			●	●	●	
ATX3 (BUSY)	●	●				●		
ATX4 (NO DIALTONE & BUSY)	●	●				●		
ATY0 (long space disconnect off)	●	●						
ATY1 (long space disconnect on)	✗	●						
ATZ (reset)	●	●	●	●	●	●	●	●
S registers								
ATS0 = 1 (rings to answer)	●	●	●	●	●	●	●	●
ATS0 = 4 (rings to answer)	●	●	●	●	●	●	●	●
ATS1 (signal quality)	●	●	●	●	●	●	●	●
ATS2 (escape code value)	●	●	●	●	●	●	●	●
ATS3 (carriage return)	●	●	●	●	●	●	●	●
ATS4 (linefeed)	●	●	●	●	●	●	●	●
ATS5 (backspace)	●	●	●	●	●	●	●	●
ATS6 (wait, dial tone)	●	●	●	●	●	●	●	
ATS7 (wait, carrier)	●	●	●	●	●	●	●	
ATS8 (pause time)	●	●	●	●	●	●	●	
ATS9 (carrier detect)	●	●	●	●	●	●	✗	
ATS10 (hang-up delay)								
= 150	●	●	✗	●	●	●	✗	
= 255	✗	●	✗	✗	●	✗	✗	
ATS11 (touch tones)	●	●	●	✗	●	●	●	
ATS12 (escape code guard time)	●	●	●	✗	●	●	●	
ATS13 (UART status)	●	●	●	●	●	●		
ATS14 (option)	●	●	●	●	●	●		
ATS15 (flag)	●	●	●	●	●	●		
ATS16 (answer mode)	●	●	✗	●	●	●	●	
ATS16 (send mode)	●	●	●	●	●	●	●	

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

crammed at the back of the unit and are hard to grasp; the speaker blats; and nothing on the modem is labeled. You'll find seven front-panel LEDs but no data terminal ready light. The user manual reassuringly notes, "EXPERIENCED USERS! You should be able to connect the PM1200SA to your computer and use it."

In the lab, the Practical 1200SA is competent. But making a connection can still be a hit-or-miss affair, and sometimes the only way is to dial the number with the

telephone and then force the modem to pick up the line once the other system answers. Switching in and out of command mode or changing communications parameters on line successfully are chancy. One thing is certain: After 45 minutes of use, the Practical 1200SA is hot enough to fry eggs.

Volksmodem 12. As its name implies, the Volksmodem is the embodiment of telecommunicating on the cheap. The shell is plastic, there's no speaker, and the front panel has only carrier detect and modem speed lights. The unit's four DIP switches are so

deeply hidden beneath the casing that you can't reach them without a bent paper clip. Like the Sportster, the Volksmodem has a knack for dialing the wrong number, and the user manual is terse to the point of obscurity.

Signalman Express. If any company deserves the Grain of Salt Award, it's Anchor Automation. The company plasters the Signalman's packaging and manual with the phrase "Ultra Smart," a claim that wears mighty thin when this plastic-covered modem repeatedly fails to dial correctly for more than an hour. In fact, the intelligence alluded to is nothing more than a patch of battery-powered memory that can store ten phone numbers whether the modem is on or off. The biggest challenge to *your* intelligence? Finding the required (and obscure) 4.5-volt battery sold predominantly to owners of obsolete Polaroid cameras. The biggest challenge to your patience? Living with a modem that shrieks whenever it is shifted from 300 bps to 1200 bps. The Signalman's user manual might try your patience as well. The discussion of DIP switch settings is murky at best, and the manual is sprinkled with technobabble such as, "Disconnecting a data link may be manually or automatically disconnected."

Pocket Modem. The Pocket Modem's claim to fame is its rugged portability, a trait that makes it a perfect mate for your laptop computer. Portability means trade-offs, however, and the Pocket Modem lacks a power switch, indicator lights, and a speaker. But this little handful of



With eight you get incompatibilities—like the Volksmodem 12's use of a nonstandard serial connector.



Anchor Automation claims the Signalman is "Ultra Smart," but in fact, it merely has battery-powered RAM that holds ten phone numbers. The battery is an odd type and hard to find.

Photographs by Peter Vecchiet

bright red plastic can be powered with a standard 9-volt battery and snapped right onto a 25-pin serial port. The modem also comes with a serial cable with a 9-pin connector, a power adapter, a phone cord, and a vinyl carrying case that's too small to hold the necessary goods.

The Pocket Modem can store only one phone number in its non-volatile memory. Should you inadvertently enter the command to dial the number when none is stored, the modem goes into a loop, spraying hundreds of S's across the screen until you unplug it. The user manual strives for clarity and simplicity and generally succeeds, but it lacks vital configuration information.

Qubié 212A/1200E. The Qubié is more compatible than most low-cost Hayes stand-ins. Like its inspiration, it wears a heavy metal

cover and features clearly marked LEDs, a crystal-clear speaker, and power and speaker volume controls around back. Qubié also deserves credit for its thorough Hayes-like manual, which defines S registers and includes schematics. The biggest disadvantage, of course, is the Qubié's disappointing performance over noisy phone lines.

SmarTeam 1200AT. From a distance, you might mistake the SmarTeam for a Smartmodem. Like the Hayes, it's wrapped in a sturdy metal jacket, includes a full bank of LEDs across the front, and hides the power switch and volume control in the back. After several weeks of heavy use, the SmarTeam's aberrations were comparatively minor. It broke a connection during a thunderstorm (a forgivable lapse) and had problems switching from data to voice, but otherwise operated reliably.

Not so reliable is the company's technical support staff. When contacted about the modem's difficulties using *Crosstalk*, one Team Technology representative admitted he had yet to plug in a SmarTeam. He later added that the ATH command would display a help screen, when in fact, this command puts the modem "on hook." The SmarTeam's quirky user manual (nearly identical to the MiniTeam's) is similarly murky about the modem's features and flaws.

MiniTeam. The basic features of the SmarTeam, dubbed the MiniTeam, are packed into a shell the size of a paperback book. The modem supports a few more AT commands than its big brother and conforms to the CCITT V.22

standard, enabling it to send data over overseas phone lines.

Like the SmarTeam, the MiniTeam plants a row of LEDs and DIP switches at the front of the box and locates two phone jacks

Executive Summary

SmarTeam 1200AT

External 1200-bps modem

This competent Hayes look-alike has a few software compatibility problems but generally performs well. However, simulator tests indicate the SmarTeam will not do well on noisy phone lines. The company's technical support is disappointing.

Team Technology, Inc.
19205 Parthenia St., Ste. J
Northridge, CA 91324
818/886-9726
List price: \$179

MiniTeam 1200

External 1200-bps modem

On balance, the best Hayes clone of the lot. The modem operates easily with all tested software, works competently over turbulent phone lines, and supports more AT commands than the other modems reviewed. When used for more than an hour, the unit is too hot to handle.

Team Technology, Inc.
19205 Parthenia St., Ste. J
Northridge, CA 91324
818/886-9726
List price: \$149

Executive Summary

212A/1200E

External 1200-bps modem

This Hayes wannabe does a good job of matching the Smartmodem's appearance and thorough user manual but doesn't score highly on phone line tests. The modem does work flawlessly with all tested software.

Qubié
507 Calle San Pablo
Camarillo, CA 93010
800/821-4479, 805/987-9741
List price: \$99

Table 1: Cheap modems compared, feature by feature

	Pocket Modem	MiniTeam 1200	Practical 1200SA	Qubié 212A	Signalman Express	SmarTeam 1200AT	Sportster	Volks-modem 12
Pulse dialing	◆	◆	◆	◆	◆	◆	◆	◆
Tone dialing	◆	◆	◆	◆	◆	◆	◆	◆
Auto-dialing	◆	◆	◆	◆	◆	◆	◆	◆
Auto-answer	◆	◆	◆	◆	◆	◆	◆	◆
Voice/data switching	◆	◆	◆	◆	◆	◆	◆	◆
Call progress monitoring								
DIALTONE	◆				◆	◆		◆
CONNECT	◆	◆	◆	◆	◆	◆	◆	◆
RING	◆	◆	◆		◆		◆	◆
BUSY	◆	◆			◆	◆	◆	◆
NO DIALTONE	◆	◆	◆		◆	◆	◆	◆
VOICE							◆	
Built-in self-tests								
Internal memory test	◆							
Remote digital loopback	◆	◆						
Local analog loopback	◆	◆	◆		◆	◆	◆	
Local digital loopback								
DIP switches		◆		◆	◆	◆	◆	◆
EEPROM settings	◆		◆					
LED/LCD status lights		◆	◆	◆	◆	◆	◆	◆
Speaker		◆	◆	◆	◆	◆	◆	
Volume control knob				◆	◆	◆	◆	
Number of phone jacks	2	2	2	1	2	2	2	2
Serial cable included	◆	◆	◆					
Communications software included	◆	◆		◆		◆		
Warranty (years)	5	2	5	1	5	2	2	5
Price	\$259	\$149	\$199	\$99	\$299	\$179	\$149	\$199

To Buy or Not to Buy: The Experts Speak

In assessing the Hayes clone scene, some experienced communications users are more bullish than others. Loren Jones, operator of the RBBS-PC Board of Chicago and a Law and Computer Fellow at the Illinois Institute of Technology Chicago, Kent College of Law, is definitely on the bargain bandwagon. "I have no reservations recommending some of these cheap Hayes compatibles," he says. "Our experience shows they pose few problems." Others are warier. "With modems, as with most products, you get what you pay for," says Richard tenEyck, telecommunications director for the Boston Computer Society. Roger Fajman, chairman of the communications special interest group of the Capital PC User's Group, advises against buying anything but top-of-the-line brands for business use. "You can easily waste more than \$100 of your and your employees' time screwing around with a modem that's not working," he warns.

It stands to reason that cut-rate-modem vendors

keep prices low by trimming expenses somewhere along the assembly line. Common sense might trigger panic bells at the thought of modems manufactured in Taiwan or Korea, or assembled from chips of murky origin. But Fajman, tenEyck, and other communications mavens polled dismiss such fears, maintaining that a clone's reliability—or lack thereof—has little to do with where its silicon came from.

Instead they cite other concerns, like cost cutting in the quality control department. If a modem retails for \$99.99, it's doubtful that the manufacturer has devoted much effort to "burning it in" before sending it out the door. In fact, a spokesperson for Team Technology admitted that 1 out of 30 of the modems Team ships are returned as defective. (Not surprisingly, one of the SmarTeam 1200AT modems evaluated by *PC World* was returned for this reason—as were a Volksmodem 12 and Practical Peripherals 1200SA.) Some dealers assess their return rate for cheap modems as about 1 out of 10.

A more likely route to maintaining low overhead is scrimping on the quality of modem filtering circuitry, according to Rich Schinnell, system operator of the Capital PC User's Group Software Library Bulletin Board. Filtering circuits siphon away phone line hisses and crackles, keeping the modem's tones pure and preventing background noise from turning your data into digital ragout. "When a call is passed through numerous switching centers," says Schinnell, "that's when the problems with modems like the Qubié show up."

Few cheap modems compensate for such distortions, and thus they are not appropriate for sending data across the country on a regular basis. On the other hand, if you typically call another PC across town or dial a local MCI Mail number to check your mail, an "econobrand" may fit your needs and your pocketbook. Says tenEyck, "If you live in an area with exceptionally clean local phone lines, buy a cheapie—you'll love it." —J. G.

PC World Evaluation

1200-bps modems

The Hayes Smartmodem 1200 can take a lickin'—and dish it out to its no-name competitors.

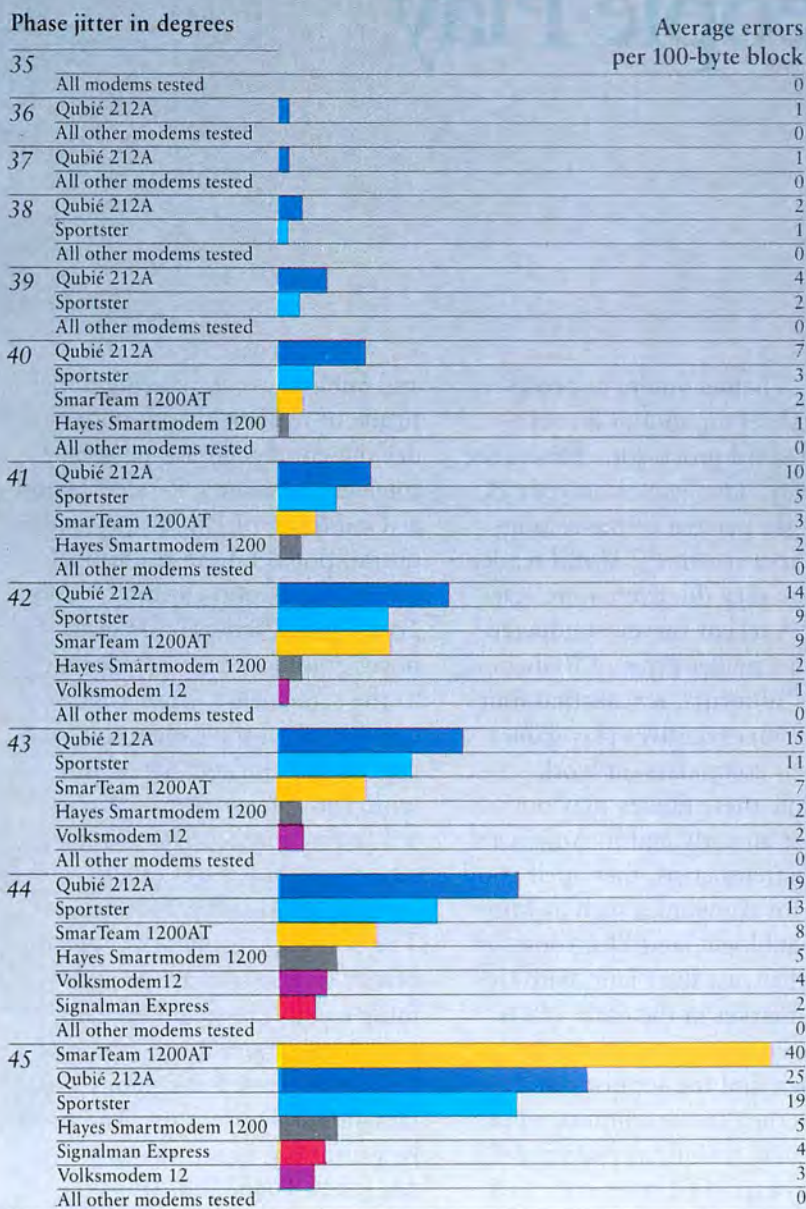
NSTL torture-tested each modem's ability to securely transmit data over noisy telephone lines using the TAS 1010 Voiceband Channel Simulator. The system includes the Network Simulator, which mimics public and leased lines, and the Modem Test Unit, which automatically runs desired data back and forth between the test modem and a control Hayes Smartmodem 2400 and calculates resulting data transmission errors. In this test, 10K simulated test files in 100-byte blocks were received by each examined modem and the block errors measured and reported. Starting values for the key impairments tested—white noise and phase jitter—were based on AT&T Bell Labs' 1982-1983 *End Office Connection Study*. In the white-noise tests, each modem was subjected to the worst impairment (a 6:1 signal-to-noise ratio); the impairment was lessened one step at a time to determine the point at which a modem could correct all the errors in a transmitted block. (In the Volksmodem 12 test, for example, at the 6:1 signal-to-noise ratio an average of 46 out of every 100 blocks received contained errors. The error rate dropped to 0 at 13:1.)

Phase jitter tests were conducted in the same manner. The intensity of the impairment ranged from a maximum of 45 degrees of phase jitter to 35 degrees.

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

Signal-to-noise ratio

		Average errors per 100-byte block
17:1	All modems tested	0
16:1	Sportster	Would not connect
	All other modems tested	0
15:1	Sportster	Would not connect
	Qubié 212A	1
	All other modems tested	0
14:1	Sportster	Would not connect
	Qubié 212A	3
	All other modems tested	0
13:1	Sportster	Would not connect
	Qubié 212A	5
	SmarTeam 1200AT	1
	All other modems tested	0
12:1	Sportster	Would not connect
	Qubié 212A	27
	SmarTeam 1200AT	9
	Hayes Smartmodem 1200	1
	All other modems tested	0
11:1	Sportster	Would not connect
	Qubié 212A	51
	SmarTeam 1200AT	20
	Hayes Smartmodem 1200	1
	Signalman Express	1
	All other modems tested	0
10:1	Sportster	Would not connect
	Qubié 212A	82
	SmarTeam 1200AT	50
	Hayes Smartmodem 1200	8
	Signalman Express	5
	Practical 1200SA	5
	Volksmodem 12	4
	Pocket Modem	1
	MiniTeam 1200	1
9:1	Sportster	Would not connect
	SmarTeam 1200AT	87
	Qubié 212A	72
	Volksmodem 12	42
	Signalman Express	34
	Practical 1200SA	30
	Hayes Smartmodem 1200	23
	Pocket Modem	13
	MiniTeam 1200	6
8:1	Sportster	Would not connect
	SmarTeam 1200AT	99
	Volksmodem 12	76
	Practical 1200SA	74
	Hayes Smartmodem 1200	73
	Signalman Express	69
	Pocket Modem	38
	MiniTeam 1200	32
	Qubié 212A	23
7:1	Sportster	Would not connect
	SmarTeam 1200AT	100
	Practical 1200SA	85
	Hayes Smartmodem 1200	81
	Pocket Modem	74
	MiniTeam 1200	72
	Qubié 212A	69
	Signalman Express	59
	Volksmodem 12	55
6:1	Sportster	Would not connect
	Pocket Modem	Would not connect
	Qubié 212A	100
	SmarTeam 1200AT	100
	MiniTeam 1200	98
	Hayes Smartmodem 1200	57
	Practical 1200SA	55
	Signalman Express	49
	Volksmodem 12	46



and a power switch in the back. A speaker is part of the deal too, but the volume is set too low, and the only way to adjust it is with the ATL command.

The MiniTeam stood up impressively through weeks of everyday use and never dropped a connection because of line noise. One warning: After several hours both the modem and the power adapter were too hot to handle. When they're not in use, leave this duo unplugged.

Final Call

In a variation on the old cliché—consider your needs before you buy—consider what trials you're willing to suffer before you crack open your wallet. On balance, the MiniTeam offers the best mix of features, compatibility, and on-line stamina. And as NSTL's tests show, all the reviewed modems work reliably over everyday (clean) phone lines. But are you willing to accept partial Hayes compatibility, uninformed technical support, or a modem-cum-hotplate that can't hack it when a thunderstorm rolls into town? If you find such compromises unsettling, reconsider the nature of the bargain modem. If it's your job to introduce the novices in your office to telecommunications, think about the time spent fussing with DIP switches and cables and software. The Smartmodem 1200 may be expensive, but it's still a better deal in the long run. ●

Judy Getts is a contributing editor for PC World.

Games People Play

PC World presents seven top-notch games for your PC playing pleasure—some old, some new, some borrowed, and one slightly blue.

Edited by Wes Nihei

Whether you're a spreadsheet top gun or an occasional word processor, chances are you play video games on your PC. Forty-six percent of the respondents to a recent *PC World* reader poll say they do. Even more startling: A recent survey conducted by game maker Epyx of Redwood City, California, reveals that four out of ten executives play games on their computers—at work.

While these figures may not suggest an early end to America's productivity crisis, they spell good news for companies such as Infocom, Sublogic, and Electronic Arts that cast their fates with the game market in the early 1980s. These companies continue to prosper, and the sophisticated games they create continue to explore new realms, as powerful (and cheap) AT clones and EGA boards flood the market.

PC World looks at seven contemporary games that range from the swashbuckling to the cerebral. Chuck Yeager's *Advanced Flight Simulator* from Electronic Arts takes a quantum leap beyond the likes of *Microsoft Flight Simulator*

and Sublogic's *Jet*, offering a multitude of realistic flying modes under the good general's personal tutelage. Infocom's R-rated *Leather Goddesses of Phobos* presents untraditional fare in traditional interactive-fiction clothing, while *Portal* from Activision takes a novel graphics-oriented approach to the same genre. Brøderbund capitalizes on the gangbusters success of *The Ancient Art of War* with *The Ancient Art of War at Sea*, a first-rate, cutlass-swinging adventure. For traditionalists, there's *Chessmaster 2000* from The Software Toolworks, which brings state-of-the-art programming to this classic board game; and *Rogue*, Epyx's revamping of a mainframe-based Dungeons and Dragons-style program. And finally, we tip our hat to the spry *Microsoft Flight Simulator*, the most popular game ever invented for the PC.

Leather Goddesses of Phobos

So you think nothing ever happens in Upper Sandusky, Ohio? Obviously, you've never gone to Joe's Bar, sucked down too many beers, and been whisked into unknown regions of the solar system.



	A	B	C	D	E	F
1	Cash Budget Worksheet	(estimated at the start of the year)				
2						
3		JAN	FEB	MAR		
4	Sales/Cash	100,000	100,000	100,000		7 Cash Out:
5	Cumulative Sales	100,000	200,000	300,000		8 Office Payroll
6						9 Other Overhead
						10 Material Costs
						11 Direct Labor Costs
						12
13	Total Costs					1
14	Cumulative Costs					
15						

capopen "mcifile", 1
match "M" "M" "

type "Activated Dow Jones at "

Thus begins your adventures with the *Leather Goddesses of Phobos*—a Buck-Rogers-meets-Wicked-Wanda romp through the cosmos, certain to titillate, irritate, and amuse.

Leather Goddesses is an interplanetary scavenger hunt that requires you to decipher coded messages, solve riddles, and unearth secret maps in order to collect the items necessary to defeat the evil goddesses, who are planning to turn all the men and women on Earth into their private pleasure slaves. Clad only in a brass bikini, you'll hit the most exotic hot spots this side of Pluto, aided by your dull-witted but exceedingly limber sidekick, Trent/Tiffany. (Your companion's gender, as well as your own, is determined by you at the beginning of the adventure.)

In keeping with the program's motto, "A dirty mind is a terrible thing to waste," *Leather Goddesses* requires you to flesh out the interactive text; there are no graphics. Certain rules common to the genre apply: If you encounter anything that isn't nailed down, pick it up. Expect to die horribly and often. And whenever you correctly complete a segment of the story, save it to spare yourself the agony of having to start from scratch the next time you hit a dead end.

Leather Goddesses offers three modes: Tame, Suggestive, and

Lewd. The modes determine the game's vocabulary and level of depravity. To wit: You're in a harem with 8379 love slaves. You have 1 hour to spend in any manner you please. Depending on the mode you select, you may: (a) engage in a stimulating discussion of the history of electricity; (b) enjoy a subdued amorous interlude; or (c) immerse yourself in wild and amorous sensual delights. Other opportunities for commingling do arise. However, even in Lewd mode the descriptions never become excessively graphic.

Infocom rates *Leather Goddesses*' level of difficulty as standard, suitable for beginners and advanced players alike. But expect

to invest a good chunk of time at the keyboard—the game takes several days to complete. And unless you're an interactive fiction pro, you're not likely to get far without the manufacturer's InvisiClues book. The clues, written in invisible ink, can be revealed one at a time with a special pen, giving you just enough information to keep you going without blowing a puzzle. Like everything else in the program, the clue book is loaded with jokes and red herrings. Though you can draw your own maps of the various scenarios, the clue book provides those too—indispensable for inept cartographers.

Leather Goddesses can be irksome. Certain scenes require a tedious succession of repetitive commands. The program can't handle most compound sentences or more than one line of instructions at a time. Still, the game recognizes over 900 words, and any program that can understand terms such as *kiss* and *fondle* can't be all bad. With a 3-D comic book, scratch-'n'-sniff plates, and plot devices lifted from every fairy tale or fable ever written, *Leather Goddesses* is a feast for the senses, as well as the senseless. So, next time you're stuck for something to do on a lonely winter night, call up a few of your more adventurous friends, douse the lights, and prepare to meet the *Leather Goddesses of Phobos*. It's a strapping-good program you're bound to enjoy. —Dan Tynan

Executive Summary

Leather Goddesses of Phobos

Fantasy

A bawdy romp through the galaxy in which you solve riddles and unearth secret maps to keep the people of earth from becoming the love slaves of goddesses. In the classic Infocom tradition, this is text-only interactive fiction.

Infocom, Inc.

125 Cambridge Park Dr.
Cambridge, MA 02140
617/492-6000

List price: \$39.95, Invisi-
Clues book \$7.95

Requirements: 64K, one disk
drive, DOS 2.00 or later
version

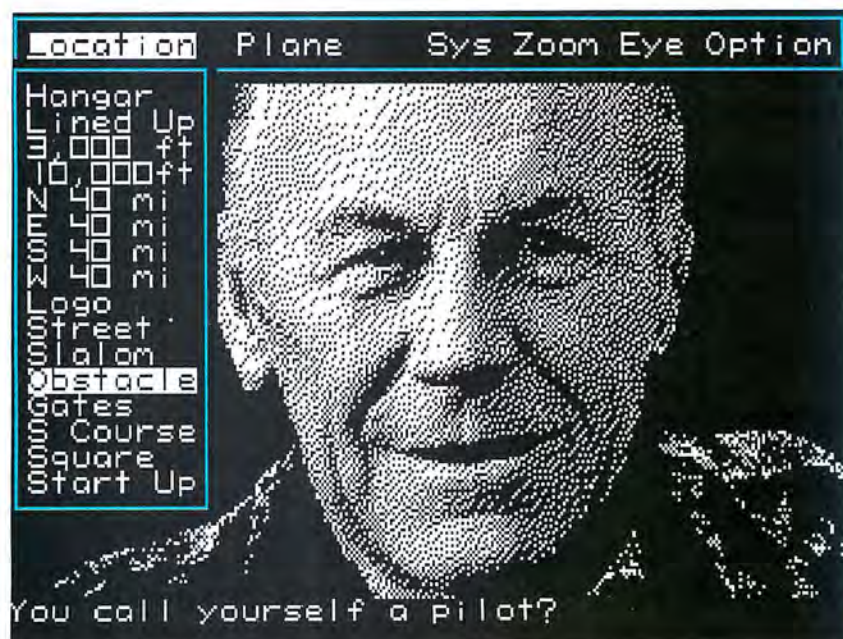
Not copy protected

Flying, said one sage pilot, consists of long stretches of boredom punctuated by moments of sheer terror. If you're fond of the long stretches, stick with Microsoft's venerable *Flight Simulator*. But if you hunger for the *feel* of flying—the rocking and rolling, stomach-in-your-mouth, cold sweat of it—Chuck Yeager's *Advanced Flight Simulator* (AFS) is as close as you can get without actually climbing into a cockpit.

War game junkies be forewarned: *AFS* is no air-to-air shoot-'em-up à la *Jet* but rather a real-time, stick-gripping experience from takeoff to landing and, yes, to augering into a freshly plowed field. How you buy the farm is up to you: You can take a skittery supersonic XPG-12 Samurai for a test flight, chance some Immelmanns in a Spad, or try to wax Chuck's tail in a P-51. Just remember that every airplane (14 in all) has a distinct and authentic set of flying characteristics that you'll have to master even to stay in the air. Just how authentic the Yeager *Simulator* is becomes apparent when you take, say, a P-51 Mustang out for a spin. Press <Esc> to display *AFS's* pulldown menu, select P-51 from the Plane option, and you're sitting in a cockpit at the end of a runway. The control panel sports the usual



Chuck Yeager's Advanced Flight Simulator recreates the twists and turns of seat-of-the-pants flying.



Make a mistake in Advanced Flight Simulator and General Yeager reprimands you personally.

instruments: artificial horizon, altimeter, turn indicator, and so on, along with a heads-up display that monitors the position of the ailerons and elevators. Advance the throttle by pressing <Gray-

neuver (such as landing) or relive that last deadly power dive, merely select Replay. Like *Jet*, the program provides a multiplicity of vantage points—from cockpit to chase plane to control tower—

tackle formation flying, loops, and flight testing. For further polishing, AFS's precise and amply illustrated user manual provides information on the program, flight basics, and aircraft specifics. You can, of course, brazen it out without help, but be prepared to take your lumps. During my first night at the controls, I botched the landing of a frisky experimental jet eight times in a row. When I finally admitted my limitations and selected the forgiving, almost gentle, Cessna 172, I landed it the first time. Caveat aviator. —Robert Luhn

If you hanker for the seafaring life, Bröderbund's *The Ancient Art of War at Sea* could be your tankard of grog.

Plus>, and like a true tail dragger, the Mustang wobbles onto the tarmac and starts its bumpy roll down the runway. As you pick up speed, the tail lifts, but pull the nose up too soon and the fighter bounces down the runway like a rubber ball; try to climb too steeply and the stall alarm shrieks. Once airborne, keeping the P-51 on the straight and level requires your undivided attention. Landing the beast takes the delicate touch fighter pilots of yore talk about.

Aside from such realism, a wide choice of flight modes separates AFS from the rest of the flight simulator crowd. Tired of screeching through the ozone layer in an SR-71? Press a couple of keys and you're behind the controls of a Spitfire. Press a few more and you can start the flight at 3000 feet, at takeoff, on final approach, or smack dab in the middle of one of seven obstacle courses. If you want to practice a particular ma-

nuever (such as landing) or relive that last deadly power dive, merely select Replay. Like *Jet*, the program provides a multiplicity of vantage points—from cockpit to chase plane to control tower—

which are particularly useful for honing your aerobatic skills. In test flight mode you can fly just about anything you want, but be prepared for trouble. On a test flight with the P-51, the flaps jammed open (a typical problem the game presents), while the XPG-16 goes into convulsions at Mach .5 when you've got the landing gear down. If you're an impatient PC pilot like me, chances are you'll smash up planes left and right. After every inglorious blunder, Chuck will pop onto the screen and taunt you with 'What a wreck. Have you tried fishin'?' or some other witticism. He's not an ace for nothing.

You can keep the general's appearances to a minimum by buckling down and running AFS's engaging on-line flight tutorial. This module introduces you to basic climbs and turns, takeoffs and stalls, and even some aerobatics, by taking over the controls and flashing the key steps on the screen as each maneuver is executed. It's a terrific way to learn, and once coached, you can quickly hop back into the cockpit and

Executive Summary

Chuck Yeager's Advanced Flight Simulator

Flight simulator

Flight simulation at its best. You can choose from 14 different aircraft, fly formations, and learn aerobatics. But be prepared for ego-bruising critiques from General Yeager himself.

Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
415/571-7171
List price: \$39.95
Requirements: 256K, one
disk drive, graphics adapter
and display, DOS 2.00 or
later version
Copy protected

The Ancient Art of War at Sea

The wind is up in the east as the frigate *Spinnet* skims rapidly through the chopping swells. The *Rounder*, a sturdy ship of the line, plows firmly behind, sails billowing, cannons gleaming darkly. Bringing up the rear is the mighty flagship *Thriceborne*, known to split lesser ships nearly in two with a single powerful blast from her broadside cannons. Suddenly the call goes up: "Three sails west!" Your formation turns hard, the wind fills your sails and propels you toward the enemy....

Sound compelling? If you hanker for the seafaring life, Bröderbund's *The Ancient Art of War at Sea* could be your tankard of grog. This strategy game combines arcade-style action and graphics with the intricacies of eighteenth century naval warfare. You command a fleet made up of three types of sailing ships—agile frigates, stout-hulled ships of the line, and massive flagships. To win, you must either capture the enemy's crown port, seize all of their flagships, or force them to surrender.

War at Sea depicts 11 naval campaigns, most based loosely on famous maritime battles such as the defeat of the Spanish Armada and the Battle of Trafalgar. Advanced players can design their own campaigns with a game generator—ships, maps, and all.

PC admirals match their sailing skills against six opponents, including John Paul Jones, Blackbeard the pirate, and Admiral Lord Nelson. Each adversary em-

ploys different tactics and has different strengths and weaknesses. For example, Blackbeard's cannons don't have the range of Admiral Nelson's, but his band of greedy pirates can reload faster than any other crew afloat.

The action occurs on three levels—strategic, encounter, and ship-board. At the strategic level, you view a campaign map and organize squadrons of up to three ships, which you then deploy to areas of strategic importance. When squadrons prepare to en-

gage, you switch to the encounter level, where you direct the action from two perspectives. The long view reveals the relative position of all the ships involved, which is crucial for framing a tactical plan and discerning the enemy's plan of attack. The short view concentrates on an area within cannon range when you fire upon opposing vessels.

The game certainly forces you to hone your sailing skills. Using



Arcade-style graphics enhance the strategic challenges in *The Ancient Art of War at Sea*.

the prevailing wind to maneuver into and out of firing range is critical. For example, after the main-sail has been peppered a few times, you soon find that turning downwind can mean the difference between victory and defeat. Piloting sailing ships with keyboard commands takes a little getting used to, but you'll soon get the hang of it.

When two battling ships get within grappling range, you zoom in to the shipboard level to command hand-to-hand combat. Here you send sailors brandishing cutlasses leaping across the breach and position marines with rifles to

fire at will. Victory in the melee is determined by capturing the opponent's flag or by massacring the enemy crew. It's a cinch you'll lose your first few boarding raids, but when you finally emerge victorious, you may stand up and cheer like your animated shipmates.

War at Sea's documentation is clear and simple, yet informative enough to help landlubbers get their sea legs. Included is a 50-page history of the fighting sail, with descriptions of famous battles and vivid profiles of the men who fought them.

The *Ancient Art of War at Sea* will test your strategic and tactical mettle and teach you something about sailing to boot. You can almost feel the grace and power of these once-mighty vessels. —Otto Waldorf


Executive Summary

The Ancient Art of War at Sea

Naval warfare simulation

A naval strategy game that features arcade-like action. You command eighteenth-century warships and clash with any one of six opponents; you can also create your own campaigns.

Broderbund Software
17 Paul Dr.
San Rafael, CA 94903-2101
415/492-3500
List price: \$44.95
Requirements: 256K, one disk drive, graphics adapter and display, DOS 2.00 or later version
Copy protected

 Chessmaster 2000
Some people consider chess a dry, yawn-inspiring test of intellectual macho. But battle-scarred veterans with a few notches on their boards know the game for what it really is: an armchair bloodbath, provoking instinctual fears of annihilation. With the advent of chess-playing software such as *Chessmaster 2000* from The Software Toolworks, those violent days are gone forever. Now a few keystrokes can delete a losing strategy or, if you prefer, a whole frightful game.

Chessmaster 2000 has all the features common to the genre, such as the ability to undo previous moves, to castle and capture en passant, and to save a game to disk. But *Chessmaster* combines these (and more) with a striking three-dimensional CGA color display and a chess-playing algorithm that defeated all comers in the 1986 U.S. Chess Federation Computer Chess Championship. The program also offers a teach mode that suggests moves for the stymied beginner and allows you to observe its deliberations as it grinds inexorably toward your doom.

Executive Summary

Chessmaster 2000

Chess game and tutorial

Chessmaster 2000 sports 3-D graphics and three levels of play. A teach mode suggests alternative moves for beginners, and the program can analyze moves and rate them on a numeric scale.

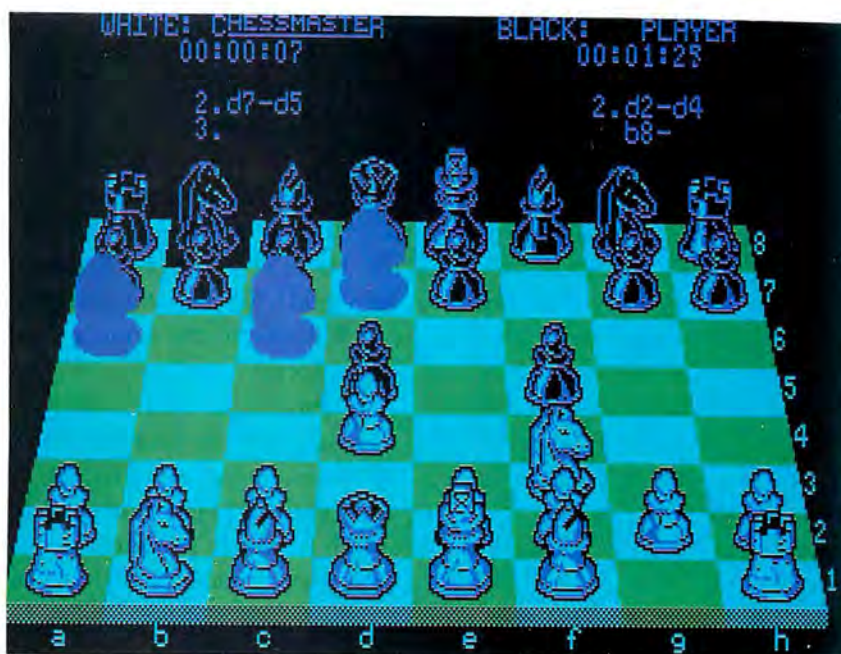
The Software Toolworks
One Toolworks Plaza
13557 Ventura Blvd.
Sherman Oaks, CA 91423
818/907-6789
List price: \$39.95; unprotected version \$10 to registered owners
Requirements: 256K, one disk drive, graphics adapter and display, DOS 2.00 or later version
Copy protected

It's great to know your program is a champion, but Toolworks understands that sometimes you just need to win. You can inhibit *Chessmaster 2000*'s prowess by forcing it to move within a limited time and by preventing it from planning ahead while you ponder your next move. Absolute beginners should head straight for newcomer mode, which forces the program to play its easiest game. Finally, there's a coffeehouse mode, which deliberately makes an error now and then.

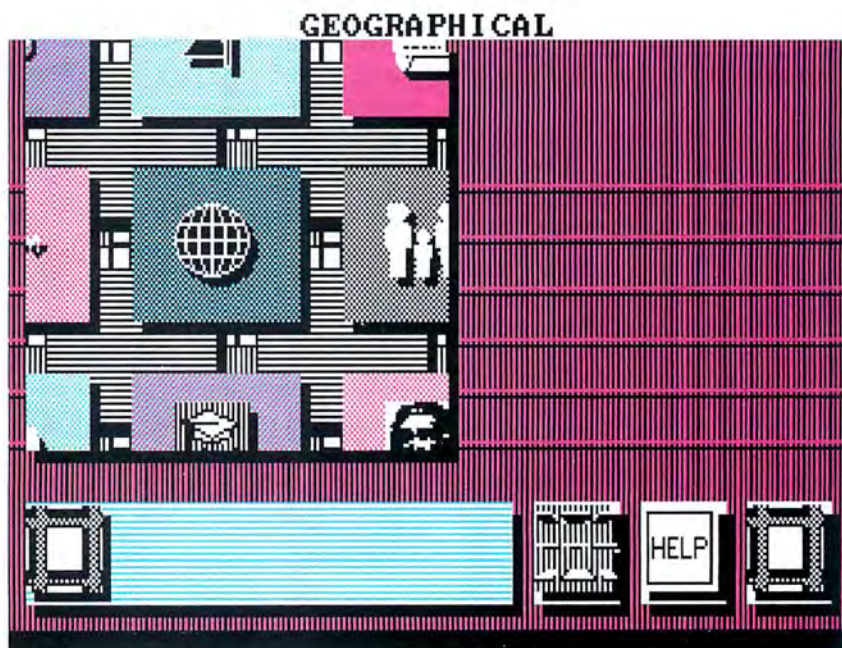
Chessmaster 2000's playing options are all selected from function-key-invoked menus; many oft-used commands can be activated with <Ctrl>-key combinations. The Chessboard menu, for example, enables you to control foreground and background colors, select a 2-D or 3-D board, and rotate the board by 90 degrees. Pop-up menus offer play level choice, instant replay, game analysis, and library functions.

Unfortunately, the game is marred by a small glitch: The chessboard cursor appears at a random location at the beginning of each turn. This mystifying and sometimes irritating detail disrupts an otherwise smooth interface.

Chessmaster 2000's 3-D display powers, adjustable play levels, and winning logic make it number one for sheer joy of playing. As a learning tool, it offers the remark-



Chessmaster 2000 shows beginners all the moves a single piece can make.



At Portal's interface panel, 12 icons designate the data bases that hold the secret to a vanished civilization.

able ability to analyze any game play by play, assessing the relative merit of each move on a numerical scale. This, along with a 100-game disk library of classic matches and a brief but authoritative history of the game of chess, constitutes the greater part of a very good chess course, lacking only a guide to chess strategy.

Whether you're a former schoolyard loser or an ongoing java-hut hustler, *Chessmaster 2000* is a worthy nonhuman adversary and tutor. —*Scott Spanbauer*

Executive Summary

Portal

Science fiction game

The time is 2106. Your PC is connected to a worldwide computer network as you search for clues to the disappearance of Earth's population. Simple keyboard commands make *Portal* a game for beginner and expert alike.

Activision
P.O. Box 7287
Mountain View, CA 94039
800/227-9759, 415/940-6044
List price: \$44.95, *Portal*
Guide \$3
Requirements: 256K, one
disk drive, graphics adapter
and display, DOS 2.00 or
later version
Copy protected

Portal

The year is 2106; after a 100-year space flight, you've just returned to Earth to find the planet eerily devoid of people. Birds and animals abound, plants flourish, but there's no sign of human life. Has a dread disease befallen the world? Where did everybody go? Welcome to the world according to *Portal*.

To unravel this Activision mystery, you hook up your PC to Worldnet, a vast computer network with 17 billion nodes, and search for clues. Worldnet's icon-oriented Interface Panel gives you entrée to 12 data bases (called dataspace) containing information on such topics as psychology, the military, history, science, and medicine.

Initially, only certain files—and certain dataspace—will be accessible to you. To crack open Worldnet, you must activate Homer, a sort of artificially intelligent storyteller who will serve as your guide. Awakening Homer involves rifling through the various dataspace and gathering enough information so you can jump start his memory banks. After decades of electronic slumber, Homer is a little hard to rouse, so you will probably need the supplied Worldnet Emergency Operating Instructions for hints.

Like his ancient Odyssean namesake, Homer tells his tale through a series of flashbacks—screenfuls of memories and disjointed data. Interaction with *Portal* calls for strong left-brain skills, for you must stitch together frag-

ments of text, diagrams, and even maps. You might, for instance, uncover a genealogy in the History dataspace and a map of Chicago in the Geography dataspace, both of which are clues to the background of a key character you have yet to encounter.

As the crusty computerized storyteller recounts more tales, related information in the dataspace is unblocked, and you can snag more pieces of the puzzle. A great help at this point is the *Portal* Guide, a flowchart showing which dataspace to access at given points in the story. Occasional reference doesn't diminish the mystery, and it may rescue you at

Executive Summary

Rogue

Fantasy/adventure

This action-packed Dungeons and Dragons-type game is set in a 26-level dungeon. No two games are alike—weapons, floor plans, and monsters change. The program runs on any video setup.

Epyx
600 Galveston Dr.
Redwood City, CA 94063
415/366-0606
List price: \$39.95
Requirements: 128K, one
disk drive, DOS 2.00 or
later version
Copy protected

critical junctures where frustration threatens to outstrip curiosity. Since total playing time averages 45 hours, you'll be glad the Guide's on hand. The tale of Earth's fate, however, is still yours to discover.

Activision's telephone support line is a boon: friendly, helpful, and absolutely necessary—offering information and hints that are glaringly absent from the manual. Without it, for instance, you can waste a lot of time and tears before you figure out how to save your place in the game when you want to call it quits for the night.

If you love mind-wrenching riddles, *Portal* probably won't challenge your sleuthing skills; the story's the thing here. But if you relish a gripping interactive science fiction yarn with a twist, you'll find *Portal* worthy entertainment. —Sally Zahner

Rogue

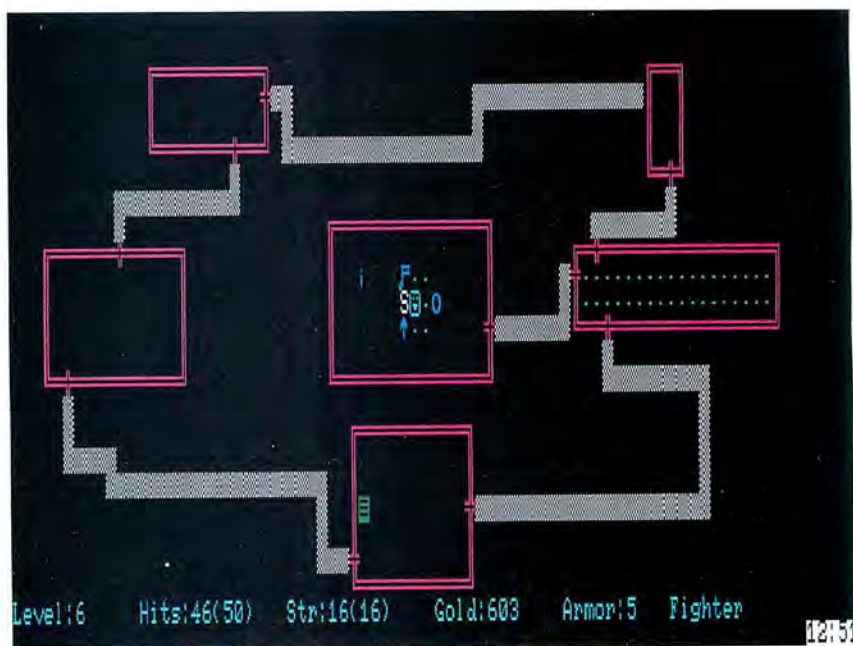
Rogue is a witty, action-packed Dungeons and Dragons-like game originally designed for mainframe computers. The *Rogue* fantasy world is complex but easy to plumb. The fabulous Amulet of Yendor lies hidden somewhere in a 26-level dungeon—probably on the lowest, nastiest level where the creepiest monsters hang out. Your quest? Bring the amulet to the surface without dying of starvation or being killed by any of the 26 different monsters—from Ice Creatures that freeze you on the spot to Slimes that replicate at will.

Rogue's graphics and animation aren't flashy by PC game standards; for example, monsters are

simply depicted by the first letter of their name. (However, since the program relies on character graphics, it can run on systems with monochrome video setups.) Even so, lackluster graphics pose no obstacle to excitement. The on-screen action effectively plunges you into a world of magic and mystery. Each dungeon level is a maze honeycombed with hidden rooms, traps, and booty galore. Menacing monstrosities attack at a dead run, magic wands illumine dark chambers, and enchanted scrolls teleport you across the screen. The cursor keys con-

trol all the action including punching out the bad guys blow by blow. All the same, playing well calls for imagination and strategic smarts, not just fast reflexes.

True to its name, *Rogue* inserts crafty twists and turns in every new game. The dank dungeon levels, for example, never repeat a floor plan; even more challenging, the relative powers of the weapons, armor, magic potions, rings, scrolls, and wands you find along



Rogue uses character graphics to create a mazelike dungeon filled with magical weapons, treasure, and monsters.

the way change without warning. The only way to discover their potency is to try them, sometimes with disastrous results. Yesterday's long sword may have been a legendary troll killer; today it's

Rogue's gallery of top ten players by grabbing as much gold as you can on route. Death, however, nets your assassin 10 percent of your dough. If you grow weary of the quest, any game in progress

Yeager's AFS, but if you want basic no-nonsense flying, *Flight Simulator* is it. This latest release doesn't add anything significant to the program—there's support now for enhanced AT 101 keyboards and the PC Convertible—and the program still includes an arcade-style World War I dogfight mode. But aerial combat isn't the program's main purpose. *Flight Simulator* seeks to re-create the essence of piloting a single-engine aircraft.

Your maiden flight introduces keyboard controls and the array of gauges on the instrument panel. To control engine power, flaps, and so on, you merely press the appropriate function key; to guide the airplane through turns, climbs, and glides, you press the cursor keys (ailerons and elevators) and the <GrayPlus> and <GrayMinus> keys (rudder). Unlike other, fancier flight simulators, this one presents a full complement of instruments, from airspeed indicator and directional gyro to everything necessary for radio navigation. *Flight Simulator's* thorough manual includes all the flight charts you'll need.

Once you're airborne, *Flight Simulator* is a visual kick. For example, the default airfield is Meigs Field in Chicago. As you take off, you see the John Hancock building approach from off the horizon and pass to your right. Look over your shoulder and Meigs Field fades away in the distance. The

Flight Simulator *can be tedious or a white-knuckle experience. If you want a little kick, you can select one of ten preset flight scenarios—anything from wind shear and cloud cover to in-flight mechanical difficulties.*

cursed and won't even zap a bat. Another conundrum is exactly how tough a given monster is: Sometimes hobgoblins are pussycats; other times they'll kill you with a single whack. To add to the general confusion, the rule book omits certain rules.

As you slash, bash, and otherwise dispatch rattlesnakes, dragons, and other dungeon denizens, your *Rogue* ranking increases, and with it, your ability to withstand the monsters' blows. Like the powers of your weapons and the ferocity of your opponents, just how much of a boost to your endurance you get with each field promotion also changes from game to game. Sometimes you'll bite the dust in 60 seconds; other games last hours. For an added incentive, you can also qualify for

can be saved to disk. You can also install the program on a hard disk.

Rogue is an addictive game that's simple to play and virtually impossible to quit. When and if you do find the amulet, don't fret about an end to your fun. You still have to carry your treasure to the surface to win. —Naomi Wise

Microsoft Flight Simulator

What game tops the charts, year after year? The answer is easy—*Microsoft Flight Simulator*. And small wonder. In the early eighties, when computer games tested your skills at hopping frogs across a busy freeway or gobbling up ghosts with Pac-Man, *Flight Simulator* took you up to 5000 feet and put the controls of a Cessna 182 in your sweaty hands. *Flight Simulator* was the 1-2-3 of PC games, and it's held that rank ever since.

Of course, some may yearn for the thrills and spills of a *Jet* or *F-15 Strike Eagle* or *Chuck*

terrain passing below is detailed when you're near any of the four populated areas the program portrays (New York/Boston, Los Angeles, Chicago, and Seattle). Those metropolitan areas have 80 airports where you can land and take off. And because *Flight Simulator* operates in real time, a flight from New York to Boston can take as long as the real journey. Luckily, you can enter coordinates (longitude and latitude) to jump instantly to a new location. For those with a quest for digital wanderlust, Microsoft also sells scenery disks for other locales and airports.

True to its quest for realism, *Flight Simulator* can be tedious or a white-knuckle experience. For example, in Easy Flight mode you can spend hours learning to keep the Cessna on course. But if you want a little kick in your flying, you can select one of ten preset flight scenarios—anything from wind shear and cloud cover to in-flight mechanical difficulties. The program is much more gamelike when wind shear throws your plane into an uncontrolled spin or the engine suddenly cuts out.

To help you avoid midflight disasters, *Flight Simulator* has several navigation aids. For added authenticity, the program maintains simulated radio communication with the nearest airport traffic controller for information on wind speed, temperature, and takeoff/landing clearance. These messages scroll across the top of your display. Two radios help you learn to fly on the straight and

narrow with VOR (very-high-frequency omnidirectional range) navigation. And DME (distance measuring equipment) assists you with instrument landings at night or in inclement weather.

Landing, however, is a challenge even under the best of conditions. Although *Flight Simulator*'s visuals are generally quite realistic, judging the plane's altitude is difficult. Mastering instrument landings is particularly risky, so

expect to see your windshield shatter and the word *crash* splatter across it frequently at first.

Flight Simulator is far more complex than most PC games and, save for the biplane dogfight scenario, isn't action oriented like arcade games.

So what accounts for *Flight Simulator*'s success? First, as with most flight-simulation games, there is the never-ending challenge to attain total mastery of the aircraft. Then too, part of the program's popularity undoubtedly springs from the hundreds of thousands of small-aircraft pilots who seek similar earthbound pleasure via their PCs. And for the timid types who wouldn't be caught living or dead at 10,000 feet, *Microsoft Flight Simulator* is an excellent way to enjoy the thrill of flight vicariously. —Jason Durbin

Executive Summary

Microsoft Flight Simulator, version 2.13

Flight simulator

Realistic Cessna 182 flight simulation has made *Flight Simulator* a PC classic. You can create your own flight modes and levels of difficulty and take off and land at 80 airports.

Microsoft Corp.
16011 N.E. 36th Way
Box 97017
Redmond, WA 98073
206/882-8080
List price: \$49.95
Requirements: 128K (192K in EGA monochrome mode), one disk drive, graphics adapter and display, DOS 2.00 or later version
Copy protected

Dan Tynan and Sally Zahner are copy editors, Robert Luhn a senior editor, and Scott Spanbauer an editorial assistant for PC World. Otto Waldorf is the editorial administrative assistant for Macworld. Naomi Wise is a film critic and cookbook author in San Francisco. Jason Durbin writes on technology from San Francisco and is manager of technical documentation for SBT Corporation. ●

Flexible Filer

Multiple-value fields and many types of forms per file enhance Tracker's power and flexibility with free-form data.

George R. Beinhorn

||||| "Keep track of absolutely everything," boasts an ad for *Tracker*, DayFlo Software's new data manager. *Tracker* is designed to work with the kind of text-intensive and hard-to-classify data—such as contact lists, memos, and letters—that gives traditional data base managers fits. Introduced in April at \$99.95, the product comes bundled with *Application Pack*, a package of four canned applications built with the *SmartKey* macro processor.

Using its earlier (and still available) data base manager, *DayFlo*, as the engine for *Tracker*, the company added 1-2-3-style menus, context-sensitive help, and templates for input forms and reports—as well as lots of customizing potential.

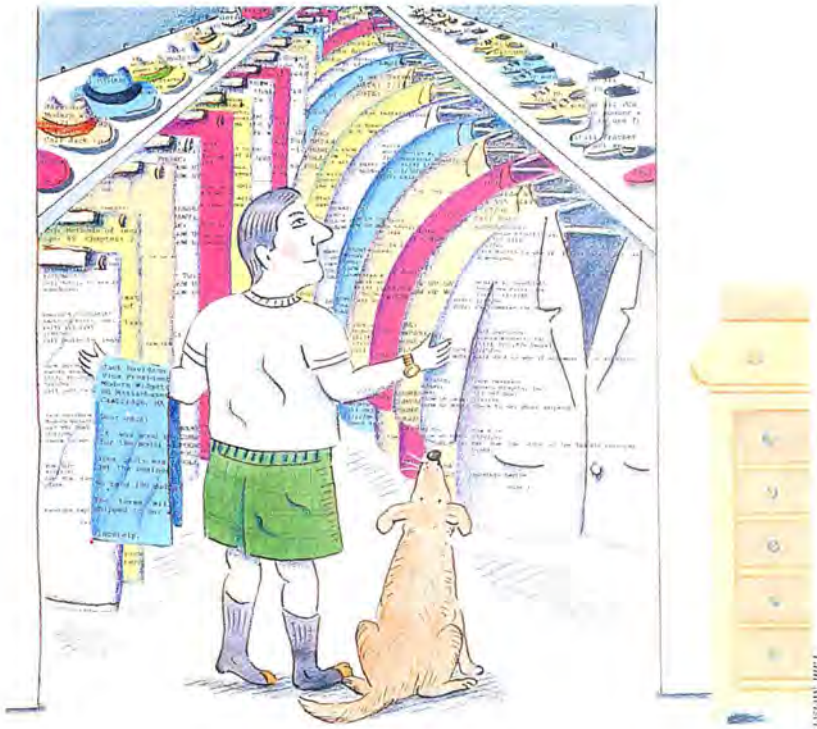
DayFlo calls *Tracker* an Information Tracking System (ITS), but don't let the nomenclature fool you. The package is really a flat-file manager with some relational capabilities, a hint of hypertext's associative power, and a good range of basic word processing features. Menu-driven and easy to install and use, the program is also fairly capacious, holding up to 65,000 records of 32K each.

Like its nearest competitor, *askSam*, *Tracker* excels at han-

dling unstructured data, but it takes a different tack. *askSam* requires no formal definitions of fields when you enter data—you can just type it in. You must, however, grapple with *askSam*'s after-the-fact field definitions and its obstreperous command language to get orderly data out of the system.

By contrast, *Tracker* requires you to assign data to fields as it is entered, but it also gives you the unique capability of assigning multiple values to each field. Thus, a *Tracker* field called Phone# could contain two or more separate phone numbers—or values. Moreover, each value in a multiple-value field can be used separately in searches, providing you enter an "end of value" marker (Ctrl-E in *Tracker*) between each instance. Both programs offer word processing functions such as block moves, cut-and-paste capability, word wrap, and margin controls.

More unusual is *Tracker*'s tactic of holding all data forms and record types in one huge file. Most traditional data bases—relational as well as single file—recommend that you store only



like records in a given file. If you have one data input form for contacts, another for memos, and a third for equipment, you set up and maintain three separate files. *Tracker*, however, encourages you to throw everything you've got into one conglomerate file—even if every single record has a unique set of fields.

Relating many kinds of data records in one file creates confusion for unwary users, and keeping track of these relationships slows down the program. But the diversity of data forms also produces a relational kind of power at query and report time—without the complex join commands, opening and closing of files, and elaborate data structures you grapple with in a real relational data base.

Starting Up Getting started with *Tracker* is a straightforward matter. *Tracker* proper comes on three disks; *Application Pack* occupies a fourth. Although you have to create a subdirectory on a hard disk, the installation batch file does the rest.

Be aware that *Tracker* is a disk hog. It requires 384K of RAM and about 1MB of space on a hard disk *before* you start adding data files. Furthermore, *Tracker* grabs whatever RAM is available up to 640K. The program does not yet support expanded memory.

When you start *Tracker*, you see a main menu consisting of a blank data entry form with a 1-2-3-style

bar menu at the bottom of the screen. You can use any of the dozen or so input forms supplied with *Tracker* for contacts, memos, collectibles, fixed assets, and so on.

Even simpler, just load *Application Pack* and press <F5> as soon as the opening screen appears. *Application Pack* provides more canned input forms, plus associated reports and stripped-down menus for four different applications: contact management, literature abstracting, project tracking, and DOS file management. Written in *SmartKey*'s macro language, the *Application Pack* modules offer a way for users to get up and running quickly and to become familiar with *Tracker*'s unusual data management strategies. The *Pack* modules, however, aren't as easy to customize as the rest of the program, and you may find them too limiting.

Menus pop up as fast as you can press the first letter of your menu choice. Once you've loaded a set of records onto the Stack—*Tracker*'s term for its desktop or work area—most functions execute quickly.

A key concept in *Tracker*, the Stack is confined to RAM. *Tracker*'s single huge file can contain up

to 65,000 records, but the Stack is limited to a maximum of 2500 records at once. *Tracker* can create reports only within the Stack and retrieve only those record sets that fit in the Stack, so these operations also have a 2500-record limit, which renders the program unsuitable for large-scale mailing lists and the like. Searches, however, can be performed on all 65,000 records in the data base using disk swapping.

Creating a new data entry form for your records is as easy as "painting" the input fields on the screen and telling *Tracker* which fields you want indexed. Furthermore, it's easy to add, delete, or reposition the fields in an existing form or move blocks of fields (with or without associated values) from one form to another.

Tracker screens offer lots of help. When you want to select a blank form, for instance, you highlight the Select command in the menu bar. A second line appears underneath explaining what the select action does, and a window shows up in the right corner of the screen listing the blank forms (*master forms* in *Tracker* lingo) that are available. Once the blank form has moved to the Stack, a status line informs you how much Stack space it's consuming.

About half of *Tracker*'s blank forms include the field name *keywords*, which you may find yourself stumbling over. Like other *Tracker* fields, keywords can contain multiple values. Unlike other

fields, keywords (and any values you assign) are *automatically* indexed by the program. Thus, if you were a salesperson with both door-to-door customers and corporate accounts, you could designate the category in the keywords field of your customer files and then conduct fast searches for a mail-merge list of corporate customers only. *Tracker* provides a list of all keyword values in your data base if you press the <F1> key.

■ Navigating and Manipulating

Most data manipulation in *Tracker* begins by "getting" records from the hard disk file and moving them into the Stack. The Get command is quite fast if you select records using an indexed field. *Tracker* permits up to 100 indexed field names per data base and sup-

ports 101 indexed field values in a given record. Unlike *askSam*, which loads any unindexed data base very quickly, *Tracker* slows to a molasses-in-January crawl when working with unindexed fields.

When you get records, you identify the set through input form names or field names, much as you do with traditional data base retrieval methods. With *Tracker*, though, you may find yourself loading an entire data base into the Stack (or at least the first 2500 records) to locate a single record—then returning to the disk any records you don't want. That's because the downside of *Tracker*'s flexibility is data redundancy. Frequently searched fields such as Name: and Date: are likely to be duplicated in several forms held in *Tracker*'s main file.

This is the **Report Writer**; the Report commands below return to this point.

Choose one of the following **Report commands** (or Quit):

- Quit** — Exit from the Report Writer and return to the Main Menu.
- Report** — Print a report using the records on the Stack.
- Merge** — Print records on stack merged with selected Form Letter.
- Add** — Add a new Report Format.
- Edit** — Edit (or view) an existing Report Format.
- Delete** — Put an existing Report Format in the trash.

Report: Quit ReportPrint MergePrint AddFormat EditFormat DeleteFormat
Return to the Main Menu

1/1 — 100%

Like all *Tracker* screens, the Report Writer is informative and well laid out. Too bad there's no print-to-disk option.

When all you can remember about an important phone conversation is the date, for instance, *Tracker* will supply all record types with that date value—whether they're memo, contact, or letter records.

Thus, you may be mildly annoyed by obtaining an excess of data until you master *Tracker's* sophisticated set of operators. The program supports up to ten criteria per search request: Equal, Not Equal, Greater, Less, In, Outside, Contains, Excludes, Present, and Absent.

You should feel jubilant about *Tracker's* field-defined searches, however, when you want to produce a tickler file or a "to do" list. Suppose you've put a field called Follow Up Date in several kinds of records. After a two-week vacation, you need a status check and ask for all records in which the follow-up date is equal to or less than today's date. *Tracker* pulls data from memo records, letters, contact lists, and others in one pass, presenting a thorough, well-organized—and probably too long—list of things to do.

Reports, Custom and Otherwise

In most data base managers, input forms and report forms are linked directly so you can easily tell which reports apply to a given set of records. Not so in *Tracker*. It supplies a bewildering number of report formats not directly linked to any particular input form—46 canned formats come with the program. Since the manual fails to describe them (and the program offers only a list of ambiguous names), you have to browse through them at your leisure.

Using the text editor, you can search and replace, cut, paste, and undo any elements in a format or record. On-screen boldfacing and underlining are interpreted by the printer drivers, which means that you can also use them in reports.

When it comes to creating reports, you'll again appreciate *Tracker's* flexibility. A *Tracker* report may contain text and numerical data in just about any combination of vertical and horizontal formats, with calculated fields, totals, subtotals, counts, and averages. Designing complex reports is made easy by a sequence of fill-in-the-blanks screens that solicit your preferences for report type (text, columnar, or a mixture), sort keys, printer settings, report layout, and field calculations. Re-

port formats can be saved, and a report may be sent to the screen, a printer, or a file. *Tracker* can also create print-merge letters.

Entirely menu-driven, *Tracker's* report functions may not provide direct links to input forms, but they are extremely flexible and much easier to use than *askSam's* difficult command language.

Application Pack

Although modifying a template is easy, tinkering with the modules of *Tracker's* Application Pack is a considerable chore. Because it was created entirely with *SmartKey*, you have to become adept at editing macro files before you can customize any Pack modules.

System Configuration Status — Standard Printer Page Layout
(Quit to exit back to main System Configuration Status)

Lines per Page: 66 Lines per inch: 6 8

Characters per line: 78

Character Size: Normal Expanded Compressed

Top Margin: 5 Bottom Margin: 5 Left Margin: 2

Forms type: Continuous Single sheet Sheet Feeder

Print Intensity: Normal Boldface Shadow

Quit Lines/Page Lines/Inch Chars/Line CharSize Top Bottom Margin Forms Intensity
 Return to previous menu

1/1 — 100% —

Tracker's flexibility extends to page layout. Note the sheet feeder and shadow settings. Command letters are highlighted in all *Tracker* screens, so you can choose and move on quickly.

Application Pack is a set of menu-driven, preconfigured data bases that can be called from anywhere within *Tracker*. From *Pack*'s main menu, you can switch to modules for managing contact data, literature abstracts, projects, or computer files. Each module contains menu selections for filling in data forms; printing preformatted reports; and loading, selecting, sorting, saving, or deleting records.

If you've seen a comparable *askSam* implementation, you'll find *Application Pack*'s contact manager unacceptably slow. Moreover, the contact manager lacks *askSam*'s phone dialer and, when loaded, automatically clears the Stack, effectively canceling the work you were doing in *Tracker* when interrupted by a contact phone call.

The literature abstractor accepts citations from a variety of sources, including books and articles, and each citation can be up to 15 pages long. The DOS file tracker is well implemented, though it's hard to imagine anyone taking the time to use it, rather than relying on well-managed hard disk directories and judiciously labeled backup disks to keep track of files.

Despite these cautions, *Application Pack* provides a quick way to get up and running on *Tracker*. It may be all many users need from the system.

Final Considerations

There's always a catch with flexible software, and *Tracker* is no exception. It's easy to get lost in a system that provides many different forms for a single file, multiple values for a single field, and a hundred possible indexes.

Part of the confusion comes from the whopping 100-plus input and report formats *Tracker* and its

Application Pack provide. Until you've experimented with each of these, seeing a list of them on screen isn't very illuminating.

Since you can change all these elements and their relationships to each other, what's needed is a status map of the system that at least shows what forms exist, what fields are on each, and what fields are indexed. But perhaps creating a continuous picture of this web of relationships would slow down *Tracker* even further—an undesirable state of affairs.

The documentation covers some features well, but it provides little information about canned forms and reports. The manual needs more definitions of what's different about the program (keywords, records, multiple-value fields) and a better index. The glossary of error messages is excellent, however.

With intuitive 1-2-3-style menus, context-sensitive help screens, flexible ad hoc retrievals, and complex reports, *Tracker* brings free-form and mixed data retrieval out of the Stone Age. But if you're too ambitious, it can take you from the Stone Age and vault you right into a black hole in data space. A final word of advice: Print copies of all your input and report formats. Keep track of *Tracker*. ●

George R. Beinhorn is a freelance writer in Nevada City, California.

Executive Summary

DayFlo Tracker

Text-oriented flat-file manager

A unique, reasonably priced package for tracking free-form and text-intensive data like lists, contacts, memos, and letters, *Tracker* arrives with lots of templates and formats for getting started quickly. Clean menus and screens make using the program easy. With multiple-value fields and the ability to create as many kinds of records as you want in one data base, data retrieval approaches relational power. But *Tracker* can also be snarly, slow with unindexed records, and it can yield unpredictable results.

DayFlo Tracker version 1.1
DayFlo Software Corp.
17701 Mitchell Ave.
Irvine, CA 92714
800/367-5369, 714/474-1364
Requirements: 384K, DOS
2.00 or later version, hard
disk and one floppy drive,
monochrome or color
monitor

List price: \$99.95

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THE HARDWARE SHELF

Edited by Michael Goodwin

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Compaq Portable 386 386 portable system

Pros: Fastest microcomputer currently available, built-in expanded memory

Cons: Mediocre screen display

Compaq Computer Corp.

20555 FM 14

Houston, TX 77070

800/231-0900, 713/370-0670

List price: with 1MB RAM, 40MB hard drive, 1.2MB floppy drive, serial port, and parallel port \$7999; with 100MB drive \$9999; 360K floppy drive \$225; expansion unit \$199; 40MB tape backup \$999; 1200-bps internal modem \$349; 2400-bps internal modem \$699; 1MB memory upgrade \$599; 32-bit memory/modem interface \$70; 1MB to 2MB memory expansion board \$799; 4MB memory expansion board \$2199; 4MB memory extension board \$2199; serial/parallel board \$149; serial board \$149; 20-MHz 80387 math coprocessor \$1199; color monitor \$799; EGA board \$399; desktop pedestal \$89; leather carrying case \$225; nylon carrying case \$89; MS-DOS/BASIC version 3.30 \$120; technical reference guide \$149; EGA/color monitor technical reference guide \$149; DC-2000 cartridge \$250 for 5-pack

Is there any limit to the public's hunger for faster processing? Compaq, the first major vendor to offer an 80386-based machine, is pushing the envelope by introducing a portable that boosts the 80386's clock rate from 16 MHz to 20 MHz. For the moment, the Portable 386 reigns as the fastest portable on the planet.

What is it like to ride this rocket? The Portable is fast all right, but for most applications you may not notice much difference—provided you're one of the lucky few who have been using a 16-MHz machine with disk caching. On the other hand, if you're trading up from an 8088 or a conventional AT, fasten your seat belt. Disk caching software boosts system performance far beyond what you would expect even from a 25 percent CPU speedup. As in IBM's PS/2 series, the cache system accelerates an already-fast hard disk by storing frequently accessed sectors in memory.

The Portable 386 looks just like the 80286-based Portable III Compaq introduced earlier this year and shares many features with it (see "A Portable for All Reasons," *PCW*, June 1987). It resides in a 20-pound box with a dual-mode gas plasma display, a



Photograph by Mark Johann Backdrop provided by MCI Studio

Compaq's Portable 386 boasts a 20-MHz 80386 microprocessor, making it one of the fastest machines in the known universe. A 40MB hard disk and a gas-plasma screen are included. And it fits under your airplane seat, too.

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What about networking? With WordTech's all new Networker Plus[™], you can run Quicksilver compiled programs and dBASE III Plus[™] on the same network, at the same time.

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The Quicksilver Diamond Release runs on DOS 3.1, and compatible networks. And it runs around \$599. Your software store or computer dealer has more information. Or give us a call.

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PC World Evaluation


Compaq Portable 386

	WordStar Professional	seconds
Compaq Portable 386		63
IBM Model 80		70
Compaq Deskpro 386		80

	dBASE III Plus	seconds
IBM Model 80		46
Compaq Portable 386		51
Compaq Deskpro 386		119

	1-2-3	seconds
Compaq Portable 386		17
IBM Model 80		22
Compaq Deskpro 386		22

	AutoCAD	seconds
Compaq Portable 386		76
IBM Model 80		85
Compaq Deskpro 386		133

	Lattice C Compiler	seconds
Compaq Portable 386		47
IBM Model 80		54
Compaq Deskpro 386		73

The performance of the Compaq Portable 386 surpasses all other currently available 80386 systems, although IBM's Model 80 outspeeds it when running dBASE III Plus.

WordStar Professional Although disk access plays a small part in the *WordStar* benchmark, processing and memory access speeds are the most significant factors. This benchmark measures the time required to perform four operations (replacing, copying, spell-checking, and printing) on a 15,364-word document.

dBASE III Plus Disk access speed is the most significant performance factor for the *dBASE III Plus* benchmark. This benchmark measures the time required to produce a report based on a three-file join, select, and sort.

1-2-3 Because no disk access is required, the *1-2-3* benchmark depends almost entirely on the processing and memory access speeds of the systems. In this benchmark, a *1-2-3* macro executes a series of recalculations within a 50-by-50-cell matrix.

AutoCAD Disk access, processing speed, and memory access all contribute to the performance of the *AutoCAD* benchmark. However, the speed and type of math coprocessor used by the system are the most important determining factors. This benchmark uses the sample office drawing provided with *AutoCAD* and measures the time required to retrieve and display the sample drawing; zoom in on a small detail within the drawing; zoom out to reveal the entire drawing; and print the entire drawing.

Lattice C Compiler The purpose of the Lattice C version 3.10 test is to gauge sequential disk access. The benchmark measures the time required to compile and link two 1000-line programs. The test was performed and timed automatically using a DOS batch file.

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

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Circle 16 on reader service card

145-watt power supply, a parallel port, and a serial port. It can also use the same piggyback expansion chassis with two 8/16-bit slots that the Portable III does. The flat-panel-display Portable 386 lacks a battery, but it fits neatly under an airplane seat. The frame seems durable, has plenty of shock mounting—and is 10 pounds lighter than that old reliable heavyweight, the Compaq Portable.

A 5¼-inch 1.2MB floppy drive is located on the right side of the unit above a second (empty) half-height drive bay. (A 360K floppy drive is available to fill that space, but a 3½-inch drive is not.) Once a floppy is locked into place, it's difficult to find the button to release it, but other engineering touches show more ingenuity. One particularly nice feature is an LED on the drive that glows green for 1.2MB disks and orange for 360K disks.

Hotshot 80386 aside, the Portable 386 improves on the Portable III with 1MB of motherboard RAM (expandable to 2MB), built-in expanded memory capability, disk caching software, and an optional 40MB tape backup unit that attaches to the bus extension at the rear of the case. A 40MB hard disk running at a fast 30 milliseconds (ms) is now standard, with the option of adding a 100MB (5ms) internal drive. To expand memory above 2MB, you can slip Compaq's small, proprietary memory expansion board

into the side of the unit. The board comes in two flavors: a 1MB board to which you can add another 1MB for a system total of 3MB or 4MB; and a 4MB board to which you can add another 4MB for a system total of 6MB or 10MB.

The Portable Enhanced Keyboard, which folds up into the face of the machine, has been revamped slightly since the introduction of the Portable III. The <Enter> key is smaller, the <Backspace> key larger, and two function keys (<F11> and

Disk caching software boosts the 20-MHz Compaq Portable 386's performance far beyond what you would expect from a 25 percent CPU speedup.

People accustomed to dim LCD displays will find the Portable 386's 10-inch gas plasma display (which it shares with the Portable III) an orange eye-opener. It doesn't provide all the viewing angles of a clamshell laptop, but by unhinging the screen and tilting it upward, you can angle the display up to 20 degrees from vertical; with the optional tilt pedestal, even the tallest users will enjoy the view. You can read the screen from any angle, and it even glows in the dark. A brightness control is located on the front of the display, but there's no contrast control.

Compaq continues its tradition of dual-mode text and graphics displays with a 640-by-400-dot text mode and three CGA-compatible graphics modes: 640 by 400, 640 by 200, and 320 by 200. A nine-pin RGB connector on the back of the unit allows the machine to drive any external CGA monitor with a three-key command.

<F12>) have been added to the top row. Some of the system keys (three of which have built-in LEDs) have also been shoved top-side, making room for a second <Enter> key on the cursor pad. The keyboard's touch is classic Compaq: If you like it loose, you'll love it; if you don't, you won't.

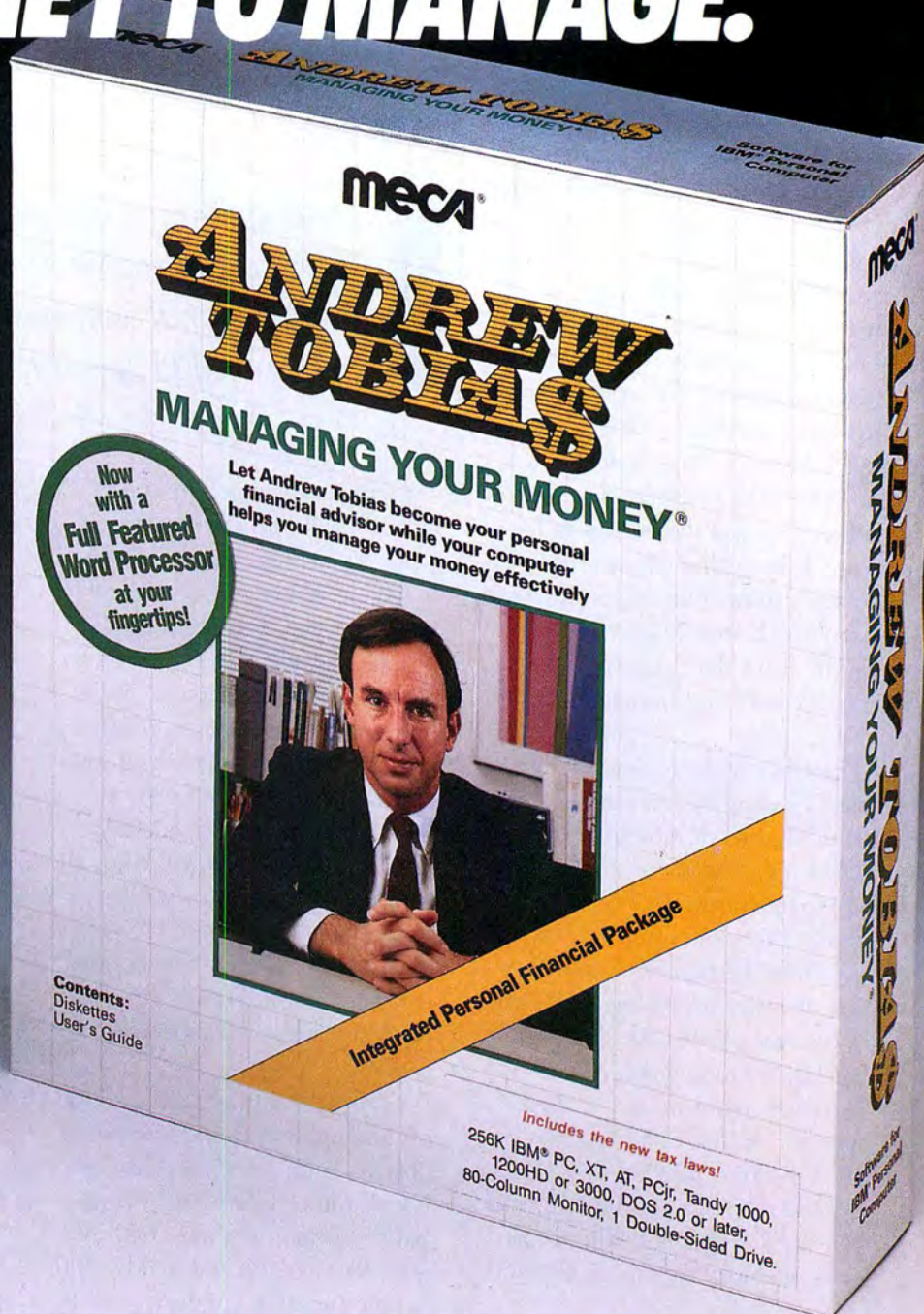
You can slide an optional 1200- or 2400-bps Hayes-compatible modem into a side bay or connect an external modem to the serial port on the back of the case. A bus extension for the expansion box or the 40MB streaming tape backup (you can't use both at the same time) is also at the back.

Getting inside the expansion box to place boards is a little tricky. Since there are no screws, it initially appears that you open it up using the time-honored Compaq technique—brute strength. In

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PC Magazine, 1987

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Circle 238 on reader service card

reality, to remove the slots' cover plates or open up the system unit (to boost memory, add a 20-MHz 80387 math coprocessor, or replace the drives), you'll need a specialized Torx screwdriver, which Compaq thoughtfully supplies.

Changing system speed requires a simple DOS MODE command. Normally, there's little reason to change from the Auto setting, which defaults to 20 MHz except for disk access, when it switches down to 8 MHz to handle timing-sensitive software. The other options are High (20 MHz) and Fast (8 MHz). Unfortunately, no keyboard toggle is provided for use from within applications.

The Portable 386 packs several other utilities that enhance performance; the expanded memory manager, called CEMM, is particularly valuable. Since expanded memory capability is built into the 80386 CPU, applications that support the Lotus/Intel/Microsoft (LIM) specification can now jump the 640K barrier without an expensive LIM expanded memory board. The Portable 386 automatically switches from 110 to 220 volts, a handy safeguard for absentminded world travelers. Useful software bundled with the machine includes Adapt, a RAM-resident utility that lets you customize display attributes (even from within an application), and a screen blanker built into ROM.

For the moment there's not a "name" road machine around that can outrun the Portable 386. But if you're a hopeless speed hound and don't require portability, you may want Compaq's 20-MHz desktop model, which flies even faster. —Eric Brown

AST Premium/286

AT-compatible system

Pros: High speed, low price, novel Fastslot bus architecture, quality workmanship

Cons: Noisy fan, sketchy documentation, no third-party support for Fastslot bus

AST Research
2121 Alton Ave.
Irvine, CA 92714-4992
714/863-1333

List price: Model 80 (512K, 1.2MB floppy drive, serial port, parallel port) \$1995, Model 90 (adds AST 3G-Plus graphics board plus 512K RAM for 1MB total) \$2495, Model 120 (adds

paq does not already bring." Thus spake AST cofounder Albert Wong a year and a half ago in these pages. Wong wasn't exaggerating; indeed, hindsight suggests he was being utterly candid. Profoundly underhyped and gimmick-free, the AST Premium/286 reflects the board maker's knack for breaking away from the pack.

The 10-MHz AST Premium/286 with its high-speed Fastslot architecture actually delivers the high performance and extra value that have eluded both IBM and Compaq. AST's Fastslot design, a homegrown extension of the standard AT bus, provides speed and performance features similar to the PS/2's Micro Channel for two

The 10-MHz AST Premium/286 with its high-speed FastSlot architecture actually delivers the high performance and extra value that have eluded both IBM and Compaq.

20MB hard drive) \$2995, Model 140 (adds 40MB hard drive) \$3495, Model 140X (subtracts graphics board) \$3295, Model 170 (adds 70MB hard drive) \$3995; AST Premium Display/Monochrome \$195; AST Premium Display/Enhanced Color \$695; Tape 286-40 \$750; 512K FastRAM \$695; 1MB FastRAM \$895; 2MB FastRAM \$1495

"You have to decide what extra value you can contribute, what high performance IBM or Com-

of its slots while the other five slots retain AT slot compatibility.

Moreover, Fastslots, with their third slot connector for direct, high-speed access to the 80286, were on the market a full five months before the PS/2's Micro Channel. Fastslots will provide a home for AST's forthcoming 386 turbo board and will eventually accommodate up to 8MB of RAM in a single slot. Not surprisingly, AST is offering technical spec sheets to any vendor interested in jumping on the bus.

Under the circumstances it's particularly unfortunate that the

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Premium/286, an admitted late-comer on the compatibles scene, is being lumped with cut-rate AT knockoffs. Truth is, the system is as near to Hewlett-Packard's high-end engineering in quality as it is to the cut-rate clones in price.

Physically the AST system is stouter than an AT or a Deskpro and less flashy. Attention to detail,

5¼-inch 1.2MB floppy drive, an AT-style 101-key keyboard, a floppy/hard disk controller, a 25-pin serial port, a parallel port, a beefy 192-watt power supply, an 8-MHz 80287 socket, DOS 3.10, and GW BASIC 3.1. The clutch of bundled AST utilities includes a RAM disk, a print spooler, an expanded memory manager, and an extend-

seven slots, one is 8 bit, four are standard 8/16 bit, and two are three-tongued Fastslots. A Fast-RAM board, the graphics board, and the disk controller take up three of the seven slots.

Predictably, AST, the swami of enhanced expanded memory, has built EEMS capability into its machine. On models equipped with 1MB, 640K is considered conventional and 384K expanded; to address EEMS RAM, you simply install AST's expanded memory manager. You can adjust memory allotments any way you choose, but if you don't specify either conventional or extended FastRAM, expanded is assumed.

The Premium/286 can be populated with zero-wait-state Fast-RAM on three-tongued Fastslot boards and, at the same time, slower conventional memory on standard expansion boards—creating the potential for chaos when moving data back and forth. Fortunately, the system knows when it's using conventional memory and brakes to two wait states when necessary.

The Premium/286 ranks at or near the top of the 286 class in *PC World's* battery of tests, even managing on occasion to nip at the heels of a few 386 machines. The system is slower with disk-intensive applications; that's where the PS/2 line, boosted by integrated disk-caching, has special strengths.

AST recruited Phoenix Technologies for the Premium/286 BIOS but tuned up the system on its

The Premium/286 is as near to Hewlett-Packard's high-end engineering in quality as it is to the cut-rate clones in price.

however, is manifest, from the finish of the keyboard to the crispness of the display and the ruggedness of the chassis.

Three of the five Premium/286 models sport hard disks; you can take your pick from a 65ms 20MB Seagate drive or two 28ms Micropolis drives (40MB and 70MB). The entry-level Model 80 comes with 512K of 100-nanosecond FastRAM. Each of the other four models provides a full 1MB of FastRAM, expandable to 4MB, plus another 9MB of traditional 16-bit memory on top of that.

All Premium/286 systems offer a three-speed, keyboard-selectable CPU; you can downshift from 10 MHz to 8 MHz or 6 MHz at any time, and LEDs indicate cruising speed. The system comes with AST's own EGA-compatible graphics board (the 3G Plus), a

ed memory emulator. You can also choose from such options as 5¼-inch 360K and 3½-inch 1.44MB floppy drives, an XT-style keyboard, and an internal 40MB Irwin tape backup unit (which runs off the existing controller).

The AST 3G Plus graphics board delivers 640-by-350-pixel EGA resolution, along with CGA, monochrome, and Hercules emulation. Brighter phosphor gives AST's 14-inch Enhanced Color monitor an unusually vivid image. A 14-inch black-and-white monitor is also available, with 720-by-350 resolution.

Expanding the Premium/286 is a breeze. You can pop up to three half-height storage devices into accessible, vertically stacked compartments; two additional storage bays are nestled below the hard drive out of harm's way. Slipping the cover off requires only modest effort and two screwdrivers. Inside you'll find a system board devoid of RAM and studded with both socketed and surface-mounted chips. Of the machine's

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PC World Evaluation




AST Premium/286

	WordStar Professional	seconds
AST Premium/286		106
IBM PS/2 Model 50		125
IBM AT (8 MHz)		150

	dBASE III Plus	seconds
IBM PS/2 Model 50		84
AST Premium/286		146
IBM AT (8 MHz)		205

	1-2-3	seconds
AST Premium/286		32
IBM PS/2 Model 50		41
IBM AT (8 MHz)		51

	AutoCAD	seconds
IBM PS/2 Model 50		171
AST Premium/286		179
IBM AT (8 MHz)		251

	Lattice C Compiler	seconds
AST Premium/286		91
IBM PS/2 Model 50		95
IBM AT (8 MHz)		126

The Premium/286 outruns the 8-MHz IBM AT on every test. In a one-on-one contest with PS/2 Model 50, the Premium/286 wins the WordStar, 1-2-3, and Lattice C events.

WordStar Professional Although disk access plays a small part in the *WordStar* benchmark, processing and memory access speeds are the most significant factors. This benchmark measures the time required to perform four operations (replacing, copying, spell-checking, and printing) on a 15,364-word document.

dBASE III Plus Disk access speed is the most significant performance factor for the *dBASE III Plus* benchmark. This benchmark measures the time required to produce a report based on a three-file join, select, and sort.

1-2-3 Because no disk access is required, the 1-2-3 benchmark depends almost entirely on the processing and memory access speeds of the systems. In this benchmark, a 1-2-3 macro executes a series of recalculations within a 50-by-50-cell matrix.

AutoCAD Disk access, processing speed, and memory access all contribute to the performance of the *AutoCAD* benchmark. However, the speed and type of math coprocessor used by the system are the most important determining factors. This benchmark uses the sample office drawing provided with *AutoCAD* and measures the time required to retrieve and display the sample drawing; zoom in on a small detail within the drawing; zoom out to reveal the entire drawing; and print the entire drawing.

Lattice C Compiler The purpose of the Lattice C version 3.10 test is to gauge sequential disk access. The benchmark measures the time required to compile and link two 1000-line programs. The test was performed and timed automatically using a DOS batch file.

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

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Circle 266 on reader service card

own. As you might expect, the machine unflinchingly runs *Microsoft Word*, 1-2-3, *dBASE III Plus*, *Crosstalk XVI*, and DOS 3.30.

The Premium/286's flaws are few and generally minor. The fan is loud, even whiny. The keyboard, while not Compaq-flimsy, is hardly IBM-snappy. Nor does the documentation measure up to the product's overall quality. DIP switch jockeys may appreciate the detailed discussion of switch positions and I/O addresses, but beginners may wish for more starting-level information. (They may also wish there were no DIP switches to worry about.)

All things considered, the Premium/286 is a remarkable first effort. If AST doesn't make a noise in systems equal to its thunderclap in expansion boards, it won't be for lack of trying, or for lack of achievement. —Ken Greenberg

Toshiba P341SL

Wide-carriage 24-pin dot matrix printer

Pros: Excellent type quality, moderately fast

Cons: Causes paper jams, can't print envelopes, no line-advance button, no NLQ capability in compressed mode

Toshiba America, Inc.
Information Systems Division
9740 Irvine Blvd.
Irvine, CA 92718
800/433-5999

List price: P341SL wide-carriage printer \$999; P321SL narrow-carriage printer \$749; font cards (*Boldface II*, *Letter Gothic*, *Elite Italic*, *Gothic 15*, *Greek Math I*,

High-quality NLQ output is a given with this new 24-pin printer from Toshiba—but its paper-handling leaves something to be desired.

APL I, *Greek Math II*, *Scientific Pi I*, *Orator I*, *Orator II*, *Outline I*, *Script*, *Theme*, *Lt. Italic*) \$79 each; 32K RAM memory cards \$99; fabric ribbons \$13.50; film ribbons (not yet available) two for \$21; MS17 single-bin sheet feeder \$329; MD17 dual-bin attachment for sheet feeder \$239

If a pretty typeface were the only issue, Toshiba's new wide-carriage, 24-pin printer, the P341SL, would be the season's hottest debutante. Toshiba's printers have always produced great-looking type, and they still do.

Unfortunately, the beauty of this innovative new printer is only

skin-deep; the P341SL is sunk by sloppy design and poor engineering. It has a number of clever paper-handling features that probably sounded great in the design stage but work very badly. The P341SL also lacks such essential capabilities as a line-advance button and the ability to print envelopes without mangling them.

Like its older 24-pin sisters, the P341SL blasts out readable high-speed draft at a decent clip (16

Photograph by Mark Johnson; Backdrop provided by MGI Studio



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Circle 37 on reader service card

seconds for a standard 250-word, double-spaced page) and prints NLQ pages at a reasonably fast 37 seconds per page. Furthermore, when Toshiba says "near letter quality" it means just that: Its NLQ type is virtually indistinguishable from daisy wheel impact letters.

Most computer users do the ever-tedious fanfold shuffle many times a day: Take the printer off line, disengage the fanfold paper from the tractor, pull out the paper, detach the tractor, insert the single sheets...

This is nobody's idea of a good time, and Toshiba has developed a brilliant alternative—at least in theory. You pull the paper bail forward, and the fanfold paper rolls out of the way. You then slip the single sheet between the paper guides on top of the machine, and the printer feeds and positions it automatically. When you're ready for fanfold again, the printer feeds it back in.

Sounds great, and four times out of five it is. The fifth time, the fanfold jams trying to get back inside the printer; you have to turn off the printer, pry open the back cover, rip out the jam, rethread the paper, and try again. It's like waiting for the berserk feeding machine to attack Charlie Chaplin in *Modern Times*: You know what's coming, but you can't do a thing about it. And after the fifth (or fifteenth) time, it's not so funny.

Furthermore, the Toshiba's paper positioning is badly in need of improvement. The printer loads paper with the printhead almost a

full inch lower than the top of the sheet. True, you can turn off the printer and adjust the paper position, but as soon as you lift the paper bail for any reason, the printer resets itself to the previous paper position—an inch too far down. For that matter, if you lift the paper bail to look at a line of

line-spacing, and other print controls from the touchpad front panel is unduly complicated. Compressed print is available only in draft mode. The fabric ribbons supplied with the printer (sealed in plastic) were underinked.

The Toshiba P341SL is full of great ideas—if only they worked.

The Toshiba P341SL has a number of clever paper-handling features that probably sounded great in the design stage but work very badly.

type, the printer thinks you want to park the fanfold paper and rolls it out, backward! This can drive you crazy.

Another critical problem is the printer's disgraceful handling of envelopes. Even with the paper-thickness lever in full-out position, the Toshiba P341SL eats one envelope out of three; there's a horrible buzz, the printhead chews into the left edge of the envelope and jams, and the printer loses all its margins. Even if the P341SL isn't hungry, most envelopes emerge badly smudged.

A series of lesser design flaws are almost as annoying. The lack of a line-advance button is incomprehensible. In *PC World's* test, one font-card slot promptly jammed and would not accept any cards. The single-sheet guides lack even rudimentary positioning clamps; unless you improvise (pushing a matchbook cover underneath the guides works pretty well), they slide instantly out of position. Selecting font, pitch,

Meanwhile, if you're in the market for a pretty face, try one of the P341SL's older siblings.

—Michael Goodwin

ALPS ALQ300

Color dot matrix printer

Pros: Good NLQ output, no DIP switches, reasonable price

Cons: Slow color graphics output

ALPS Electric

3553 N. First St.

San Jose, CA 95134

800/828-ALPS, 800/257-7872

California

List price: printer with 18-pin printhead \$895, with 24-pin printhead \$995, with both \$1090; serial port \$55; tractor feeder \$85; single-bin automatic



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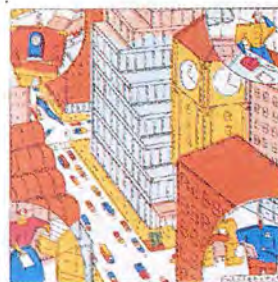
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Lotus Metro



Lotus Metro

System Requirements: Lotus Metro runs on IBM® PC/XT™, AT® Portable PC®, COMPAQ PORTABLE®, COMPAQ PLUS®, COMPAQ DESKPRO® Two 5.25" double-sided disk drives (hard disk recommended for optimal performance). Minimum of 80K required for RAM-resident kernel of Metro. Metro is unprotected and can be removed from memory. Lotus Metro runs with a wide variety of software programs, including 1-2-3, Symphony, Symphony Spelling Checker, Symphony Text Outliner, Lotus Report Writer™ and Signal®. When you purchase Lotus Metro directly from Lotus, take your first 30 days to try it. If after 30 days, Lotus Metro does not perform as described and you've purchased it directly from Lotus, we'll gladly give you a full refund.

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*Suggested Retail Price

sheet feeder \$195, dual-bin feeder \$320; font cartridges (OCR-A, Prestige Elite, Courier, Orator, Tiempo, Serif [18-pin only]) \$55 each; 64K print buffer \$95; black ribbon \$15, extra color ribbon \$18

In the realm of color dot matrix printers, the ALPS ALQ300 (the ALQ200's wide-carriage cousin) is the equivalent of Ralph's Pretty Good Grocery: The convenience is hard to beat, even if the quality and prices leave something to be desired. For \$895 you get decent color output, reasonably fast text printing, keypad selection of most options, a 7K print buffer, and an 18-pin printhead. A faster 24-pin printhead is available for an extra \$100; for versatility you can buy both and snap them in and out just as you would printer ribbons.

A variety of programs such as *WordStar*, *WordPerfect*, *Enable*, and *Windows* provide drivers for ALPS printers. Even if your software lacks that specific driver, compatibility should be no problem: The ALQ300's 18-pin and 24-pin printheads emulate the 9-pin Epson FX-185 and the 24-pin Epson LQ-1500, respectively.

Unlike many dot matrix printers, the ALQ300 produces nice, readable draft copy, but it takes its time about doing so. Printing a 250-word, double-spaced standard page takes 16 seconds with the 24-pin printhead. In what ALPS calls letter quality mode, the same page requires only 31 seconds; given the quality of the output, that's a pretty fair clip.

ALPS ALQ300 offers decent color output, reasonable speed, and a 7K print buffer. Epson emulation ensures software compatibility.

For color printing, the ALQ300 emulates the Epson JX-80. It can produce black, cyan, magenta, yellow, orange, green, and violet using a four-color ribbon and an overstrike process. As the 1-2-3 graph illustrates, the output is fine for most uses, although the blocks of color aren't entirely smooth and color registration isn't perfect. What's most annoying, though, is the slow printing: the ALQ300 took over 17 minutes to produce the graph (with the 24-pin printhead in unidirectional mode for best quality). An upgrade kit, due out by the time of this publication, is expected to double or even triple graphics printing speed, according to ALPS product marketing manager Dan Steele.

Photograph by Mark Johann Backdrop provided by MCI Studio



Fortunately ALPS doesn't believe in DIP switches, so it's easy to change settings. From the front panel you can select line spacing, pitch, font (Pica, Elite, Pica Condensed, and Proportional), and print mode (draft, high density, or letter quality) and choose either the internal font or one of several cartridge-based fonts. You can also change the default settings permanently from the front panel by using the ALQ300's memory mode and saving the settings in the printer's memory. And you can direct the printer to override a

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software package's default settings in favor of selections.

The ALQ300's optional tractor feeder works flawlessly. However, setting up the tractor is hardly intuitive: Before feeding the paper through the platen, you have to lift the tractor bar and hook it onto a hidden set of sprockets, a process the manual doesn't make clear. The saving grace is that once you've set the tractor up, it holds on to the paper with the tenacity of a pit bull.

Should the ALQ300 break down, ALPS's generous one-year warranty, including parts and labor, could be a lifesaver. Service is available at hundreds of authorized repair sites. Overall, the ALQ300 is a fine deal if you're looking for an all-purpose printer with fairly good color output. But if your needs are more specialized, don't shop at the general store.

—Anita Amirrezvani

ColorMetric 20 Video Adapter

Video graphics board

Pros: Displays VideoShow graphics on a PC monitor with 35mm-slide quality

Cons: Not compatible with all graphics software

General Parametrics Corp.
1250 Ninth St.
Berkeley, CA 94710
415/524-3950

List price: ColorMetric 20 with ColorMetric Connection \$1875, VideoShow 160 \$4595

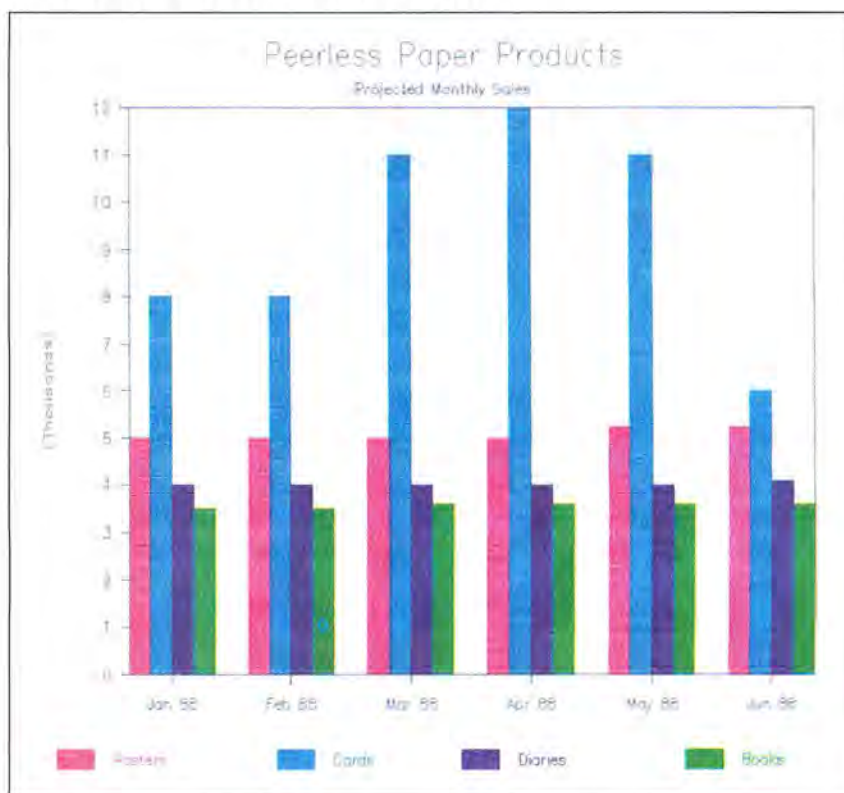
Forget the thousand words; a picture is worth seven days and \$100. At least that's what it usually takes to hand-produce a typical slide for a business presentation. Using a PC to generate the graphics saves time and money, but the quality of the final image leaves a lot to be desired.

Enter VideoShow, a high-resolution business graphics system starring the VideoShow 160—a small, computerized graphics controller that replaces the conference room slide projector. The new ColorMetric 20 video adapter is an essential supporting performer

in the show, enabling PC users to create and preview VideoShow graphics with what-you-see-is-what-you-get fidelity.

VideoShow uses the MacroVision scanning process to display up to 1000 simultaneous colors with a screen resolution of 2048 by 484 pixels—roughly the quality of a 35mm slide. Images are saved as disk files; the 160 console can display them on a standard color graphics (CGA or EGA) monitor, project them on a large screen with a high-quality video projector, and/or record them on a stan-

Colorful Chartwork From ALQ300



This high-density, unidirectional color printout from ALQ300 reveals imperfect color registration and rough color blocks. The chart took 17 minutes to print with a 24-pin printhead.

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□ The Instructor II	26.
■ Directory Assistance 1.0	33.
□ Professor DOS (with Smartguide)	33.
□ Smartguide (mem. resident DOS reference)	15.
□ Typing Instructor II	26.

Intersecting Concepts ... NCP

□ Display Master 2.11 (for EGA systems) ..	39.
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Javelin Software ... NCP

□ Javelin 1.1 (more than a spreadsheet) ...	\$69.
□ Javelin Plus 2.01	159.

Lifetree ... NCP

□ Volkswriter Deluxe Plus 1.0	69.
□ Volkswriter 3 1.0	147.

Micro Education (MECA) ... CP

□ Managing Your Money 3.0	115.
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Micropro ... NCP

□ WordStar Professional Release 4.0	259.
□ WordStar 2000 Plus Release 3.	229.

Microrim ... NCP

□ R:base System V 1.1 (with Express)	429.
□ dB Graphics 1.0	199.

Microsoft ... NCP

□ Learning DOS (for any version)	33.
□ Windows 2.0	65.
■ Works 1.0	119.
Bookshelf (CD-ROM)	189.
■ Project 4.0	319.
■ Word 4.0	239.
■ Chart 3.0	249.
■ Excel 1.0	319.

LANGUAGES

□ Quick BASIC 3.0 (newest version)	59.
■ Macro Assembler 5.0	97.
■ FORTRAN Compiler 4.01	289.
■ C Compiler 5.0	279.

Migent ... NCP

□ Ability 1.2	65.
■ Ability Plus 2.0	149.

Monogram ... NCP

□ Dollars & Sense 3.0	105.
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Nantucket Software ... NCP

□ Clipper (Autumn '86, dBase Plus compiler)	399.
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New England Software ... NCP

□ Graph-in-the-Box 2.0	57.
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Nolo Press ... NCP

■ WillWriter 1.0	35.
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North Edge Software ... NCP

□ Timeslips III 3.1	119.
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Paperback Software ... NCP

□ VP-Planner 1.3 (1-2-3 vers. 1A compatible)	57.
□ VP-Planner Plus 2.0	95.
□ VP-Info 1.4	65.
□ VP-Expert 1.2 (expert system)	65.
□ VP-Graphics 1.0	65.

Paul Mace ... NCP

□ H/Test-H/Format 1.5 (hard-disk tools)	49.
□ Mace Utilities 4.1 (DOS utilities)	59.

Personics ... NCP

■ SmartNotes 2.0 (Post-It-like notes)	49.
■ SeeMORE 1.0	49.

Quarterdeck ... NCP

□ DESQView 2.0 (operating environment) ..	79.
□ Expanded Memory Manager 4.0.	39.

Simon & Schuster ... NCP

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Webster's New World Writer 1.04	59.

Softlogic Solutions ... NCP

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■ PFS:Professional File 1.01	149.
■ Harvard Graphics 1.0	239.
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Newsroom•Pro	45.
Symantec ... NCP	
□ Q & A 2.0 (database, word processor)	209.
□ Q & A Write 1.0	119.
Traveling Software ... NCP	
■ LAP-LINK 2.0 (5 1/4" to 3 1/2" and back)	79.
True BASIC, Inc. ... NCP	
□ True BASIC 2.01	57.
■ True BASIC Libraries	each 32.
Turner Hall ... NCP	
■ Spellin! 1.0	49.
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■ Note-It Plus 2.0 (notes on 1-2-3 sheets)	49.
■ 4Word 1.0 (add word processing to 1-2-3)	59.
■ Cambridge Spreadsheet Analyst 2.02	59.
Unison World ... NCP	
Newsmaster 1.0	57.
WordPerfect Corp. ... NCP	
■ WordPerfect Executive 1.0	119.
□ WordPerfect 4.2 (one of the best)	199.
WordTech Systems ... NCP	
□ dBOX 1.1	89.
□ QuickSilver 1.1	359.
Xerox ... NCP	
Ventura Publisher 1.1	489.

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Computer SAT	35.
Stone & Associates ... NCP (reqs. CGA)	
My Letters, Numbers, Words (ages 2 to 6)	27.
Kids Stuff (ages 2 to 6)	27.
True BASIC, Inc. ... NCP	
■ Trigonometry	32.
■ Algebra	32.

RECREATIONAL

Accolade ... CP (reqs. graphics brd.)	
Hardball (baseball simulation)	24.
Mean 18 (great golf game, CGA or EGA)	29.
Blue Lion (requires CGA or EGA)	
□ Ticket to London, Paris, or Spain (specify)	25.
□ RSVP (etiquette & international business protocol)	25.
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Starflight (NCP)	32.
Chessmaster 2000 (CP, CGA or Hercules)	32.
Chuck Yeager's Flight Simulator (CP)	32.
Grand Slam Bridge (CP)	45.
Hayden Software ... CP	
Sargon III (chess, reqs. EGA or Hercules)	15.
Infocom ... NCP	
Bureaucracy Stationfall	Lurking Horror
Hollywood Hijinx	Hitchhiker's Guide

PC Connection Hardware Special

through December 31, 1987

KRAFT SYSTEMS ... 1 year Three-button Joystick Plus ACCOLADE ... NCP Hardball

A famous person said a few years back that there's nothing like central heat to bring in a crowd. Since then, everyone up here has it, so we needed a little better draw. After all, what would be better than the Boys of Summer to warm up those Nights of Winter?

- Kraft Premium Joystick will self-center or float free; includes an 8-foot cable; connects to a standard PC game port; and has an extra fire button on top of the stick ... \$33.
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- For PC, XT, AT, XT286 ... both just 49.

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Microleague Baseball (requires CGA)	25.
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Microsoft ... CP	
□ Flight Simulator 2.13 (reqs. graphics brd.)	32.
Mindscape ... CP	
Balance of Power (reqs. graphics brd.)	30.
Parlor Software ... CP	
■ Bridge Parlor (best Bridge simulation)	49.
Sierra On-Line ... CP	
□ Leisure Suit Larry (requires CGA or EGA)	25.
□ Space Quest (requires CGA or EGA)	33.
□ King's Quest III (requires CGA or EGA)	33.
Simon & Schuster ... CP	
Star Trek/Promethean Prophecy	27.
Sphere, Inc. ... NCP	
GATO (submarine simulation, requires CGA)	12.
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Sublogic ... CP	
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XOR ... NCP	
NFL Challenge	69.

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HARDWARE

Manufacturer's standard limited warranty period for items shown is listed after each company name. Some products in their line may have different warranty periods.

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I/O Mini 2 C/S/P	\$89.
NEW! SixPakPlus 64k C/S/P	
(now upgrades to 576k)	129.
SixPakPremium 256k C/S/P	
(upgrades to 1 Meg or 2 Meg w/Piggyback)	call
Advantage Premium 512k S/P	
(upgrades to 1 Meg or 2 Meg w/Piggyback)	299.
RAMpage! 286 512k (upgrades to 2 Meg)	339.
RAMpage/2 64k (upgrades to 2 Meg)	209.
Hot Shot 286	call
AST Premium series boards and RAMpage! boards support EMS and fully support EEMS, and also include a FREE copy of DESQView.	
Amdex ... 2 years	
Laserdrive (CD-ROM Drive)	629.
Video 310A (amber monochrome monitor)	139.
Video 410A (amber monochrome monitor)	169.
Compuable ... 2 years	
2-Position switch box	39.
3-Position switch box	59.
Cuesta ... 1 year	
Datasaver 200 Watt (PC backup power unit)	339.
Datasaver 400 Watt (AT backup power unit)	459.
Curtis ... lifetime	
ACCESSORIES	
Disk Holder (holds 50 5 1/4" disks)	8.
Printer Stand	18.
Universal System Stand	25.
CABLES	
Smartmodem-to-PC Cable (9 feet)	17.
Printer-to-IBM cable (9 feet)	17.
SURGE SUPPRESSORS	
Safestrip (6 outlets)	21.
Diamond (6 outlets)	32.
Ruby (6 outlets; EMI/RFI filtered; 6 ft cord)	59.
Ruby-Plus (w/FAX & modem protection)	69.
DCA ... 1 year	
Irma 2 (3270 emulation board)	729.
Irma PS/2 (for Models 50 and 60)	729.
Epson ... 1 year	
All cps speeds listed are for 12 cpi mode	
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EX-1000 printer (136 column, 300 cps)	call
FX-86e printer (80 column, 240 cps)	call
FX-286e (136 column, 240 cps)	call
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LQ-1050 printer (136 column, 264 cps)	call
LQ-2500 printer (136 column, 324 cps)	call
LX-800 printer (80 column, 180 cps)	call
Printer-to-IBM cable (6 feet)	15.
5th Generation ... 6 months	
Logical Connection 256k	319.
Logical Connection 512k	379.
Hayes ... 2 years	
Smartmodem 1200	299.

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Smartmodem 1200B (no software)	265.
Smartmodem 2400	449.
Smartmodem 2400B (with Smartcom II) . . .	449.
Hercules ... 2 years	
Hercules Color Card (CGA)	159.
Hercules Graphics Card Plus	189.
Hercules Incolor Card (includes RAMfont) . .	call
IMI ... 1 year	
Optimouse (includes Dr. Halo II)	99.
Genius Mouse (includes Paint)	47.
Intel ... 5 years	
Inboard 386/AT (requires cable inst. kit) . .	949.
Inboard Cable Installation Kit	139.
Aboveboard 286 512k	319.
Aboveboard PS/286 512k S/P	349.
8087 (for IBM-PC & XT)	114.
80287 (for IBM-PC AT & XT 286)	195.
80287-8 (for 8 MHz AT compatibles) . . .	249.
80387 (16 MHz)	499.
Kensington Microware ... 1 year	
Masterpiece	94.
Masterpiece Remote	119.
Masterpiece Plus	109.
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key tronic ... 3 years	
101 Keyboard (enhanced layout)	119.
Kraft ... 1 year	
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Microsoft ... 1 year	
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Mouse with Easy CAD (specify bus or serial)	119.
Migent ... 1 year	
Pocket Modem (ext., 1200 baud, w/software)	169.
Mouse Systems ... lifetime	
PC Mouse (w/Pop-up Menus & PC Paint+) .	99.
Bus Mouse (w/Pop-up Menus & PC Paint+) .	109.
NEC ... 2 years	
Multisync monitor (EGA compatible)	547.
Multisync Plus	949.
GB-1 (supports 640 x 480 resolution) . . .	279.
NSI Logic ... 3 years	
Smart EGA Plus	269.
Okidata ... 1 year	
Laserline 6	call
Laserline 6 RAM cartridge (384k)	239.
Advanced Personality Module	159.
Orchid Technologies ... 2 years	
Tiny Turbo 286	379.
Twin Turbo 12	399.
PC Turbo 286e w/1 Meg (10 MHz)	729.
Jet 386 (includes cable kit)	869.
RAMquest 2 Meg (for PS/2 models 50/60) .	699.
Practical Peripherals ... 5 years	
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Microbuffer Inline (par. print buffer w/256k)	149.
1200 Baud Internal Modem	89.
1200 Baud External Modem	109.
2400 Baud Internal Modem	159.
2400 Baud External Modem	189.
Princeton Graphics ... 1 year	
MAX-12E Amber monochrome monitor . . .	139.
HX-12E (EGA compatible)	499.

Quadram	
Prosync (with mouse; supports 640x480 & 752x410 resolution)	\$259.
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Multiscan (comes with EGA/CGA cable) . . .	call
Toshiba ... 1 year	
P321SL printer (80 col., 216 cps, w/tractor)	529.
T1000 Laptop Computer	call
T3100/20 Laptop (w/20 Meg Hard Drive) . . .	call
Tseng Labs ... 1 year	
EVA 480 (supports 640x480 res., includes Dr. Halo II & drivers for Autocad & Lotus 1-2-3)	299.
Video 7 ... 2 years	
VEGA Deluxe (supports 640x480)	259.

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Bernoulli Box 20 Meg w/PC2 card	1649.
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20 Meg cartridge	82.
Miniscribe Corp. ... 1 year	
ScribeCard 30 Meg (68 ms)	479.
Mountain Computer ... 1 year	
40 Meg Internal Tape Drive (XT or AT)	379.
40 Meg External Tape Drive (XT or AT) . . .	499.
40 Meg External Tape Drive w/Power Supply (XT or AT)	569.
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DriveCard 30 Meg (78 ms)	569.
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Plus Development ... 1 year	
Hardcard 20 Meg (49 ms)	call
Hardcard 40 Meg (39 ms)	call
Seagate ... 1 year	
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PC, XT 360k Drive (5 1/4" half-height)	99.
Toshiba ... 1 year	
PC, XT 360k Drive (5 1/4" half-height)	99.
AT 360k Drive (5 1/4" half-height)	117.
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Sony (10 disks per box)	12.
Maxell MD2-DM (10 disks per box)	13.
Verbatim Datalife (10 disks per box)	13.
5 1/4" DS/High Density Disks for AT (1.2 Meg)	
Fuji MD2HD (10 disks per box)	22.
Sony (10 disks per box)	23.
Maxell MD2-HDM (10 disks per box)	23.
Verbatim Datalife (10 disks per box)	22.
3 1/2" Double-sided Diskettes (720k)	
Sony (10 disks per box)	19.
Maxell (10 disks per box)	20.
3 1/2" High-Density Diskettes (1.44 Meg)	
Fuji (10 disks per box)	55.
Maxell (10 disks per box)	59.

MISCELLANEOUS

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CompuServe Information Service	24.
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dBASE Users!
Independent Reviewers Say:

Nobody Beats The Fox ...Nobody's Even Close



Data Based Advisor



BYTE Magazine

FoxBASE+ Fastest By Far

BYTE* benchmarks show that FoxBASE+ takes only 14 minutes to do what dBASE III PLUS needs an hour to do. The others are even slower. Clipper needs an hour and 17 minutes. Quicksilver needs an hour and 40 minutes.

Nobody beat FoxBASE+ in *even one* of the 27 BYTE benchmarks.

FoxBASE+ zipped through the exhaustive Data Based Advisor** benchmarks in just 15.5 minutes. New FoxBASE+/386 ran them in only 7 minutes! By contrast Clipper took 53

minutes, Quicksilver took 59 minutes, and dBASE III PLUS took an hour and 18 minutes.

Why Waste Your Time?

BYTE's data shows FoxBASE+ is up to 7 times faster. DBA's benchmarks show FoxBASE+ is over 5 times faster.

You can **run** with Fox...or you can **crawl** with them.

FoxBASE+ Delivers Now...The Others Only Promise

We're totally committed to insuring that FoxBASE+ will *always* be fastest...now and in the future. *You can't buy a faster product.*

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FoxBASE+ offers other great features like: true compatibility...familiar interactive commands like BROWSE and EDIT... "dot-prompt" programming...major language extensions...ideal development environment...and a *money-back guarantee*.

So call us for the details. After all...

Nothing Runs Like a Fox.

FOXBASE™ 

FoxBASE, FoxBASE+, and FoxBASE+/386 are trademarks of Fox Software.
dBASE III PLUS is a trademark of Ashton-Tate. Clipper is a trademark of Nantucket.
Quicksilver is a trademark of WordTech Systems.

*Using the benchmark timings published in BYTE, September 1987.

**Using the suite of benchmarks published in Data Based Advisor, March 1987.

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Circle 7 on reader service card

dard video cassette recorder for repeat performances.

While any one of 40 or more popular graphics programs can create VideoShow graphics on a standard PC, until recently it was difficult to view the artwork while it was being created. VideoShow graphics displayed on a PC are

disk. A few programs can display VideoShow drawings via ColorMetric without first saving them to disk. These exceptions include *Freelance Plus*, *Microsoft Chart*, and Ashton-Tate's *Master* series (*Chart-Master*, *Sign-Master*, and *Diagram-Master*). With these packages you can change the art

monitors. *Microsoft Chart* fails to list drawings in VideoShow's on-screen table of contents. General Parametric's own graphics-creation program, *PictureIt*, does not work unless ColorMetric Connection is removed from memory. *EnerGraphics* locks up the PC when trying to convert a drawing to VideoShow format.

In fact, of the five graphics packages PC World tested, only *Freelance Plus* performed without complications. General Parametric ascribes the problems PC World experienced to the applications and not to VideoShow or the ColorMetric 20, but clearly, in either case the situation is less than ideal.

VideoShow 160 is a revolutionary product, but revolutions require popular support, and here ColorMetric 20 is lacking. Smoother interaction between General Parametric's hardware and its software supporters is needed to make this system a real box-office smash. —TJ Byers

VideoShow uses the MacroVision scanning process to display up to 1000 simultaneous colors with roughly the quality of a 35mm slide.

limited to the colors and screen resolution supported by the computer's native video mode. To see your creation as it will finally appear, you must hook the PC to the VideoShow 160 console. If two or three people are working on presentations at the same time, commando raids on the conference room console may result.

The ColorMetric 20 brings peace to the VideoShow battlefield by allowing users to run a board-level version of the system on any PC. The board installs easily in any IBM PC, XT, AT, or clone and displays VideoShow graphics in high resolution, exactly as they will appear on the console.

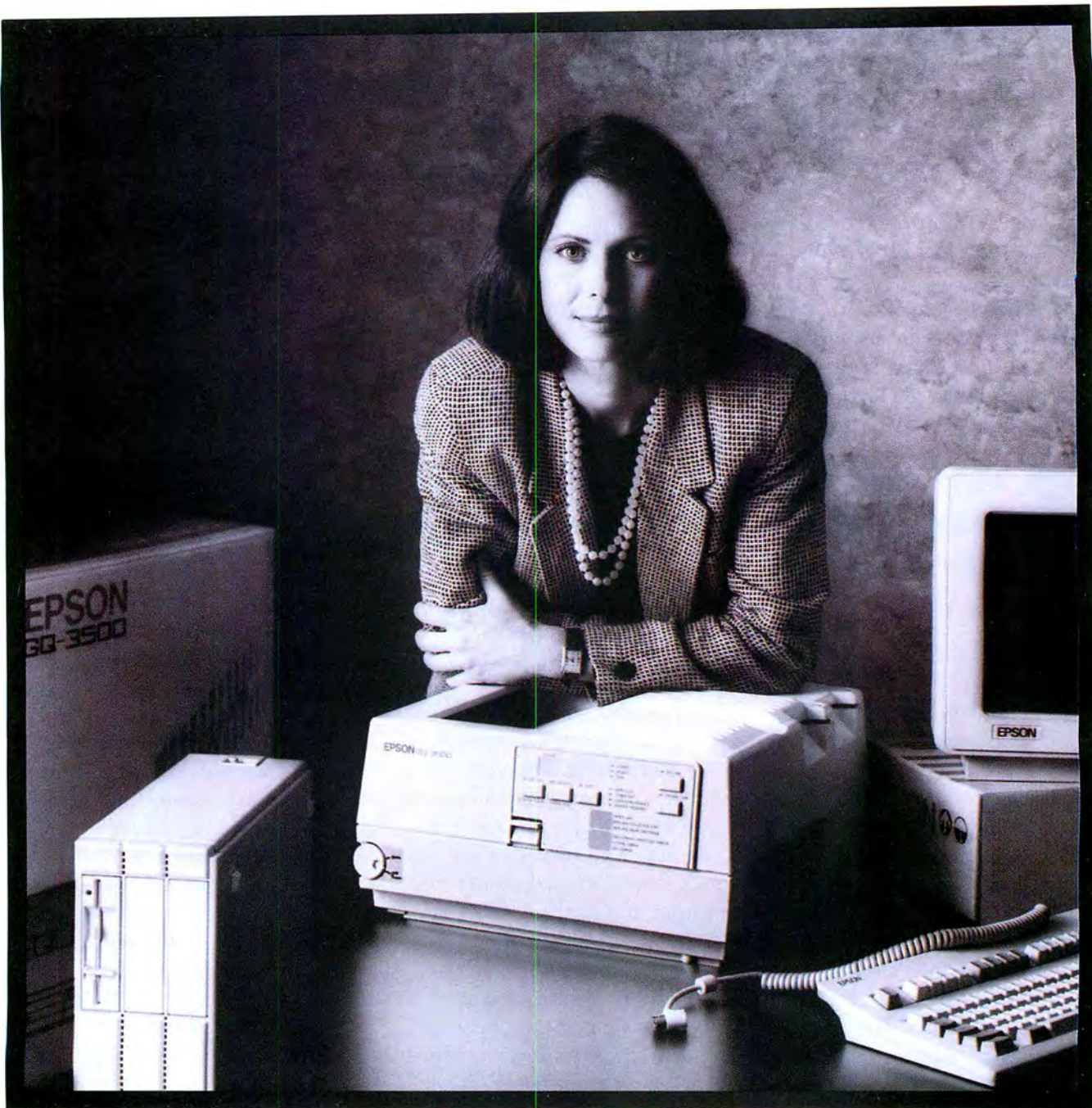
To view VideoShow artwork, you must first convert it to a special file and save it to a proprietary VideoShow presentation

without first quitting the graphics program, thereby saving time.

ColorMetric 20 operates in two modes—primary or secondary. If you want to avoid the hassle of working with two monitors, primary mode lets you channel the output of a standard CGA or EGA video adapter into the ColorMetric. In this configuration, memory-resident software switches your monitor between VideoShow graphics and normal PC display as the application requires. In secondary mode, a dedicated ColorMetric monitor (any CGA or EGA unit will do) displays VideoShow graphics only; normal PC operations require a second video board with its own monitor.

Unfortunately, ColorMetric's software support has serious flaws. Ashton-Tate's *Master* series does not work in primary mode; on-line previewing requires two

Eric Brown and Ken Greenberg are PC World contributing editors; Michael Goodwin and Anita Amirrezvani are associate editors for PC World. TJ Byers is a freelance writer and the author of Inside the IBM PC AT (McGraw-Hill, New York, 1986). ●



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Kate entered the world of Epson desktop publishing with her new Epson Equity™ III+ computer and GQ-3500 laser printer on June 4th at 1:05 P.M. Give or take a few seconds.



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Edited by William Rodarmor and Wesley Nihei

PC-MOS/386

Multiuser/multitasking operating system

Pros: DOS-like interface and command set; acceptable multiuser facilities; full 32-bit development support

Cons: Questionable DOS compatibility; sluggish performance; extensive memory requirements; inadequate system administration tools; limited documentation

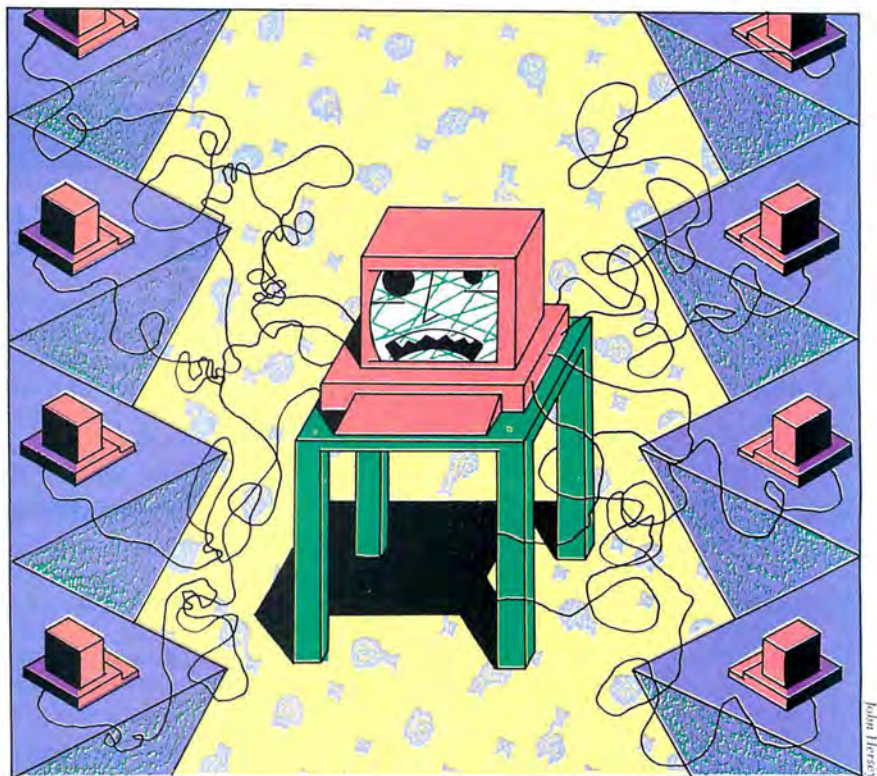
Version 1.01

The Software Link
3577 Parkway Ln.
Atlanta, GA 30092
404/448-5465

List price: single user \$195, 5 users \$595, 25 users \$995; PC Emulink terminal emulation program for PC-MOS/386 \$199
Not copy protected

Forget cheap cigars. What this world really needs is a good 386 operating system.

Never mind that an all-points bulletin is out on 80286-based OS/2; the march toward the 80386 is inexorable. So you have to admire the pluck of a company like The Software Link (TSL) for trying to get the jump on Microsoft. Best known for its LANLink



serial port network, TSL has launched PC-MOS/386, a from-the-ground-up Modular Operating System (MOS) for the burgeoning flock of 80386-based systems. By offering PC-MOS as a retail—not just an OEM—product, TSL is aggressively courting users whose 386 systems are all decked out with nowhere to run.

PC-MOS is designed to replace DOS completely, but it isn't likely to succeed, at least in its present incarnation. Version 1.01 is little more than a glorified virtual 86



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All the right connections

The Buffalo SX is an intelligent buffer, switcher and interface converter all in one. It allows several PC users to select any output device connected to the network.

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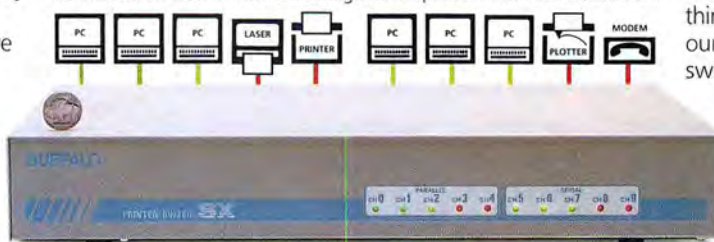
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Circle 202 on reader service card

control program that runs a number of DOS applications in separate partitions in RAM. Unfortunately it works with only a handful of contemporary programs, and its DOS interface (read: no windows) makes managing multiple tasks unwieldy.

PC-MOS cribs heavily from its sibling *MultiLink Advanced*, a DOS extension that divvies up RAM and provides multitasking/multiuser facilities for serially linked terminals, PCs, and ATs.

A Compendium of Commands

DOS 3.30	PC-MOS/386	DOS 3.30	PC-MOS/386	Additional PC-MOS/386 commands
APPEND		GRAFTABL		.ADDEV
ASSIGN		GRAPHICS		.CLASS
ATTRIB	.FILEMODE	IF		.DIRMAP
BACKUP	.EXPORT	JOIN		.ENVSIZE
BASIC		KEYB		.EXCEPT
BASICA		LABEL	.DISKID	.HELP
BREAK		LINK		.MOS (MAP, DIS, NODIS, USERIRQ,
CD (CHDIR)	.CD	MD (MKDIR)	.MD	FREEIRQ, IRQ, WAIT, VMODE,
CHKDSK	.VERIFY	MODE		SERINIT, ROUTE, RESIZE)
CLS	.CLS	MORE	.MORE	.MOSADM (SLICE, PRI, CACHE)
COMMAND		NLSFUNC		.ONLY
COMP	.COMPFILE	PATH	.PATH	.SIGNOFF
COPY	.COPY	PRINT		.SIGNON
CTTY		PROMPT	.PROMPT	.SPOOL
DATE	.DATE	RD (RMDIR)	.RD	
DEBUG	.DEBUG	RECOVER		
DEL (ERASE)	.ERASE	REM		
DIR	.DIR	REN (RENAME)	.RENAME	
DISKCOMP		REPLACE		
DISKCOPY	.DISKCOPY	RESTORE	.IMPORT	
ECHO		SELECT		
EDLIN	.ED	SET	.SET	
EXE2BIN		SHARE		
EXIT		SORT	.MSORT	
FASTOPEN		SUBST	.ALIAS	
FDISK	.HDSETUP	SYS	.MSYS	
FIND	.SEARCH	TIME	.TIME	
FOR		TREE		
FORMAT	.FORMAT	TYPE	.TYPE	
GOTO		VER	.REL	
		VERIFY	.WVER	
		VOL		
		XCOPY		

The commands in PC-MOS/386 often duplicate those in that old familiar DOS, but many are new. The telltale dot is optional.

Unfortunately, PC-MOS is a chore to administer. Adding users and allocating storage is tedious, and the program runs so slowly that it isn't suited to more than a half-dozen workstations. A new version just released may correct some of these defects.

Of course a suitable 80386 operating system should do more than run multiple 8086 applications at once; it should handle up to 4 gigabytes of RAM in protected mode and transparently manage the terabytes of virtual memory the 80386 can access (see "The Soul of the 386," PCW,

March 1987). PC-MOS is worth buying for its virtual 86 support, but access to RAM is limited, and its management of virtual memory clumsy. Moreover, only a handful of vendors support the product so far. Summit Software Technology broke the ice with its Better-BASIC/386. Two other language developers, Phar Lap Software and Metaware, signed on early, offering PC-MOS-specific assemblers and compilers.

PC-MOS duplicates DOS's file and disk structure—including the

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32MB-per-volume limit—so you needn't reformat your hard disk. And installing PC-MOS is as straightforward as installing DOS. Like DOS, PC-MOS maintains its own versions of COMMAND.COM, AUTOEXEC.BAT, and CONFIG.SYS. In addition, PC-MOS includes additional device drivers. The \$SERIAL.SYS driver defines serial ports, for example, while \$\$USER.SYS establishes user accounts, passwords, and file security for multiuser settings; another device driver treats contiguous extended memory like EMS RAM. PC-MOS also includes a dozen device drivers that enable a variety of terminals to act as workstations in a multiuser setup, any of which can display CGA—but not EGA—graphics.

PC-MOS features a DOS-like command-level interface but has its own quirky lexicon. To avoid confusion, all PC-MOS commands begin with a dot—an annoying convention you can toggle off.

Once PC-MOS is up and running on a 386 machine serving a group of workstations, the system administrator must configure device drivers—adding users, assigning serial ports, defining tasks, partitioning memory, and so on. The manual is too diffuse to be much help, but TSL's technical staff is both knowledgeable and accessible.

As a multitasking system, PC-MOS isn't likely to make history: It can juggle only a handful of off-the-shelf programs, and the applications can't share data. Worse, available RAM soon runs out be-

cause the first 640K of RAM can hold only a single task, and every task in a memory partition must include a copy of the PC-MOS command processor. As a result, a system with 2MB of RAM supports just three tasks. You can deal with only one program on screen at a time and must use an

provides a task directory, but in a windows world, that's an archaic device.

System security is optional and enforced through a group scheme, with 26 groups supported and password protection available. PC-MOS features four levels of access rights: no access, execute

PC-MOS duplicates DOS's file and disk structure—including the 32MB-per-volume limit—so you needn't reformat your hard disk.

<Alt>-key sequence to move between programs. Interprogram (or intertask) communication is possible only through a PC-MOS version of DOS's piping functions.

As with any single processor system, programs must share the CPU on a *time-slice* basis: Each task (or program) is given a predetermined chunk of processing time. The system administrator can tinker with both the time slice and the task priority and play with up to eight priority levels per user. The problem is in orchestrating users and tasks.

With most multitasking operating systems, the resources that any new task requires are immediately set aside. By contrast, PC-MOS requires the user or administrator to issue the ADDTASK command to create a task, or the REMTASK command to remove it. Before embarking on a new task, you must know how much memory the task will require, run the ADDTASK command, and specify the appropriate program. To tell you what's running, PC-MOS

only, read and execute only, and unrestricted access.

Although written entirely in assembly language, PC-MOS is surprisingly sluggish. As the number of tasks increases, performance degrades significantly. In informal tests, PC-MOS running a single task was 20 to 30 percent slower than DOS; performance diminished by roughly 20 percent as each new task was added. To increase system throughput, TSL offers RAM disk and cache drivers. With both installed, overall performance does increase, albeit marginally. More troubling, PC-MOS takes minutes to display an error message when asked for a file that doesn't exist. It can take so long that users may be tempted to reboot the system—a drastic step in a multitasking system.

At press time, TSL announced the release of PC-MOS version 1.02, which the company claims



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includes drivers for the 8088, 8086, and 80286 and has "unprecedented" compatibility with DOS applications. If TSL has really cured version 1.01's ills, PC-MOS becomes a much more interesting product, but considering the defects in the first version, caution is in order. For single users and for multitasking, *Desq-view* is still a better choice; for multiuser setups, you'd do well to wait a while longer. —*Judi Uttal*

PC-File +

Data base manager

Pros: Easy to use at the introductory level; some relational capabilities; inexpensive

Cons: Advanced uses require primitive, arcane commands

Version 1.0

ButtonWare Inc.

P.O. Box 5786

Bellevue, WA 98006

206/454-0479

List price: \$69.95

Requirements: 384K, two disk drives, DOS 2.00 or later version
Not copy protected

Sooner or later, most PC users yearn for a data base manager tailored to their own unique information needs. Yet simple file managers generally lack the muscle to perform sophisticated searches or produce detailed reports, and full-fledged relational programs like *dBASE III Plus* and *R:base System V* are overwhelming. ButtonWare's *PC-File +* is designed to fill the gap.

Written in C, *PC-File +* moves faster and travels farther than its predecessor, *PC-File III*, and continues ButtonWare's rock-bottom pricing and shareware copying policies. You'll need an eye for detail and a stomach for cryptic commands to use it, but *PC-File +* will reward you with speed, power, and flexibility.

PC-File + offers users a two-tiered approach. At the casual user's level, you tap commands from menus and are guided by over 175 context-sensitive help screens and a pop-up teach mode.

You'll need an eye for detail and a stomach for cryptic commands to use it, but PC-File + will reward you with speed, power, and flexibility.

If you need only to file and retrieve single categories of data, the first tier is plenty. Looking up data in other data bases and including it in reports and calculations moves you up a rung. You'll have to master formulas like (*Fieldname1* [+] @ *Fieldname2*, *Database2*, *Fieldname3*, *Fieldname4*).X

The first step with *PC-File +* is defining a data base, which can be done in one of two ways. Using the "fast" method, the program displays a template with fields set off by square brackets; you type in field names as they should appear on the data entry screen, then indicate how long each field should be. The free-form "paint" method lets you plant fields of any length wherever you like.

The fun—and the need for precision—begins when you turn ordi-

nary text or numeric fields into special-purpose fields. A calculation field can hold a formula that uses values stored in one or more fields; when combined with a Relational Lookup field, the formula can even take into account values stored in fields in other data bases. You can also speed up data entry and verify entries. Define a constant, for example, and *PC-File +* will put that value, such as an area code, in a given field. Another function enters the current date, time, or record number in a field. And a field mask helps elimi-

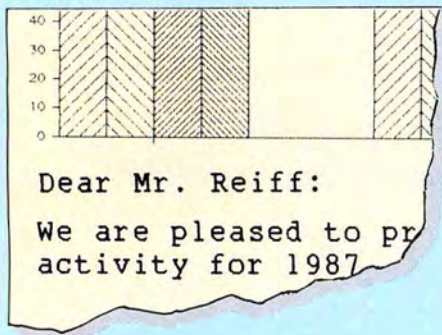
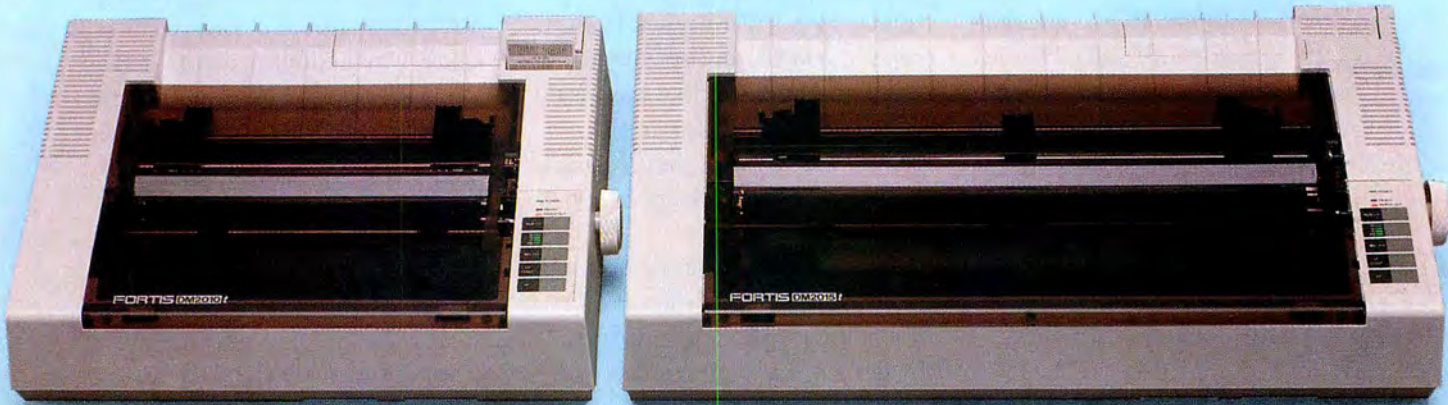
nate some input errors by restricting entries to specified types of characters.

PC-File + offers some useful tools once you've entered the data. <Ctrl>-F, for example, conveniently repeats data you entered in the same field of the previous record, but you have to be careful. If you load a new data base and use <Ctrl>-F in the new data entry screen, you'll wind up repeating data that was entered in the old data base.

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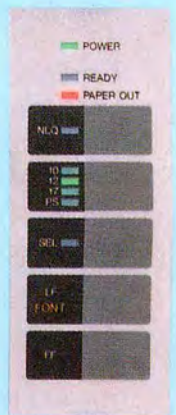
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the fields in the data base. If you want to find all people who live in San Francisco, just type *San Francisco* in the appropriate field. To narrow the search, you can fill in several fields and even ask for entries that resemble the word you entered. For example, ?Stuart will find Stuart and Stewart. For complex searches, you must enter formulas using parentheses, Boolean operators, field names, and constants. To find all customers in California or Oregon with a gross income of \$50,000 or more, you would type

```
(State = "CA" | State = "OR")
& Gross# >= "50000.00"
```

If you build a useful complex-search request, you can easily store it as a macro and reuse it. *PC File +* macros can run other macros or prompt for user input.

PC-File +'s flexibility in altering a data base's definition deserves an ovation. To add or delete fields or change field lengths, you simply redesign the input screen. You can also combine two fields into one, such as Last-Name and First-Name into Name, or break up one field into several.

For a quick-and-dirty report, you can easily print the complete contents of each record, one record per page. With a little more effort, you can choose which fields to print and confine each record's contents to a single line. Generating a report with headers, footers, or subtotals, however, is another matter altogether. You must either create a free-form report format on screen, use an arcane system of commands, or

Enter the field NAMES in their relative positions
You can place the names anywhere on the screen.

[illegible]

Please respond. Press (F10) when complete.

Field names: 12 letters or less. Data locations: []
Example: CITY [NEW YORK] Press (Alt)H for help

```

Please draw your data-entry screen 21:00
----- Press Ctrl/H for help -----

      - - - BIRTHDAY DATA ENTRY SCREEN - - -

NAME [                                     ]

ADDRESS [                                 ]

                                     TYPE [ ] 1-roses 2-tulips

                                     QUANTITY# [   ]

                                     PRICE# [       ]

                                     ■

(F1, F2)Cut (F3, F4)Paste (F5, F6)Del (F10)Done
r:18 c:23

```

PC-File+ gives you two ways to design your data entry screen. With the “fast” method, you just enter the names of your fields between the square brackets on the definition screen approximately where you want them to appear on the data entry screen. The “paint” method presents a blank screen on which you type field names wherever you want them to appear on the data entry screen, followed by brackets enclosing blank spaces. The number of blank spaces determines the field length. You can put your own help text on the screen, such as [() -] for a telephone number field, to guide the user during data entry.

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- NDP Fortran-386 generates code for the 80287, 80387 or MicroWay's mW1167. The mW1167 has a floating point throughput exceeding 2.5 mega-

flops, which is 4 to 5 times the throughput of an 80387 and is comparable to the speed achieved by the VAX 8600.

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MicroWay 80386 Compilers

NDP Fortran-386 and **NDP C-386** are globally optimizing 80386 native code compilers that support a number of Numeric Data Processors, including the 80287, 80387 and mW1167. They generate mainframe quality optimized code and are syntactically and operationally compatible to the Berkeley 4.2 Unix f77 and PCC compilers. MS-DOS specific extensions have been added where necessary to make it easy to port programs written with Microsoft C or Fortran and R/M Fortran.

The compilers are presently available in two formats: MicroPort Unix 5.3 or MS-DOS as extended by the Phar Lap Tools. MicroWay will port them to other 80386 operating systems such as OS/2 as the need arises and as 80386 versions become available.

The key to addressing more than 640 kbytes is the use of 32-bit integers to address arrays. NDP Fortran-386 generates 32-bit code which executes 3 to 8 times faster than the current generation of 16-bit compilers. There are three elements each of which contributes a factor of 2 to this speed increase: very efficient use of 80386 registers to store 32-bit entities, the use of inline 32-bit arithmetic instead of library calls, and a doubling in the effective utilization of the system data bus.

An example of the benefit of excellent code is a 32-bit matrix multiply. In this benchmark an NDP Fortran-386 program is run against the same program compiled with a 16-bit Fortran. Both programs were run on the same 80386 system. However, the 32-bit code ran 7.5 times faster than the 16-bit code, and 58.5 times faster than the 16-bit code executing on an IBM PC.

NDP Fortran-386™\$595
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MicroWay Numerics

The **mW1167™** is a MicroWay designed high speed numeric coprocessor that works with the 80386. It plugs into a 121 pin "Weitek" socket that is actually a super set of the 80387. This socket is available on a number of motherboards and accelerators including the AT&T 6386, Tandy 4000 and MicroWay Number Smasher 386 (Jan. '88). It combines the 64-bit Weitek 1163/64 floating point multiplier/adder with a Weitek/Intel designed "glue chip". The mW1167™ runs at 3.6 MegaWhetstones (compiled with NDP Fortran-386) which is a factor of 16 faster than an AT and 3 to 5 times faster than an 80387\$1495

Monoputer™ - The INMOS T800-20 Transputer is a 32-bit computer on a chip that features a built-in floating point coprocessor. The T800 can be used to build arbitrarily large parallel processing machines. The Monoputer comes with either the 20 MHz T800 or the T414 (a T800 without the NDP) and includes 2 megabytes of processor memory. Four or more Transputers can be easily linked together to form a Quadputer. A single T800 is comparable in speed with an mW1167-equipped 80386. The compilers to drive one or more Monoputers include Occam, C, Fortran, Pascal and Prolog.

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AT8™ - This intelligent serial controller is designed to handle 8 users (16 with two boards) in a Xenix or Unix environment with as little as 3% degradation in speed. It has been tested and approved by Compaq, Intel, NCR, Zenith, and the Department of Defense for use in high performance 80286 and 80386 Xenix or Unix based multi-user systems\$1299

MicroPort Unix 5.3 is a port of the new Unix 5.3 to the 80386. MicroWay NDP-386 compilers currently run on this version of UNIX.

MicroPort Unix 5.3from \$399

PC-MOS-386™ is an 80386 operating environment that turns an AT with an AT8 into an MS-DOS multi-user system. The system makes it possible to run applications such as Lotus 1-2-3 on terminals. The operating system also has a Phar Lap compatibility mode that runs programs developed with the Phar Lap versions of MicroWay's compilersfrom \$199

Phar Lap™ created the first tools that make it possible to develop 80386 applications which run under MS-DOS yet take advantage of the full power of the 80386. These include an 80386 monitor/loader that runs the 80386 in protected linear address mode, an assembler, linker and debugger. These tools are required for the MS-DOS version of the MicroWay NDP Compilers. **Phar Lap Tools**\$399

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combine both methods for maximum control. Whatever route you take will require patience.

With the free-form approach, you can use a template that guides you in creating a cover page, a header, a footer, a detail section, and subtotal and total sections. If the report doesn't print as expected—and odds are it won't the first time—you must redo the layout or resort to *PC-File +* report commands, using codes such as [NAME] to print the name field, or /*n* to insert *n* blank lines. With the report commands, what you put on the screen won't look anything like the final output.

Using *PC-File +*'s primitive built-in word processor, you can even mail-merge form letters. You won't find word wrap, boldface, underlining, or similar functions, but you can generate a decent letter or memo. You can also store the output as an ASCII file, then use a word processor to add glamour.

PC-File + excels at printing mailing labels. A separate program, PCLABEL, leads you through a series of questions about the dimensions of the labels to be used. Alternatively, a snapshot utility instantly prints a mailing label for any record displayed on the *PC-File +* screen.

PC-File + relates to the outside world fairly well. It imports and exports data in an impressive number of formats, including dBASE, fixed length, *WordPerfect*, and user-defined delimited. The manual asserts that files need not

match the field structure of the receiving *PC-File +* data base. In tests conducted with a *WordPerfect* 4.2 secondary merge file containing fewer fields, however, data was imported into the wrong *PC-File +* fields.

If you've ever tried to copy files from one disk to another by typing DEL *.* , you know why Peter Norton is such a popular guy. Since 1982, *The Norton Utilities'* talent for recovering lost data has enshrined Norton's smiling photo

The Norton Utilities' talent for recovering lost data has enshrined Peter Norton's smiling photo as an icon for the distraught.

With its mix of power and complexity, *PC-File +* offers sophisticated data management at an unbeatable shareware price. Once you invest the concentration required to design a data base, input screens, and reports, you'll have both an easy-to-use data base and the satisfaction of having designed it yourself. —Jordan Breslow

The Norton Utilities Version 4.0 and Advanced Edition *Hard disk utilities package*

Pros: Improved interface; five new programs; shell program makes utilities easy to run

Cons: Not RAM-resident

Peter Norton Computing, Inc.
2210 Wilshire Blvd.
Santa Monica, CA 90403
213/453-2361

List price: version 4.0 \$100, Advanced Edition \$150

Requirements: 64K, DOS 2.00 or later version

Not copy protected

as an icon for the distraught. With version 4.0, Norton does it again, providing a substantially improved interface, extensive help, and a number of handy new programs. Alas, those of us who had hoped that *Norton Utilities* would finally be RAM-resident like *PC Tools* have been disappointed again.

The new version of *Norton Utilities* is a lot easier to use than the last one. Its interface is less confusing and the utilities much more accessible. Thanks to the new Norton Integrator (NI), for instance, people who could never remember what Norton's two-letter program commands meant can now type a utility's name—SI, say—followed by a question mark, and get an on-screen explanation of the System Information program, complete with options, switches, and examples. NI will then run the utility they choose from the screen.

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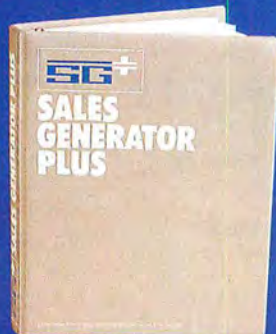
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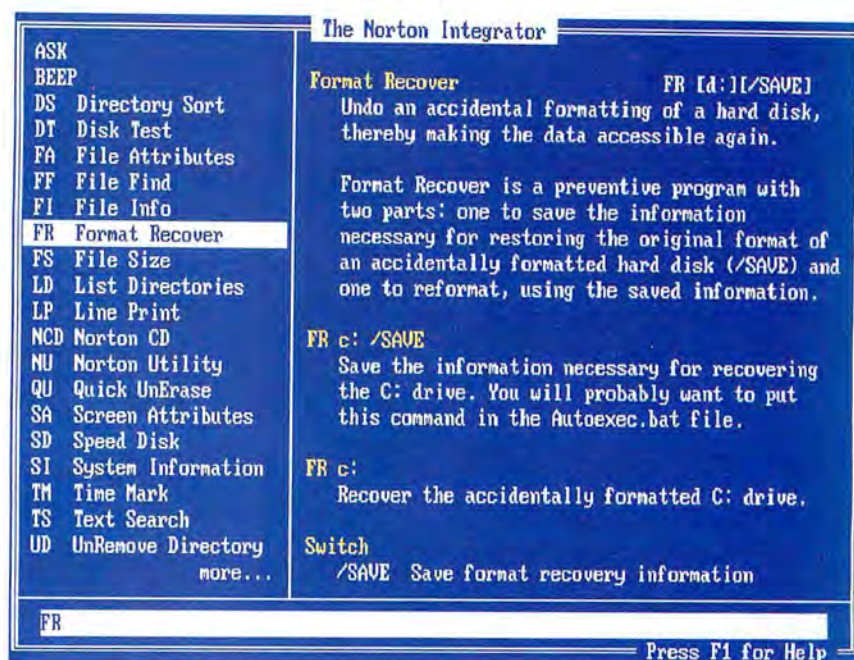
Circle 260 on reader service card



Of the five new utilities included in version 4.0, the most useful is Quick UnErase (QU), which unerases files from the DOS prompt. Enter QU *.* and Norton prompts you for the first letter of each file name in turn. And Norton upstages DOS with its File Info (FI) utility, which lets you attach a comment of up to 65 characters to a file name. Type FI instead of DIR, and a directory listing scrolls by, displaying your comments on each file's line. You can even give your batch files a modicum of intelligence with another new program, ASK. This lets you modify a batch file so it generates an on-screen message asking the user to make a choice. For instance, in a batch file called TRANSFER.BAT you might enter ASK "Do you want to copy your files from drive A to drive C? Y/N." The batch file can then branch to the appropriate routine according to the user's response.

Of the many changes Norton has made to version 3.1's utilities, the most radical is in Directory Sort, which lets you interactively sort a directory on screen. Files can be sorted alphabetically, by size, extension, time, and date—or even all five, in descending order of importance. If you don't like the way the directory looks, you can re-sort it before writing it to disk.

If you're a programmer, computer consultant, or micro manager, you may want to spend an extra \$50 for *Norton Utilities Advanced Edition*. It includes everything in version 4.0, plus a utility for unformatting a hard disk; a



New in version 4.0, the Norton Integrator brings solace to sleepy or forgetful Norton Utilities users. Type in one of those cryptic two-letter runes, and the Integrator treats you to a full explanation of what the corresponding program does and how to use it.

disk optimizer; and a specialized editor for altering (or fixing) directories, the FAT (File Allocation Table), and partitions. If there is a bad cluster in the FAT, for instance, you could use the editor to repair the damage or salvage the rest of the table. But beware: You can easily frazzle the entire hard disk if you don't know what you're doing.

Advanced Edition can also find absolute sectors (physical sectors on a hard disk) and copy the relevant data to another file or disk. Using *Advanced Edition* in drive A:, you could search a dead hard disk for data you know is near the beginning of a file you want to save. Once the data is found, *Advanced Edition* will also supply its absolute sector number. You need

only save that absolute sector and the ones following it to another file, from which you can recover the data.

Of *Advanced Edition*'s two other utilities, one is designed to optimize your hard disk, the other to restart your heart. Speed Disk tidies up a disk full of fragmented files so the drive's read/write head can more quickly find and access data; running Speed Disk is very slow, but it doesn't appear to corrupt data. Format Recover stores file and directory information in a



The KODAK DATASHOW™ System for projection of PC images.

Imitations come and go, but the original from Kodak continues to lead in quality and convenience.

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file at a specific place on disk, so you can find and recover it in the case of a misguided hard disk format.

Both version 4.0 and *Advanced Edition* come with a vastly improved 174-page manual and the Norton Disk Companion, a readable booklet that explains more than you ever wanted to know about hard disks. *The Norton Utilities* still faces competition from *PC-Tools* and *Mace Utilities*, but it continues to improve in features and ease of use. For those of us who occasionally manage to delete whole chunks of valuable data, it's as vital as a skydiver's backup parachute. —Christopher Johnston

pfs:first publisher

Low-end desktop publishing program

Pros: Inexpensive; easy to learn and use; first-rate manual and tutorials; excellent selection of PostScript fonts for the Apple LaserWriter

Cons: Slow page-by-page make-up; few HP LaserJet fonts; disappointing dot matrix output

Software Publishing Corp.
1901 Landings Dr.
P.O. Box 7210
Mountain View, CA 94039-7210
415/962-8910

List price: \$99

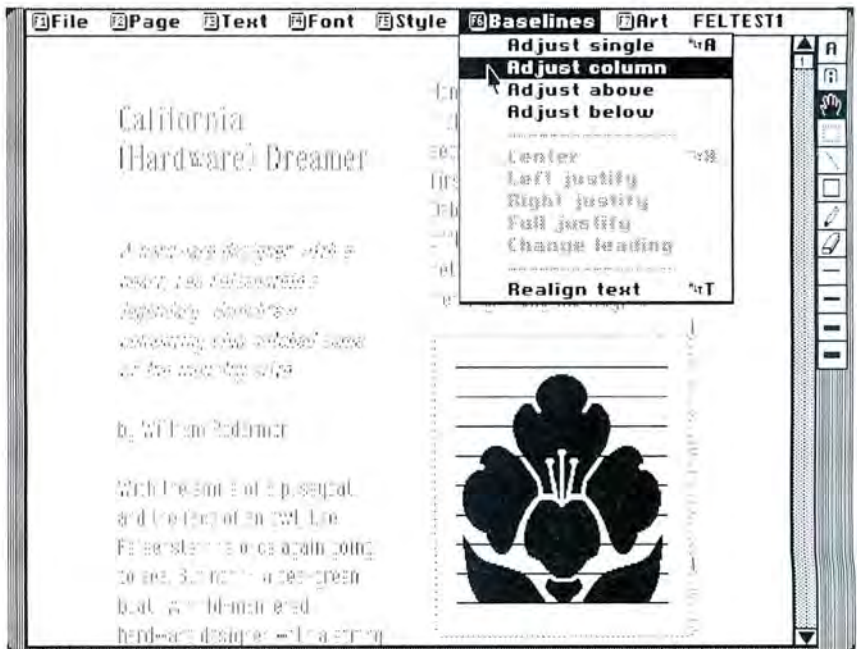
Requirements: 512K, two disk drives, DOS 2.00 or later version, graphics card and display
Not copy protected

Who says picking a desktop publishing program is hard? You just find the few packages you can afford, then decide what shortcomings you can bear. *pfs:first publisher* from Software Publishing is a case in point. Where the program succeeds, it does so brilliantly, but potential buyers should keep its limitations clearly in mind. *first publisher* is a fast, uncomplicated WYSIWYG program for creating newsletters and brochures; however, it stumbles over long documents, and its dot matrix print quality is less than satisfactory.

first publisher does an excellent job of implementing basic desktop publishing design features. It offers flexible page formatting with variable column widths, imports text in ASCII format, and throws in a copy utility that grabs graph-

ics generated by programs such as *PC Paintbrush* and folds them into *first publisher* documents. Capable line draw, freehand sketching, and pixel-level editing of text and graphics are also on hand, along with a modest library of professional-quality clip art images.

As with other popular desktop publishing programs, you select functions from orderly pulldown menus with a mouse or keyboard commands; many functions can be invoked using <Alt>-key shortcuts. Either way, page design and typesetting proceed in smooth, efficient fashion. To delete, move, and copy text or change its font, style, and size, you first highlight it, then select



To reposition a section of text in *pfs:first publisher*, you adjust the baselines on which the text sits. The text is grayed to remind you that it can't be edited while you're adjusting the baselines.

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the desired options from one of the pulldown menus.

Although *first publisher's* user manual promises 99-page document handling, related amenities such as running headers, footers, and style sheets are sorely missing. And when a page fills with text,

of mixed-column material. Once you've created a layout with a three-column article at the top of the page and a two-column article at the bottom, for example, adding or deleting text is about as easy as removing the sauce without disturbing the spaghetti.

Where *pfs:first publisher* succeeds, it does so brilliantly, but potential buyers should keep its limitations clearly in mind.

first publisher beeps plaintively and stops in its tracks, much like *PageMaker*. You must then create a new page, position the cursor, and insert the overflow text. If lengthy documents are your bread and butter, this program clearly isn't for you.

first publisher's best—and worst—feature is what the program calls *baselines*, horizontal ruler lines designed to help you quickly lay out text; they look exactly like the lines in a third-grade notebook. Imagine that you've just filled a page of lined paper with text. If you divide the baselines into two, three, or four columns, *first publisher* will automatically adjust the text to the new format. You can also select a baseline and push it up or down on the page—for example, to make room for a photo or headline.

Baselines work smoothly with simple layouts in which the entire page uses the same number of columns, but it's easy to make a mess

To position an imported graphic, you choose Get Art from the Art menu, then select one of the image files listed in a dialog box; *first publisher* places the image in the file at the present cursor position. You can then move the image around freely. To wrap text around a picture, choose Picturewrap from the Page menu, and text automatically wends its way around.

While *first publisher* boasts a "smoothing algorithm" that purportedly enhances dot matrix print quality, buyers who expect even a remote approximation of their dot matrix printer's NLQ output are sure to be disappointed. So will users spoiled by the excellent dot matrix output of *Ventura Publisher*, *GEM Desktop Publisher*, and *Fancy Font*. Of *first publisher's* three dot matrix printing modes—draft, standard, and smoothed—draft is by far the most pleasing to the eye.

first publisher's laser printer support is acceptable, if unspectacular, with a good selection of Apple LaserWriter fonts: Courier, Helvetica, and Roman typefaces from 7-point to 48-point in normal, bold, italic, and bold italic.

The HP LaserJet font offering is limited to Helvetica 14-point bold; Roman 8-point normal; and Roman 10-point normal, bold, and italic. It comes as no surprise, therefore, to find this telling sentence hidden in the back of the manual: "We recommend that you use *First Publisher* to print your publications on a LaserWriter."

The past success of Software Publishing's *pfs* series proves there's a market for well-designed, easy-to-learn software that performs a limited range of functions. *first publisher* lives up to the *pfs* tradition with a good balance of features—and limitations. If you can put up with shaky dot matrix print quality, clumsy long-document handling, and some moderately pestiferous design quirks, *pfs:first publisher* will serve you well at a bargain price. —George Beinhorn

QuickSearch

On-line financial retrieval system

Pros: Fast access to detailed financial information on over 10,000 companies

Cons: None

Dow Jones News/Retrieval
P.O. Box 300
Princeton, NJ 08543
800/257-5114; New Jersey, Arkansas, and Canada
609/452-1511

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Cost: \$12/year membership fee, connect charges, plus special \$39 rate for a complete company report



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What was the other machine? The new Citizen MSP-55. Which just goes to prove that if you want to be considered one of the best, you have to be a Citizen in good standing.

For more information call 1-800-556-1234, Ext. 34. In California call 1-800-441-2345, Ext. 34.

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Quick: How much does the head of IBM earn? If you know the answer, maybe you've been dialing *QuickSearch* on the sly. It's a streamlined Dow Jones News/Retrieval service that lets you quickly glean information from the company's on-line financial and investment data bases. *QuickSearch* is one-stop shopping for corporate planners sizing up the competition and harried analysts trying to spot takeover candidates. The service can supply an in-depth report on any of some 10,000 companies for about the cost of a three-martini lunch.

QuickSearch isn't a new data base but rather a fast menu-driven route to eight of Dow Jones's most frequently accessed business research services. Although you can gather the same information by rummaging through the individual data bases, *QuickSearch* does it in a single visit.

Calling up *QuickSearch* is a matter of logging on to Dow Jones News/Retrieval—directly or

through MCI Mail—and typing *//Quick*. *QuickSearch* will ask if you want to search by stock symbol or company name. Once you decide (for example, *//Quick*

day's volume, while Dow Jones News gives you full-text access to the *Wall Street Journal*, *Barrons*, and many other financial and news publications. Standard &

QuickSearch is one-stop shopping for corporate planners sizing up the competition and harried analysts trying to spot takeover candidates.

IBM), a list of the eight data bases currently accessed appears. At this point, you can order from the prix fixe menu or à la carte. To get a complete report on IBM, type *ALL* and sit back and relax while the information is saved to disk. *QuickSearch*'s interface and command structure are pretty intuitive, but you can get context-sensitive help by typing *//Help*.

The range of *QuickSearch* data bases should satisfy the most information-hungry searcher: Dow Jones Current Quotes yields opening, closing, high, low, and final stock trading prices as well as the

Poor's Online provides information concerning a company's performance, direction, earnings, dividends, and balance sheet; Corporate Earnings Estimator lists a company's earnings estimates for the next two fiscal years; while General Financial Services compares the company to the rest of its industry. Disclosure Online carries company-filed financial documents, such as annual and

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- Automatic redial
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- 30 number memory
- Call restriction system
- A/B roaming system selection
- Electronic lock.

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Panasonic

The EB-311 is a fully-featured cellular phone, ideal for your car. Its especially large display keeps you informed of the operational status and signal strength.

Features include:

- 40 number/16-digit memory
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quarterly reports, balance sheets, and financial ratios. It also describes the company's line of business, officers and directors, ownership, and subsidiaries.

To these six data bases, Dow Jones has recently added two new ones. Insider offers buying and selling information by insiders of the company being monitored. The information is drawn from filings made with the SEC. The second, Investext, yields up to 40 of the most recent research reports on a chosen company.

To help you pick and choose among the data, *QuickSearch* lets you print specific portions of the company report with a single command. Typing *Print 1,3,9*, for example, produces a printout of current quotes, the financial overview, and the research reports. This selective printing is useful if you want to read the entire report on line but print out only parts of it.

You don't need any special hardware to access *QuickSearch*, except for an IBM-compatible graphics adapter—Hercules is verboten. Dow Jones warns that not all communications software is compatible with *QuickSearch's* All command, which creates a complete company report for a flat \$39 plus connect time.

Like a 7-Eleven store, *QuickSearch* offers convenience at a price. Each of the Dow Jones News/Retrieval data bases has a separate—and expensive—fee system for connect time and document production, so making individual menu choices gets pricey. *QuickSearch* may be one reason Wall Street professionals are richer than the rest of us.
—Stephen Blumenthal

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NA
CONRADES, GEORGE H./ 48/ SENIOR VICE PRESIDENT / NA
GOMORY, RALPH E./ 57/ SENIOR VICE PRESIDENT, CHIEF SCIENTIST / NA
METZ, FRANK A., JR./ 53/ SENIOR VICE PRESIDENT / NA
ROGERS, CLARENCE B., JR./ 57/ SENIOR VICE PRESIDENT / NA
CONTI, CARL J./ 49/ VICE PRESIDENT / NA
```

^PrtSc=prnt Alt- T=tran R=recv U=view D=dial E=echo M=msg X=exit <Home>=Help

If you've ever wondered where the money goes when you buy a computer from IBM, *QuickSearch* will give you an idea. Its Disclosure data base information on Big Blue is nearly complete and very revealing.

Maestro

Menuing, security, and desktop utility

Pros: *Menus and passwords easily adapted to customize access to applications; useful desktop accessories*

Cons: *Poor documentation, no LAN support*

Version 2.0

Spectre Software

P.O. Box 4211

Greensboro, NC 27404

800/426-7305, 919/272-9984

List price: \$99.95

Requirements: 256K, hard disk,

DOS 2.10 or later version

Not copy protected

A little knowledge can be a dangerous thing, as anybody who has ever trained people to use computers knows. Show someone the power switch, and the next thing you know, your hard disk is reformatted. In any business where people share computers, there's always the risk of having data blasted to byte heaven.

Now there's another choice. With *Maestro 2.0*, an intriguing program from Spectre Software, you can create custom menus to guide neophytes to the applications they need without exposing the company archives to disaster. Moreover, it includes a multilevel security system and a fair complement of desktop accessories.

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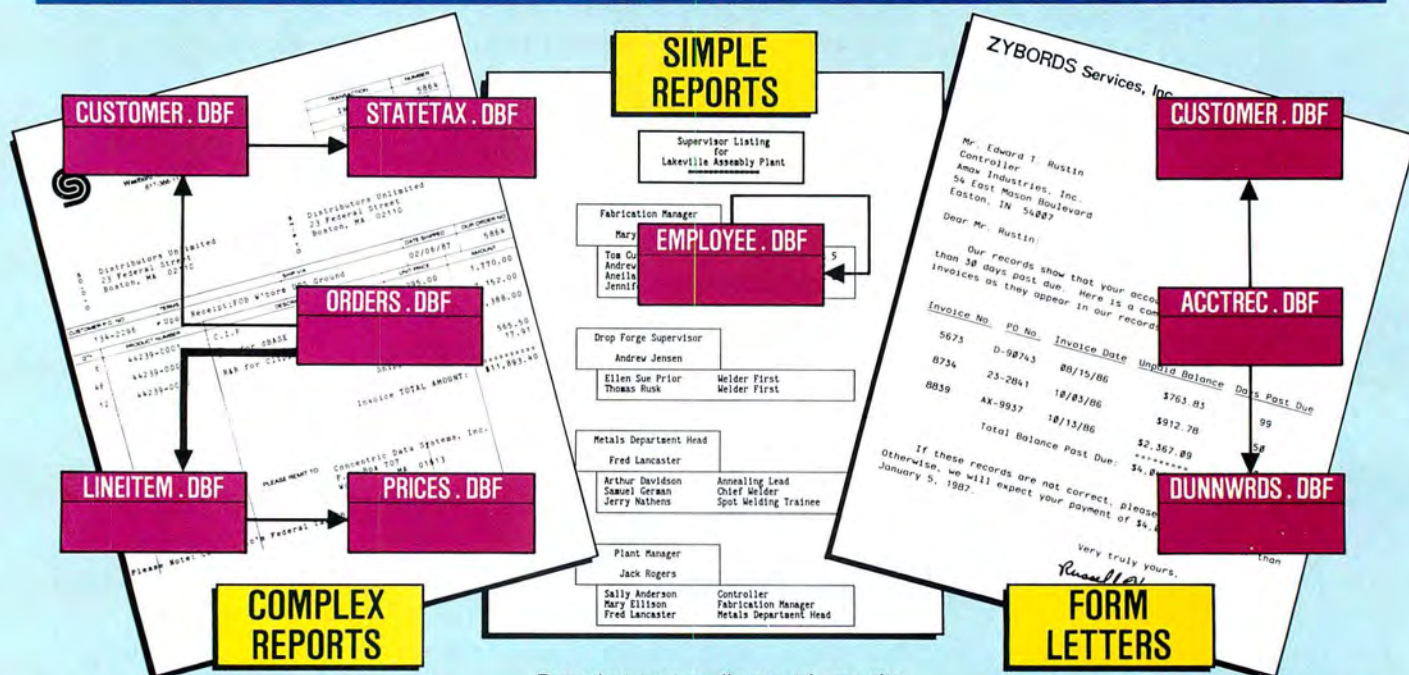
PC Magazine, 1/13/87

"Constructing a report layout with R&R is easy and quick. . . ."

Business Software, 2/87

". . . run, don't walk, to the nearest phone and place your order. . . ."

PC Week, 11/11/86



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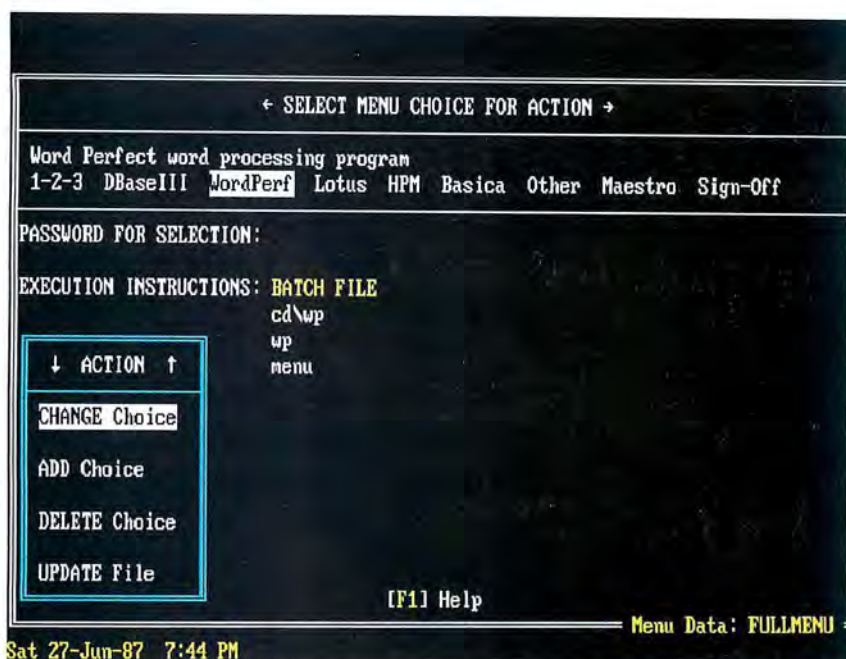
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the screen and comes with a few sample selections such as 1-2-3, *WordPerfect*, and *dBASE* that you can either retain or replace with other applications. To add a program, just type the necessary commands on screen (such as CD/WORD and WORD/C) and *Maestro* generates a batch file that will retrieve and run the corresponding application.

The main menu also lists an option called *Maestro*, which displays a submenu of the program's desktop accessories, DOS functions, and security utilities. In a major improvement over earlier versions, *Maestro 2.0* lets you choose whether or not you want the deskset accessories to be RAM-resident.

Maestro's desktop tools include a calendar, an appointment planner, a telephone file, a notepad, and a calculator. The accessories are attractively designed and function adequately, though there are a few glaring oversights. The calculator, for example, can only add, subtract, divide, and multiply; it can't determine percentages or store figures.

The notepad is a curious combination of power and frailty that might have intrigued Nietzsche. It stores up to three pages of notes, justifies paragraphs, and centers text. In a nice touch, *Maestro* personalizes note files by automatically assigning them an extension that links them to a particular user's password. Inexplicably, however, the notepad also forces you to delete (or cut and paste) text one line at a time.



When you want to design a new menu, *Maestro's* editor prompts you to create a batch file that instructs the PC to leave *Maestro*, change directories to a specified application, start the application, and return to *Maestro* when a user quits.

The DOS Functions option of the *Maestro* submenu offers virtually all of the important DOS commands necessary to manage directories and files, back up and restore files, and copy or move files between drives and directories. As with DOS, you can rename files but not directories.

Access to DOS functions—especially ones that delete files and directories—is just what you don't want inexperienced users to have. Fortunately, *Maestro* is particularly adept at separating the sheep from the goats.

As the Security Officer (don't blame me, it's the program's terminology), you can prevent unauthorized access to commands and files with a Security function that appears only on your private *Maestro* submenu. From there,

you can assign up to 20 passwords and dictate each user's access level. Full-access users have entrée to all functions and menus except the Security menu. Access to the DOS Functions menu can be decided on a case-by-case basis. Limited-access users are automatically denied both the Security and the DOS Functions menus. The Security function also automatically generates a log file that records when an application was used and who used it.

Maestro's menu editor is itself a superb example of a well-designed menu. By following the on-screen options, you can create a new menu or alter an existing one without cracking the manual.

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Curiously, though *Maestro* is designed to serve multiple users, version 2.0 doesn't work on local area networks. At press time, Spectre Software was readying a LAN version with all of *Maestro*'s functions, plus electronic mail and scheduling. Called *Command Performance*, it will sell for \$495 per server and accommodate 200 users.

If you know your way around a PC and you're the only one using a computer, you probably won't need *Maestro*—there are better disk managers and more complete desktop packages on the market. But if you share a machine with less experienced users and value your peace of mind, *Maestro* can be a friend indeed. —Patrick Marshall

Polaris Rescue

Help screen generator

Pros: Creates pop-up help screens and linked help files; well-designed command structure

Cons: Changing a menu requires recompiling; menus can't pass keystrokes to an underlying program; poor on-line help

Polaris Software

613 W. Valley Pkwy. #323

Escondido, CA 92025

800/338-5943, 800/231-3531 California, 619/743-7800

List price: \$149 plus \$6 for shipping

Requirements: 33K for RAM-resident program (256K for editor), two disk drives, DOS 2.00 or later version

Not copy protected

"Real men don't use menus," growled the headline in an old and infamous advertisement for *dBASE III*. As hard disks have gotten cheaper and applications more complicated, that obstreperous claim has been pounded into

Rescue in ASCII format. The hardy can turn to *Rescue*'s resident editor, which offers rough-and-ready text entry functions, no automatic paragraph reformatting, and no search or replace functions.

You'll have to dig through Rescue's dry manual to grasp the menu-creation process; once mastered, though, it's gratifyingly logical.

jelly. Show me anyone whose desk is littered with cheat sheets and program manuals, and I'll show you someone who's eager for some menu-style help from *Polaris Rescue*.

Rescue lets you create custom, RAM-resident help screens that spell out office procedures, demystify *dBASE* routines, or do most anything else. *Rescue* isn't a menuing program in the usual sense of the word; you can't use it to create DOS shell menus, for example, that run other programs. (For such a program, see the review of *PreCursor* in *The Software Shelf*, PCW, October 1987). What you can do is form your own help systems consisting of up to 1000 linked screens. If that doesn't cover your needs, you can access separate help files via an on-screen menu.

To enter help screen text, you can use your word processing software, then transfer the data to

The menu systems you create with *Polaris Rescue* have the slick appearance and operational smoothness of commercial software. *Rescue* lets you decorate your screens with line-drawn single or double borders, and you can select from a palette of 16 text colors. The sole background color is basic black, however—an anomalous shortcoming for a program of this sophistication. Ironically, *Rescue*'s own on-line help hardly deserves the name: You must switch to an entirely separate file, then search for the appropriate screen.

You'll also have to dig through *Rescue*'s dry manual to grasp the menu-creation process; once mastered, though, it's gratifyingly logical. To generate a help file from scratch, you select Open, Edit, and First Screen from successive menus. At each step of the way, pop-up menus of mnemonic, press-the-first-letter commands list available options.

For example, to assign a function key the task of jumping from

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one help screen to the next, you select Function Pointers from the Edit screen's pop-up menu. You can also direct *Rescue* to display a key assignment, such as F1-Next or F8-Main, at the bottom of the screen. You next tell *Rescue* what to do when a user presses those function keys. Menu scroll bars are created in much the same way.

If you use a word processing program such as *WordPerfect*, you've probably learned that line-drawing utilities are trickier than they seem. Lines and text exist in a delicate balance, and changing one or the other usually leads to tedious switching back and forth between text and line draw modes to fix displaced line segments.

Polaris Rescue makes the process a bit less painful by letting you design standard screen layouts (with borders, colors, and the function key assignments for a specific help file) that can be saved to disk, then copied into new files and adapted. Inserting text, on the other hand, is best done with a word processor instead of *Rescue*'s primitive text editor.

When you've perfected a help system, select Execute from the main menu; this runs the system through an error-checking compiler and delivers a run-time version that's 90 percent smaller than the original file.

Entire help files can be read/write password-protected, and you can also password-protect individual screens. *Rescue*'s Timed

Screen function lets you create self-running tutorials. For \$25 *Polaris* will sell registered owners ten copies of a run-time, royalty-free version of *Rescue* that generates read-only screens.

If you're even a casual observer of the software scene, you know that *Polaris Rescue* is merely one good program in a crowded field

Polaris Rescue lets you design standard screen layouts (with borders, colors, and the function key assignments for a specific help file) that can then be copied and adapted.

that includes Opt-Tech Data Processing's *On-Line Help* and Software Bottling's more sophisticated *Flash-Up Windows*, which can pass keystrokes to an underlying application or to DOS. *Flash-Up* can also run macros from menus and offers better use of color and more flexible sizing and positioning of menus than *Polaris Rescue*. Harvey Software's *FirstMenu* is similar to *Flash-Up Windows* in range of features. *Select: Auto-menu* from Magee Enterprises is an interesting *Flash-Up* clone with a tiny, 16K assembly language command file.

All of these programs deliver the goods, but some give you more than you really need. Peer into that part of your monitor that isn't covered with Post-It notes, and you may see the fractured visage of someone who's in need of simple on-line help. For that, *Rescue* is unrivaled. —George Beinhorn

NoBlink/Accelerator

Cursor control utility

Pros: Speeds up the DOS cursor; allows user-definable cursor and screen colors; RAM-resident

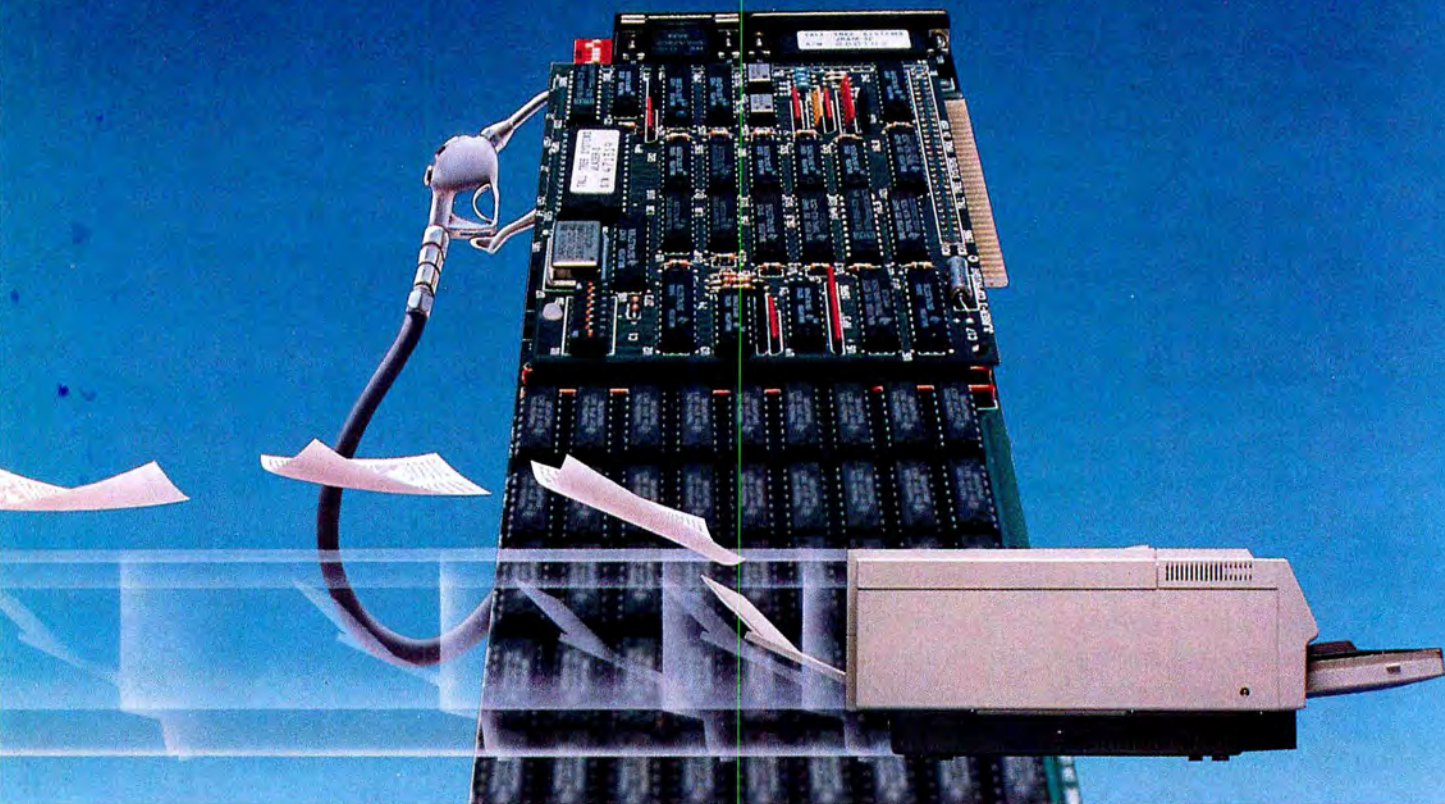
Cons: Settings can't be changed at DOS level; limited EGA color choices; screen blanker isn't automatic

Version 4.0
Nostradamus Inc.
3191 S. Valley St. #252
Salt Lake City, UT 84109
801/487-9662

Requirements: 6K, DOS 2.00 or later version
List price: \$49.95

Like the echoing "drip, drip," of water torture, the endless "blink, blink," of your computer's cursor may drive you to the brink of insanity. Nothing in DOS's bag of tricks will help; it's amazing anyone has any fingernails left. For a price, *NoBlink/Accelerator* from Nostradamus offers strobe-weary

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screen gazers respite from the savage DOS cursor and sweetens the deal with some screen-taming extras.

NoBlink is aimed at a very specific market—PC users who can't stand a blinking cursor. Although

From the menu, function keys let you flip through 14 foreground and 15 background colors, increasing the possible cursor and highlighted-character color combinations to several hundred. You can even bring back the blink if

multicolored mystery cursors on the screen. Finally, *NoBlink* comes with a screen blanker that for some strange reason isn't automatic. To blank the screen you have to pop up the *NoBlink* window and then press the # key; you might as well just switch off the monitor.

NoBlink's biggest limitation is that you can't configure it from the DOS prompt or via batch files; you can only toggle between blink and no-blink. Of course, that alone may be worth your sanity.

—Patrick Marshall

NoBlink is aimed at a very specific market—PC users who can't stand a blinking cursor. It also lets you change the cursor's speed, shape, and color.

it lets you increase cursor speed à la *Cruise Control*, change cursor shape and color, and set EGA foreground and background screen colors, other utilities perform these functions better, and for less money. Still, if you're a blink-hater, the program's extras may justify the rather steep \$50 price tag.

To its credit, *NoBlink* is simple to install and use. <Ctrl>-<Shift>-\$ pops up a menu that displays 26 possible cursor and highlighted-character combinations labeled from A through Z, as well as speed, blink, intensity, and screen-blanking options—all one-keystroke selections. The menu covers the upper third of the screen, so by placing the cursor in the lower part of the screen, you can see how the cursor actually looks in your application as you transform it.

For EGA users, *NoBlink*'s color-control features extend beyond the cursor to the whole screen.

you want—not for the cursor itself, but for highlighted characters. One drawback: *NoBlink* can't independently control highlighted character color. If you want more control, you should turn to a color-selection utility that lets you individually adjust all 16 colors from the 64-color EGA palette. One such utility, *Spectrum*, can be found on some computer bulletin boards.

Besides steadying the cursor, Nostradamus claims that *NoBlink* can give it a real kick in the behind. Four preset speed settings start at the standard DOS rate and top out at about five times that. As any decent accelerator should, it clears the keyboard buffer when you release the key, curbing runaway cursor. Although the speed increase is obvious at the DOS prompt, most people don't do the bulk of their work there. *WordStar*, *Microsoft Word* (in character mode), *1-2-3*, and *Alpha/3* seemed indifferent to *NoBlink*'s cursor accelerator. In fact, the first two products showed some distinct compatibility problems, displaying

Judi Uttal is president of Technical Marketing Services, a Los Angeles consulting firm focusing on marketing projects for UNIX hardware and software companies. Jordan Breslow is an attorney in Walnut Creek, California, who specializes in computer law. Christopher Johnston is a journalist and fiction writer based in New York City; his work appears regularly in The Village Voice. George Beinhorn is a freelance writer in Nevada City, California. Patrick Marshall edits the Commentary Page of the Oakland Tribune. Stephen Blumenthal is a contributing editor for PC World. ●

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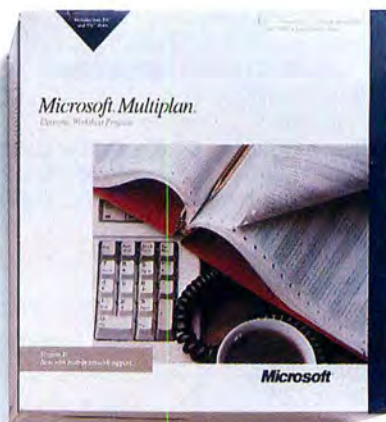
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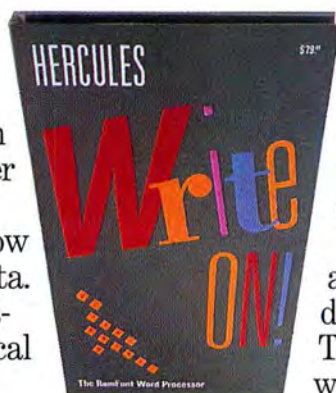
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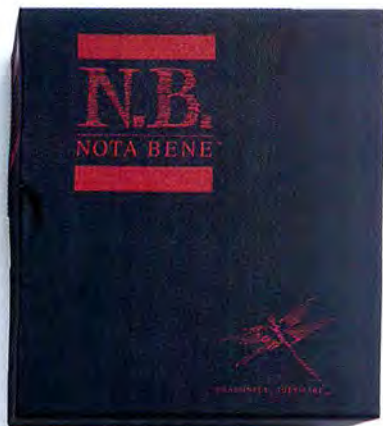
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Why Buy a PS/2?

IBM's top scientists tell why they think the Personal Systems/2 represent the ideal platform for tomorrow's software.

Eric Bender

 If the Personal System/2 line really represents the next generation of PCs, why do the diverse benchmarks provided by National Software Testing Laboratories and other groups all show IBM's new machines running deep in the pack of the current generation?

PS/2 development head Dennis Andrews stoutly defends his machines' performance using today's software, insisting that the question misses the main point by ignoring upcoming needs. "As applications get more complex, you're not interested in how fast you run Lotus. You're interested in how fast you run Lotus when you're already moving communications files, and you're also hot-keying to your calendar, and you're running something else in the background."

Unlike classic PCs, PS/2s were born to fill this demanding role, says Andrews, director of Entry Systems Division's Boca Raton laboratory. A few years from now, he adds, the PS/2's new Micro Channel Architecture (MCA) will shine even more brightly in "a lot of multiuser environments, which have complex servers and gateways and things that require additional processors or complex subsystems."

The PS/2 Models 50 and 60 with the MCA bus shipped in April, and in late summer third-party board suppliers began filling in the slots. But most of the benefits of the new architecture won't really show until next year when Operating System/2 applications begin to arrive.

According to its creators, the new PS/2 bus architecture is just one element of a broader framework of hardware, operating system software, and applications that IBM is building to support tomorrow's multitasking. Among the PS/2's promises are greater reliability, clean specifications for a solid hardware/software foundation, and new capabilities such as support for multiple processors. And, of course, the new architecture offers the potential for more compact designs and good old-fashioned turn-up-the-clock-rate performance boosts.

New Threads for a Bus Driver

OS/2, one of the most critical supports in the framework, will take multitasking far beyond the current PC norm. Not only will multiple applications execute concurrently while remaining protected from one another, but each application will also be faster because it will perform several internal tasks simultaneously. In OS/2 lingo, programs are made up of one or more *processes* which, in turn, are composed of one or more *threads*, the smallest executable units of code. These threads grab the system resources to perform such functions as writing to screen or accessing the hard disk. Thus the overall system is dubbed a multithreaded environment.

With all these threads sharing processor time and making demands on system resources, operations will tend to be many times more complex under OS/2 than under single-threaded DOS. The AT's bus will support these operations, but the PS/2's Micro Channel bus was expressly designed for them from the ground up.

In a true multitasking environment, "because every task may have its favorite piece of input or output, the amount of I/O is going



An upgraded AT wouldn't have met IBM's long-term needs, says PS/2 development head Dennis Andrews.

IBM's solution is the Programmable Option Select, a feature that assigns each adapter a unique number that identifies it to the system. This resolves conflicts and does away with the need for DIP switches. System designer Andrews says IBM plans to write OS/2 facilities that further simplify installation, particularly in OS/2 Extended Edition (see the sidebar "Grooming Tips for OS/2").

Tuning Components for the Micro Channel

Whereas AT-compatible add-in boards run at only 8 MHz, the Micro Channel permits boards to run at any speed, up to the speed of the processor. MCA also guarantees at least a 16-bit interface. "That means your BIOS can be 16 bit, so you can access a lot more efficiently through the BIOS," Heath says. "If you do a lot of data transfer, that's a significant point." Although most add-ins today hook in via an 8-bit connection, the PS/2 Model 80's 32-bit connection is more than mere window dressing. In the future, not only memory but intelligent devices will demand 32-bit access on an 80386-based computer.

to grow," points out Chet Heath, chief architect of the Micro Channel. "That means two things: The configurations are going to be more complex, and the number of interrupts per second are going to be more frequent. We have to accommodate both."

That widening stream of interrupts, flowing out to every resource attached to the system, will create big problems for the AT bus. Difficulties are already showing up even with components that used to be simple, such as serial ports on the system board.

Presently, to avoid having two serial ports competing for COM1 interrupts, for example, "you have to implement circuitry that shares

an interrupt, and that circuitry is quite expensive and apt to be noisy. You see the complexity you're getting into." But on the Micro Channel all system interrupts are shared without the need for additional hardware, thus eliminating extra electromagnetic interference.

Currently, fiddling with DIP switches to ease conflicts among I/O addresses, memory addresses, and interrupt levels can be a real bear. "That problem grows in magnitude in a multitasking environment," Heath says. "Believe me, people are going to be tearing their hair out. We had to do something."

Grooming Tips for OS/2

Much of the PS/2's hardware capability will lie dormant until OS/2 arrives. But as the new operating system nears commercial form, potential customers and software authors are grappling with questions about daily life under its regime. For many, performance limitations are even more troubling than the need for 2MB of main memory and large amounts of disk storage.

Both IBM and Microsoft have been careful to state that DOS applications will run more slowly in the OS/2 "compatibility box" than in their native environment. But how will OS/2 applications compare?

"Performance is always tough on a new operating system, [particularly] if you move from a single-thread to a multitasking environment," acknowledges Jim Archer, head of OS/2 development at IBM Entry Systems Division's Boca Raton laboratory. While declining to cite any numbers, he says, "I'm reasonably comfortable that we're not going to have major performance concerns on the AT" (the least powerful machine that can run OS/2).

"We have set ourselves some aggressive targets," Archer says. "Our performance work starts down at the smallest atomics and then builds up into an application environment.... We'll be working closely with people who want to tune the system, providing them the right kinds of tips and techniques. We're learning, and the software vendors are learning."

Another major push is to keep complicated processes hidden from the user. Right now, setup often requires the end user to become a systems integrator, Archer notes. With OS/2, the goal is for the Install command to install the entire system, rather than give the user umpteen different pieces to sort out.

IBM will provide useful sample installations but can't promise that users with multiple programs and add-ins won't have to change their CONFIG.SYS files, though Archer adds that "an installation facility that's easier to get at than editing CONFIG.SYS with EDLIN is an automatic assumption." In the first round of OS/2, Ar-

cher cautions, there will be no "real magic." But in the long run, combining PS/2's Programmable Option Select with OS/2 Extended Edition functions will provide a base for a systems solution.

OS/2 will bundle in some on-line help and clearer error messages, but IBM is still pondering several crucial user-interface issues, such as finding better ways to view files in environments where data is distributed among several computers. One option here is the Macintosh-style folder, but as Archer points out, "Millions of users have learned to deal with directories and sub-directories. Do you want to reteach them?" To further complicate matters, OS/2's answers to all such questions must fit within the Common User Access standards for Systems Application Architecture, a grand scheme for IBM's entire product line that is still being hammered out.

Like any multitasking system, OS/2 offers *performance knobs* that allow application developers or users to set priorities among tasks. This function will be shielded from most users, although "clearly you

want those facilities to be available for an administrator or a power user," Archer notes.

All of today's DOS communications packages will need to be completely rewritten for OS/2. Memory-resident applications also will be redone from scratch; their OS/2 equivalents will act just like other applications, sharing system resources.

Special concerns arise when running a DOS application in the compatibility box. If that program crashes, what happens to OS/2 applications running concurrently? IBM software engineers say that because some pieces of OS/2 code reside in low memory, the OS/2 applications are not necessarily protected. If the DOS application mangles only itself, OS/2 will recover; otherwise the system will probably crash.

While software houses struggle to master an onslaught of tricky new details (and expect some bugs to sneak through), the big question is whether everyone will play by the OS/2 rules. In the DOS world, each vendor from Microsoft on down bends the rules. In a mul-



Peter Strongwater

Jim Archer, manager of IBM's OS/2 team, doesn't expect major performance problems on the AT.

titasking environment, that's a recipe for chaos.

"If everybody wants [his or her applications] to be absolute top priority, it's going to be hard to keep control of the system," Archer says. If each developer ignores some specs or tries to write directly to the hardware, the problems will get progressively worse, especially when the Presentation Manager graphics interface comes along.

To avert this situation, "We've added a lot of functions to the system, so there's less need to go

around it," says Archer. For instance, OS/2 video calls for text have been speeded up dramatically over those in DOS.

What's in it for developers? First of all, compatibility: Their customers won't complain that their packages don't work with other applications. Archer also emphasizes that today's "ill-behaved" applications must be laboriously modified for each new machine that comes along. "A much more structured environment can simplify that and let us move faster to take advantage of new capabilities." —E. B.

Heath describes a case in point: "If you don't have 32-bit I/O and you build an intelligent hard file with caching, your limitation is going to be in data transport, not in accessing the hard file."

Among other hardware changes, PS/2s now sport two BIOS chips: one for the 80286 or 80386 microprocessor's protected mode, the other for real mode. This is significant because in OS/2, applications issue system calls rather than interrupts, and these go through the protected-mode ABIOS (Advanced BIOS). Like all other OS/2 software components, the ABIOS is reentrant code that can be switched from one task to a higher-priority one and then back. ABIOS screen drivers also can handle multiple screens. Furthermore, the ABIOS facilitates a several-fold speedup in the 80286's awkward switch from protected mode to real mode.

Another PS/2 plus is disk caching, which benefits both DOS and OS/2 applications, and which came along after the Micro Channel was designed. The ability to read an entire track on a hard disk at once and to transfer data rapidly in the Micro Channel's "burst" mode pays off in cache transactions. The PS/2's other key ingredient, according to Heath, is a sophisticated caching algorithm derived "from data collected under real conditions and with a great deal of computer simulation."

If the data you need is in cache 90 percent of the time, you don't see the slow disk accesses that might otherwise bog down the Model 50, Heath notes. The setup minimizes wear on the disk as well, increasing reliability.

Unlike the Enhanced Graphics Adapter, the new Video Graphics Array of the PS/2 can tell the sys-

tem which graphics or text mode it's in. That simplifies screen management when the system switches between applications. With the EGA (as a component of the AT), OS/2 must tackle that problem in

erations," he adds. "If I get a lost interrupt and it takes me five minutes to bring that system down and then up again, how many wait states were there in that five minutes?"

The ability to read an entire track on a hard disk at once and to transfer data rapidly in the Micro Channel's 'burst' mode pays off in cache transactions.

a clumsy way, says Andrews. The VGA's ability to respond with information about its screen mode was "a requirement laid on the hardware by the operating system," he recalls. "I remember that very painfully."

Will early OS/2 applications notice these rather subtle differences and perform markedly worse on an AT than on a PS/2? "I wouldn't think so, beyond the differences you could extrapolate in terms of megahertz, and in terms of the sophisticated caching algorithm," Andrews responds. "Saving the video registers in software, or banging against the mode-switch delay, is not a big deal the first time out of the chute. But stay tuned to this channel."

Emphasis on Reliability

"It's very hard to take a piece of software, throw it in a machine, and get a number back that says reliability is low," Heath remarks. "Yet I contend that reliability is the most important thing for a system, next to error recovery."

"When you think about performance, think about other consid-

With the new machines, IBM has boosted mean time between failures fivefold over its first PCs, according to Andrews, although he withholds exact figures. "We were the best in this industry, but reliability rates—not only in our products but in everyone else's built using that [PC] architecture—just didn't cut it."

That concern for reliability runs throughout the PS/2's design. Frank King, vice president for development at Entry Systems Division, emphasizes the extensive use of proprietary CMOS chips to reduce heat and the number of solder joints.

Increasing clock speeds and sandwiching components closer together also increases electromagnetic interference. PS/2 solutions include laying a grounding plane through the entire chassis, grounding all board-slot covers, and avoiding right-angle bends in system-board trace wiring. Among the payoffs: a clear route to much faster system speeds.

The PS/2 development team stresses the need for well-defined specifications that link tightly into other IBM standards and promise third-party developers compatibility for their software and hardware add-ins. "It's very important

to put together a clean, consistent architecture that can be taught and can be exactly specified, rather than giving schematics and module types and BIOS and forcing people to work backward," Heath says. "There's no real specification for Personal Computers—you work backward and figure out what it is. What is the compatibility point? The last [PC] to ship."

A Montage of Processors

Whereas in AT-style architectures the CPU controls bus access, the Micro Channel can arbitrate simultaneous bus access via the central processor and up to 15 other intelligent devices known as bus masters. Although IBM doesn't offer bus masters yet, it has publicly demonstrated multiple processors working on the bus. Heath says one option is to operate a 386 in 16-bit mode, so it can go into a machine with a 16-bit interface and either work cooperatively with or to the exclusion of the other processor.

"There are a zillion scenarios in multiprocessing," he adds. "The most likely is that the processing will be contained within intelligent attachments and take advantage of the [bus] master's inherent efficiency with bus transfers." Heath estimates this approach to be two to four times as efficient as going through the direct memory access (DMA) controller. (The PS/2 has eight DMA channels, so devices such as disk drives can bypass the central processor when talking to memory.)

Handling I/O with a dedicated processor, you can prevent one high-priority task from clobbering another, Heath notes. "I now have the flexibility to build a system

where I can control interference and overruns." Other suitable applications include jobs with high volumes of incoming or outgoing data, such as exchanging information with a mainframe or another PC on a network.


Jim McClellan, manager of strategic and systems planning for the PS/2, suggests that multiprocessing will probably start with intelligent devices controlled by DOS extensions using device drivers. Next, under OS/2, will come slightly more flexible arrangements, although there will be no specific support for these in the first release. McClellan forecasts that we'll eventually see "a very complex kind of process sharing, with concurrent processors plugged onto the bus."

"We've solved those [parallel processing] problems in \$5 million dollar computers," McClellan

Who's on the Bus?

With competitors scrambling to duplicate PS/2 functionality, IBM is guarding the proprietary aspects of the Micro Channel as fiercely as it has certain types of technology in the past. As King describes it, "the Micro Channel consists of a design described partially in patents, a copyright-protected BIOS, masks, and silicon. We're not going to license the technology in those four parts."

However, a large portion of the PS/2 architecture is open to all comers, and IBM has held developer seminars on the subject. "If you want to know if the machines are clonable, you really have to ask the people who are trying to do it," remarks Heath. "I wouldn't say it's [technically] impossible. They took us a long time [to develop]."

 *"We were the best in this industry, but reliability rates—not only in our products but in everyone else's built using that [PC] architecture—just didn't cut it."*

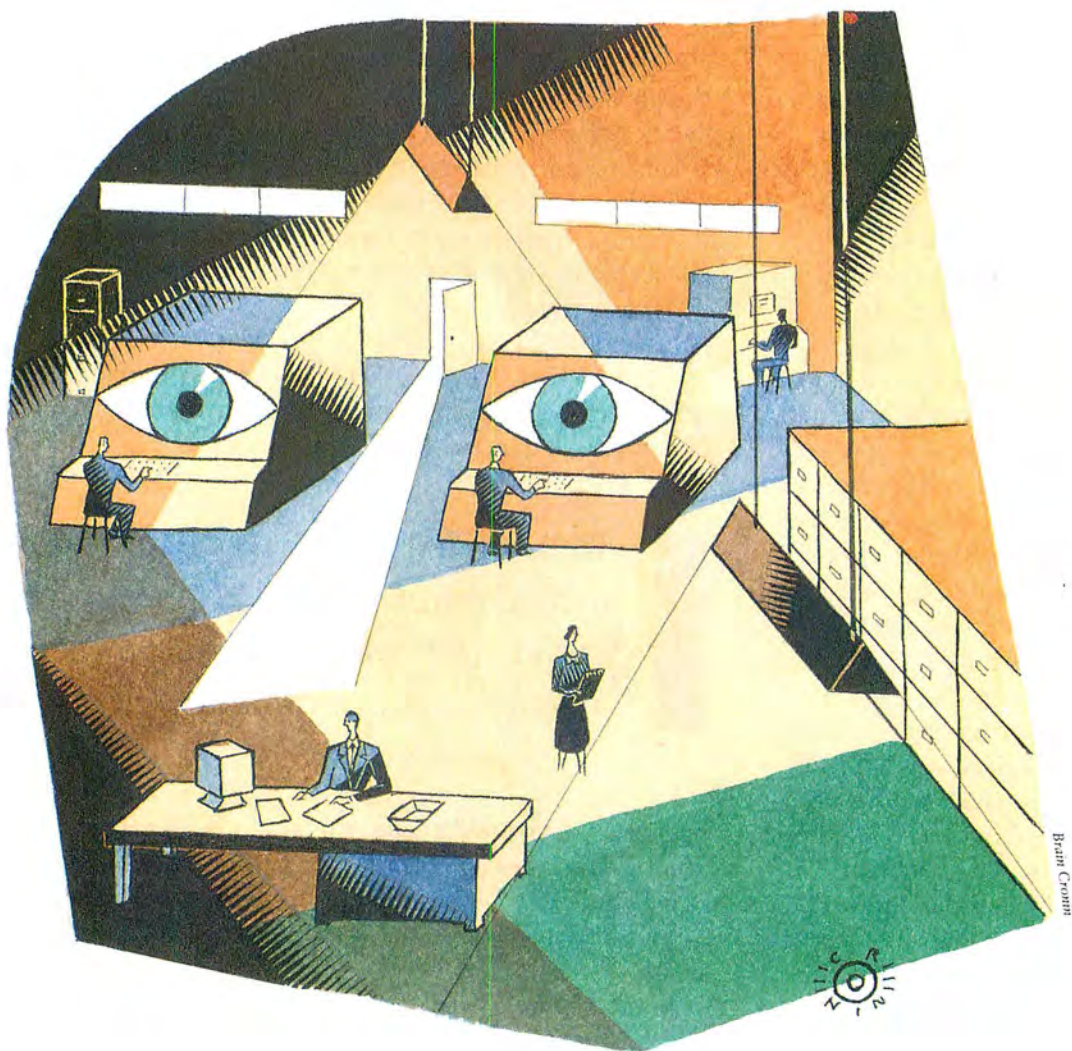
comments. "Now we're talking about solving those problems in computers that you and I can almost afford to buy and take home."

Much closer to home are specialized processors that handle, for example, communications or graphics chores. "When you talk about a network server, you talk about a radically different set of parameters," McClellan says. "It's ridiculous to think that a server system is going to be the same box you want to set on your desk, but the fundamental technology is the same."

"We could have lifted the AT structure and architecture up another notch, but in the long term that wouldn't get us where we have to go," Andrews sums up. "It was fundamental to change the platform underneath. We could have taken another baby step, but time's a-wasting." ●

Eric Bender is PC World's East Coast editor.

Neural Nets: The Dream Machines



Brian Croom

Neural-net computers promise to fulfill the science fiction fantasy of machines that can think. But first they'll tackle some mundane business problems.

James House

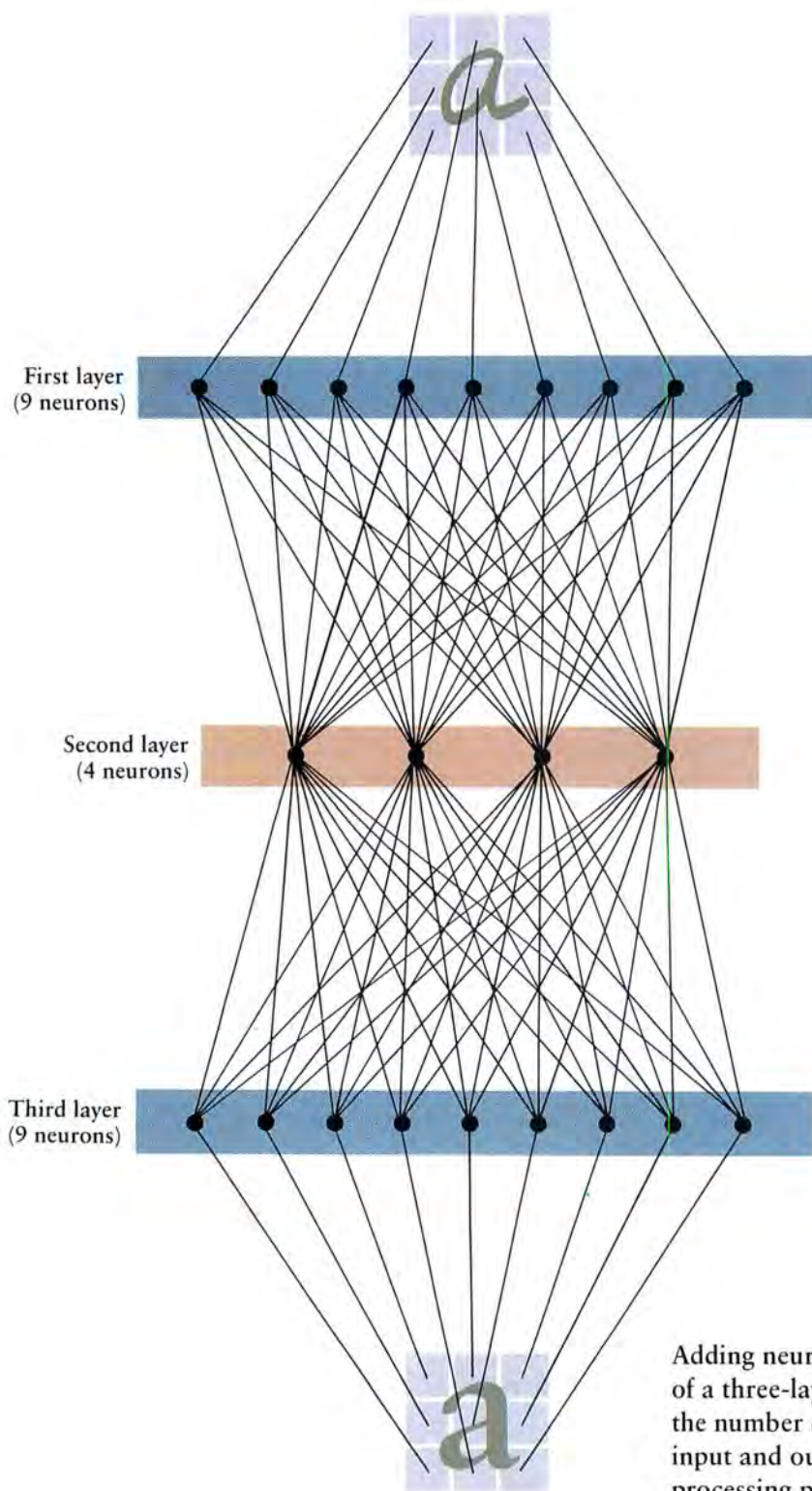
■■■■ Ask your conventional von Neumann computer to multiply long strings of numbers, and you'll get your answer in nanoseconds. It will happily crunch giant spreadsheets at a dizzying speed. Sort a multimegabyte data base? No problem. But not even a supercomputer can recognize a face or voice quite as adroitly as the average 4-year-old. There are limits to what sheer processing power can accomplish.

Those limitations have prompted some researchers to take a different, perhaps more oblique, approach to computer design—one that emulates the pattern-recognition processes of the human brain. Called artificial neural-net systems, these new designs promise quick and relatively inexpensive solutions to certain business problems that remain largely beyond the reach of traditional serial computers. Neural nets place a poor second to serial designs when used for computation. But they excel at such tasks as recognizing handwriting, speech, and images, offering productivity payoffs for industries with extensive data-input or security needs. They promise equally far-reaching benefits in real-time manufacturing

process control and in financial and other types of risk analysis.

Hundreds of academic and industrial researchers already are heavily involved in the creation of this new form of artificial intelligence (as distinguished from the more widely known rule-based expert systems), producing at least a dozen different neural-computer designs. Some implementations for PCs have already begun to appear—including application development systems and at least one finished application, *NestorWriter*, that shortens data-input time by converting handwriting into on-screen text.

"Neural nets are faster and more flexible than serial machines at analyzing nearly any pattern, even those that deal with political and economic concepts," says Bart Kasko, a leading neural-net researcher and manager of adaptive systems at Verac, Inc., in San Diego. "Conceivably, nets could even analyze political systems and predict revolutions."



"There's no programming; nets learn from experience," adds Peter Carroll, a financial consultant with New York City's Oliver, Wyman, and Company. He sells a \$500,000 neural-net analysis system to mortgage companies for determining the risk inherent in loans. "Nets will change the way that we work," Carroll predicts.

Such open-ended visions are not uncommon among those who try to assess the implications of neural-net technology. By reproducing in silicon—even on a modest scale—the patterns of neurons, axons, and synapses in the cerebral cortex, neural-net researchers and manufacturers have come as close as anyone to building computers that think. While some programming is involved, neural nets already can "learn" applications by themselves simply by synthesizing random data; and, as their designs improve, so will their "IQs."

Hypothetically, neural-net systems will become increasingly adept at doing things in which humans specialize. Their ability to learn from experience and make decisions based on pattern recognition approaches the exercise of human judgment. Combine real-time speech, vision, and data entry peripherals, and one day we

Adding neurons to the middle, or "hidden," layer of a three-layer neural net geometrically increases the number of connections between neurons in the input and output layers and, therefore, the net's processing power. For example, adding four nodes to the four already in the middle layer increases the net's connections from 72 to 144. This type of net is capable of changing handwritten letters to typed letters for data entry applications.

may each have a neural-computer assistant.

On the other hand, Michelle Blank, president of Neurocomputer Connections, a market research company in Hackensack, New Jersey, reminds us that we have a long way to go before that day. "Nobody's making money, and nobody's likely to for at least three years," she says.

Although the concept has been around for years, the application of neural nets to business problems is still in its infancy. Many implementations of the technology remain in development or are just now entering the market. The paradox of neural nets is that while manufacturers can build them, no one—not even their designers—fully understands how they work. Neural designs are not just a further evolution of serial machines; these new computers are fundamentally different from their conventional cousins.

Neural Teamwork

A conventional computer's instructions are arranged in a series (hence the term *serial* computer) and processed one at a time. Data is also arranged serially; each byte resides in a single location with its own unique address. An instruction causes the central processor to reach out to memory for a byte of information, change it or combine it with other bytes, then send it back to memory again to await further manipulation. Of course, the computer performs such tasks at incredibly high speeds.

But no matter how fast the serial computer, some tasks just aren't

easily reduced to binary mathematical computation. It is possible, for example, to program bit-mapped images of every script character in the alphabet into a serial computer. But how do you program in all the potential variations in human handwriting?

data path of its neuron network at the same time. As in the human brain, the image is remembered as a pattern rather than as a series of information bits. Different combinations of neurons memorize different objects; some neurons are activated by a given pattern, some

By reproducing in silicon the patterns of neurons, axons, and synapses in the cerebral cortex, neural-net researchers and manufacturers have come close to building computers that think.

The neural computer doesn't rely on processing speed to recognize a user's handwriting; rather, it imitates human pattern-recognition techniques. Instead of one powerful central processor, a neural net uses arrays of a type of circuitry analogous to the neurons in the human brain. Individually these neurons lack the power of a standard serial central processor, but the extensive interconnections among them enable neural computers to accomplish tasks that serial computers can't.

A neural computer captures a pattern—a letter, a shape, or a sound, for example—with an input device such as a digitizing pad, a camera, or a microphone. It then splits the information into pieces and sends images of each and every piece through each and every

are not. Using this schema, a neural net can process various parts of a pattern simultaneously, which gives it a dramatic advantage over a serial computer.

The Neural Pathway

In structure, however, neural-net computers differ markedly from the brain. Since it is impractical, if not impossible, to copy the physiology of the brain's neuron connections, neural-net developers use electronic components. However, they do mimic the brain's neural structure, arranging the neural processors (or neurons) in carefully aligned layers or slabs, with signal pathways running between the neurons in one slab and those in other slabs. Some nets have a single layer of processors, but a net of at least three layers is needed for most real-world applications, such as speech- and visual-pattern recognition.

Who's Who in Neural Nets

Neural-net business applications are only starting to appear. At this writing, *NestorWriter* is the most widely disseminated off-the-shelf product.

Nestor's \$1595 neural-net simulation software changes cursive writing into printed text for entry into a computer using an optical character recognition device. The Providence-based company markets *NestorWriter* to professionals, such as insurance or real estate agents, who use it to read handwritten data on clients into a computer trained to recognize a user's handwriting. With further peripheral hardware development, this system could also be used by banks, retailers, or any company whose employees must read a lot of handwritten numbers on checks. *NestorWriter* needs an IBM PC XT or compatible with at least

384K of RAM, a digitizing pad, and an optical scanner.

Several companies are involved in the sale of neural-net simulations with which companies can develop either in-house or commercial applications. HNC in San Diego brought out the first such product in April—an accelerator board bundled with five different neural-net simulations. The ANZA board and software system costs \$9500. Bundled with an AT compatible it sells for \$14,950; with a 80386-based computer and an 80MB hard disk it costs \$19,500. The ANZA system can simulate up to 30,000 neurons and 300,000 connections and can process up to 25,000 interconnections per second.

Science Applications International Corporation (SAIC), also in San Diego, should have a faster system out by year's end for \$25,000, called the SIGMA-1. It includes a DELTA-1 accelerator board, ANSIM software running eight different net simulations, and a 386 machine. Additionally, the user needs *Microsoft Windows* and an EGA graphics card. SIGMA-1 supports 1 million neurons and 1 million connections and processes as many as 1.5 million interconnections per second. For \$10,000, SAIC sells the workstation and software alone or, for \$15,000, its DELTA-1 accelerator board and the software.

AI WARE of Cleveland offers its AI-Net-101-1 accelerator board and software employing two net architectures with back-propagation for \$4500. The neural-net simulation software is available sep-

arately (\$1500) but may run more than ten times slower without a board, depending on the application. It has 11,000 interconnections, making it slower than other neural nets discussed here.

Plato/Aristotle by Neuraltech of Portola Valley, California, is a much different kind of product—a neural-net expert system program generator that lets you program in English using a word processor, then changes your commands into C code. It is currently being beta-tested at about a dozen sites for cancer research, data base search, engineering, financial forecasting, and insurance applications. The software requires an 80286-based machine and 256K of RAM, and it sells for \$2000. —J. H.

The most popular neural-net design is the Rumelhart Net, named after designer David Rumelhart, a researcher at the University of California, San Diego. The Rumelhart Net sandwiches one or more so-called hidden slabs between an input slab and an output slab in order to geometrically multiply the signal pathways between the two. For example, a three-slab net with nine neurons in the input slab, nine in the output slab, and four in the hidden slab provides 72 pathways for signals to travel. But add just four more neurons to the hidden slab and the number of pathways doubles to 144. Greater neuron density means greater storage capacity and greater computing power.

But today's neural nets still fall far short of the human brain in number of neural connections—and, therefore, in computing capacity. One of the most advanced implementations is NETalk, a demonstration program developed at Johns Hopkins University that converts printed text into speech on a minicomputer. It simulates 231 neurons and 10,346 connections. By comparison, the human brain contains 10 *billion* neurons and about 100,000 times that many neuron connections.

Neural nets would be hard-pressed to imitate in real time even the seemingly simple but actually complex pattern-oriented activities of which the human child is capable—such as recognizing a friendly face. But other tasks are within reach of the technology, including the acceptance of handwriting as computer input.

To do that job well requires a neural computer with at least 2000 neurons and as many as 1.5 million connections.

■ Learning to Learn

While many applications are far more complex and require special programming, it doesn't take long to train a net of 2000 neurons to recognize handwriting. For example, the *NestorWriter* user simply copies out all of the letters of the alphabet on a digitizing pad a couple of times. As the cursive letter A, for instance, is written on the digitizing pad, its form triggers some input neurons and does not trigger others. Each triggered neuron responds by sending a signal down every one of its pathway connections to the inner layer of neurons. Thus, each inner-layer neuron receives a signal from some, but not all, input-layer neurons. If the sum of the signals received by an inner neuron is of sufficient strength, that neuron fires signals down its connection to the next layer of neurons. This propagation of signals eventually forms a pattern of stimulated output neurons that matches the preprogrammed pattern of the letter A. Thus the neural net recognizes the handwritten A.

The net does not successfully recognize a letter the first time the letter is presented. Instead, the net trains itself. To make the output-layer pattern more closely match the preprogrammed A, the net retraces the signal routes from the

output layer back to the input layer, adjusting the signal level at which stimulated neurons will fire and adjusting the strength of each signal that a sufficiently stimulated neuron sends down each of its connections to the next layer.

practice makes perfect. Frequent use strengthens neural pathway connections; infrequent use weakens them.

But some neural training sessions are quite dramatic. With the NETtalk voice-synthesis program,

Unlike with serial computers, there is no one right solution to the problems that neural nets are asked to solve—or if there is, the net may not recognize it every time.

This process, called back-propagation, is repeated until the adjustments, or weights, cause the input signals to generate the preprogrammed A pattern in the output neurons. After the net encounters a few more samples of the handwritten A and additional weights are determined by back-propagation, the net can recognize almost every A the user writes on the digitizing pad.

In one sense, the training session is directed by the user or, with more advanced applications, by a "programmer" who feeds in information. But in a very real sense, the computer teaches itself to find the best path for each particular section of a letter.

That path may not be the best one in absolute terms. Unlike with serial computers, there is no one right solution to the problems that neural nets are asked to solve—or if there is, the net may not recognize it every time. Additionally, with neural nets as with humans,

for example, you can hear the net adjusting weights as it changes letters into simple English words and sentences. Like an infant, it starts out speaking gibberish. Then, notes Jeff Hazen of General Dynamics in San Diego, who has witnessed one of these demonstrations, "NETtalk learns to speak before your eyes."

The Hurdles

But one significant drawback is retarding the new technology's growth. So far, it hasn't been practical to use a real array of neurons in production-model neural nets; there exist only a few special chips and hard-wired systems for running neural nets today. Most systems are neural-net software simulations—both more expensive and slower than true neural designs would be.

In simulation, the neurons are only memory addresses. Even though neural images are supposed to move through the net in parallel, they don't; they move step-by-step as data bits. The base of the simulated neural computer remains a serial machine with a single high-speed processor doing all the work.

An accelerator board makes these programs run faster; boards bundled with neural-net software simulations have recently surfaced on the application development market. One of the most popular combinations—an ANZA accelerator board and software offered by HNC of San Diego—goes for approximately \$15,000 when bundled with an AT compatible, not counting setup costs. A faster ANSIM accelerator board and software combo from Science Applications International Corporation, also in San Diego, costs almost twice as much. Nevertheless, prices for such boards and software have come down from the \$50,000 minicomputer systems available a year ago.

While *NestorWriter* stands pretty much alone as a ready-to-go end-user application, many companies and commercial developers are using development systems to set up in-house neural nets. For example, a consumer loan analysis system is being implemented by AVCO Financial Services of Irvine, California, the world's third largest consumer finance company. A study of 6000 loans that were made using a digital-computer qualifying system indicated that AVCO would have increased profits by 27 percent by using a neural net. On that basis, AVCO is installing an HNC system in 400 of the 5000 furniture and appliance stores the company serves. Some in-house systems—like the Oliver, Wyman, and Company mortgage analysis system—will eventually be sold to a wider audience.

We can expect to see neural-computer financial forecasting,

medical diagnosis, and industrial controllers, says HNC competitor John Vovoedsky of Neuraltech, a Portola Valley, California, company designing expert systems based on neural-net principles. In the latter category, Global Holonetics Corporation of Fairfield, Iowa, has developed a neural-net-supported "smart" camera that determines whether assembly line products meet quality-control standards. The company will probably bundle a PC, a camera, a neural-net board, and software for \$15,000 to \$20,000. A comparable digital system currently in use sells for \$50,000 to \$80,000 and isn't as efficient as a neural net.

Tony Materna, vice president of marketing at HNC, thinks that the first important general PC product to come from neural technology will be a conceptual spreadsheet or data base that enables you to make relational queries. Rather than performing contextual or keyword searches, you

able to create genuine neural networks. Then companies will have the product to truly begin developing the market.

"By 1990, neuronets will be a \$100 million a year business," predicts HNC founder and chairman Robert Hecht-Nielsen. ●

James House is a science and technology writer based in San Diego.

AI-Net-101-1
AI WARE, Inc.
11000 Cedar Ave. #212
Cleveland, OH 44106
216/421-2380
List price: accelerator board and software with two net architectures \$4500, neural-net simulation software \$1500
Requirements: IBM PC, XT, AT, or compatible; 256K; DOS 2.00 or later version; mouse; Microsoft Windows

compatible \$14,950, with 80386-based computer and 80MB hard disk \$19,500
Requirements: IBM PC AT or compatible, DOS 3.00 or later version

NestorWriter
Nestor, Inc.
One Richmond Square
Providence, RI 02906
401/331-9640
List price: \$1595
Requirements: IBM PC XT or compatible, 384K, DOS 2.00 or later version, digitizing tablet and optical scanner

Plato/Aristotle
Neuraltech, Inc.
177 Goya Rd.
Portola Valley, CA 94025
415/854-8389
List price: neural simulation software \$2000
Requirements: IBM PC AT or compatible, 256K, 1.2MB disk drive, DOS 2.00 or later version; 80287 math coprocessor recommended

SIGMA-1
Science Applications
International Corp.
10260 Campus Point Dr.
San Diego, CA 92121
619/546-6000
List price: DELTA-1 accelerator board and ANSIM software running eight neural-net simulations \$15,000, ANSIM software and 80386 machine \$10,000
Requirements: IBM PC AT or compatible, 640K, DOS 2.00 or later version, Microsoft Windows, EGA graphics card, extra cooling fan

No matter how fast the serial computer, some tasks just aren't easily reduced to binary mathematical computation.

will be able to locate data by writing a paragraph about the idea or concept to which your data relates.

Perhaps most exciting, the first commercial neural-net chips may make their appearance in the coming year. Several companies are working toward the introduction of these chips, which are critical to the ultimate development of the technology. Instead of simulating the operation of neurons in software, developers will be

ANZA Neurocomputing
Coprocessor
HNC Inc.
5893 Overland Dr.
San Diego, CA 92121
619/546-8877
List price: accelerator board and software with five neural-net simulations \$9500, with AT

Say It Your Way

Natural-language packages speed access to data—once they've had English lessons from someone who has the data base down cold.

Mickey Williamson

||||| If you sometimes feel cheated by your data base, you aren't alone. Data base management is one application where computer power really pays off, but it's probably the least intuitive of all PC tools—and one that gives many users trouble.

It's easy enough to get your information into a data base; data entry screens let you fill in the blanks, and the system just takes over. But getting data back out in a useful form is another story. You must tell the system precisely where to look, what to retrieve, and how to present it. If you don't ask the right question, you may get the wrong answer or no answer at all.

You may not mind that regimen if you happen to be a large-systems programmer accustomed to communicating via structured query language (SQL). But it wasn't very long after data base management came to the PC that

less technical users began to ask why they had to speak the computer's language rather than the other way around.

Developers responded with a bevy of natural-language systems designed to insulate users from the tyranny of a data base's demanding syntax. The idea is appealing in its simplicity: You tell the computer what you want to know; it finds the answer. At least, that's what the advertisements say.

Of course there's a little more to it than that. Computers don't speak English, although many natural-language systems manage a pretty good pidgin within a narrow range of subjects. To become truly useful, these systems first need a good teacher. Such systems know the language to speak when querying the data base, but they must be taught the data base structure and the words that you'll use in your questions.

If you've created the data base application yourself and remember all the intimate details, natural-language software may not buy you all that much. But if



you're building the application for others or are using someone else's program, that kind of front end may pay off.

Natural-language packages are still relatively rare, in part because they demand an awful lot of system resources for an add-on function. But look for their use to spread over the next few years as OS/2 opens the door to more memory and as more and more networked PCs access multiuser data base systems.

In an effort to separate promise from payoff, we put three representative packages through their paces: Microrim's *Clout*, Ansa's *Paradox*, and Symantec's *Q&A*—giving each the same series of questions on the same data. *Clout*, the natural-language front end to *R:base*, went to work on the original data base that was imported in ASCII format into the others.

Written in Microrim's *R:base 5000*, the data base application contains 814 records. It's in daily use in the tax assessing department of a medium-size city. Entries include the name under which each company does business, the company's local address and phone number, and each owner's name and mailing address. The data base also includes taxable values of inventory, furniture and fixtures, and machinery and equipment; company tax status; and the name of the person who entered the assessment information.

The following queries were posed: Who are the manufacturers? Which companies are tax exempt? What is the average taxable value for all companies and for those that are not exempt? Which company has the highest taxable value? What is each company's tax bill? What is the city's total tax levy?

Let's look at one sample question: Who are the manufacturers? Here the standard *R:base* query

language command translates literally to, 'Select column names from the OWN table where TCODE equals 3.' That is, look within the table of property owners and find those whose tax code field has a value of 3. You need to know such details to set up a natural-language application for an existing data base.

■ Using Your Clout

Like most PC-based natural-language packages, *Clout* and *Q&A* are lexical systems, based on a user dictionary that's modified for each data base application.

For example, the first time that *Clout* meets a new data base, it makes assumptions about what the field names mean. The closer the field names come to English words, the fewer questions *Clout* must ask, and the fewer definitions it requires.

Clout works best if you fine-tune its vocabulary at the outset. The system presents each field name in turn, letting you specify any number of expressions for each. You can use jargon, slang, or any common term. You can also teach *Clout* what fields to search for answers to questions beginning with *who*, *where*, and *when*.

Clout has a built-in vocabulary of 300 words and can add 500 words, phrases, and formulas—far more than most applications require. *Clout* looks first in the user dictionary and then in its internal dictionary for the words that will enable it to rephrase your question in the *R:base* query language. If it doesn't find what it needs, it looks next at the table and field names in the data base, and finally at the data itself. If that sounds too time-consuming, you also can control how long it spends looking at data before it asks for help. Ultimately, if it can't find enough information to complete the query, it will ask you to clarify the question.

In our question series, *Clout* had to be told that 'tax exempt' was a multiword phrase with the data synonym 'xmt'. To find the names of all the manufacturers, *Clout* needed to be instructed that 'manufacturer' matched up with the numeral 3 in the TCOD field. (Simply specifying a 3 anywhere would not do, since there were plenty of 3s in the numerical fields.) If you are responsible for building the data base from scratch, you can tailor it to take advantage of a particular natural-language system. For example,

knowing that you're going to use *Clout*, you can call the TCOD field *taxcode* when you set up your data base.

Clout had a speedy answer when asked the average taxable value of all companies, once it was told that 'taxable value' referred to the TVAL field. It had no problem calculating averages. Additionally, it found the highest taxable value easily, as long as the question included the phrase 'of all companies'.

Quick Q&A Work

Intelligent Assistant, the natural-language front end to Q&A (an integrated data base manager, report writer, and word processor), takes a similar lexical approach. Technically, the Assistant works much like *Clout* but pays a lot more attention to training.

After designing your Q&A data base, you enter the Assistant and its eight-step teaching module. First you complete a general de-

Current Series of Requests

which companies are tax exempt

Unknowns

While interpreting your request, CLOUT did not recognize the indicated word or phrase. You can make a synonym for the phrase, correct the typing, or delete the word (by pressing the [ENTER] key). If a multi-word phrase is a data item, then it needs to be quoted (for example, 'San Jose'). If a single word is a data item, then it was not found in the database. Enter ? for further information, or press [ESC] to cancel this request.

Did not understand: tax exempt
Please enter a synonym or change spelling.
R>xmt

Do you want to make this a permanent definition? (Y/N).....

Clout isolates unfamiliar terms and asks for definitions. Then it offers to add the new definitions to the user dictionary.

Current Series of Requests

show me the companies whose taxable value is greater than 8 of these what is the average

Average: \$19,286.43
Enter request (or [ESC] for main menu).
R>-

When requesting data, you often don't know what your second question will be until your first one is answered. In *Clout*, a question series remains open until you type a closing punctuation mark.

scription of the data base. Then you specify what fields, if any, should be displayed in response to each question. You choose the fields that contain locations and names; give synonyms for field names; and teach the program units of measure, comparative adjectives, and verbs associated with various fields.

Q&A already knows the normal form of comparatives (high, higher, highest) and the forms of regular English verbs. If you teach it *cheap* and *expensive* as low and high descriptors for a given numerical field, it will automatically recognize *cheapest* and *most expensive*—as well as *expensivest* and *most cheap*. You can expand and edit the Assistant's knowledge base as often as necessary.

Teaching the program took only a few minutes, after which querying it was remarkably easy. When it didn't know the meaning of 'tax exempt', Q&A offered to learn a synonym ('xmt'). It had to be told that 'tax bill' meant TVAL (a field name) multiplied by the tax rate numerical constant. That done, the program answered complex calculation questions with aplomb where other systems had struggled or failed.

Q&A responds to each question with a paraphrase that details the formal query that will go to the data base. It's worth reading these questions through to verify that you'll get what you want. If the software has the query wrong, tell it so and then edit the question. On the other hand, if you're absolutely certain that you and your Assistant are on the same wavelength, you can bypass the paraphrase.

Query by Example: Paradox

Paradox employs yet another schema: query by example. The system automatically generates simple query forms; you find answers by making selections and giving examples within these forms.

The software arranges data in columns within tables. Because each table is a separate disk file, *Paradox* can answer questions about any table or group of tables without making you name a specific data base, as you must with *Clout*. Nor do you need to know table names. *Paradox* employs 1-2-3 style menus; the query portion is called ASK, and it is always available. This allows you to nest your questions, bringing in a different table for each question.

When you select ASK, you are requested to name the table about which you want to inquire, for example, OWN.R. To find the manu-

facturing companies in OWN.R, you would place a check mark in the DBA column (doing business as) and a 3 in the column holding tax code status.

Similarly, finding the tax-exempt companies requires a check mark in the DBA column and the letters 'xmt' in the Clerk column. This column could be titled something like Input clerk/Exempt = xmt.

To ask for the average taxable value, you place the instruction Calc Average in the Total Value column. (To exclude companies with values of 0, the command is >0, Calc Average.) Finding the company with the highest taxable value requires another check mark and the instruction Calc Max in the Total Value column. Because you must learn commands like

acct	"Each form contains information about a particular _____."	
idat	Are there any words or phrases that could be used to complete the above sentence? If YES, type them in the blanks below. If NO, press F10 to continue. If you're NOT SURE, press F1 for more explanation.	
inum	<company	>
dba:	<personal property taxpayer	>
madr	<taxpayer	>
mcit	<business-	>
phon	<	>
tcod	<	>
subi	<	>
tval	<	>

OWN1.DTF

Esc-Cancel F1-Examples and explanation

F10-Continue

To teach Q&A's Intelligent Assistant, you begin with terms used to discuss the data base. A form in Q&A is like a row in a tabular data base such as R:base.

Calc, many critics discount *Paradox*'s claims to natural-language status.

But query by example's strong suit is answering questions about relationships. Say you wanted to list all the companies that had the same property value as a specific company, whose value you didn't know. With a product like *Paradox*, you could do the job in a single step instead of the two or three steps most systems require. The major disadvantage to query by example is that you must know the right tables to search.

If you're setting up a *Paradox* data base for other users, you can include a table listing the contents of other tables so that users can query it when they need help. You also can exploit the Scripts/Query/Save option, which remembers the

keystrokes you used to enter your most recent query. At the end of a successful search, the query script can be saved for later inspection and editing. To aid other users, you'd want to build a table that listed scripts by name and showed what they accomplish.

Gaining in the Translation

Each program's approach has its own advantages and disadvantages that reflect the developers' philosophies and market strategies. *Clout* emphasizes ease of use but presupposes a solid understanding of the data base. Similarly, *Paradox*'s query-by-example method can respond on the fly to complex questions and even make retrievals across a number of tables—as long as the questioner knows which tables. *Q&A* offers the best facilities for teaching, and its paraphrase feature maximizes the likelihood that you'll get the information you need.

Natural Efficiency

With natural-language software in general, two techniques will make your queries more efficient. The first involves the concept of granularity—matching the level of abstraction in the questions to the level of abstraction in the data base. If you want more detail, ask follow-up questions to modify the field of view. For example, to track a salesperson's quarterly performance you might ask, Show me all of John's sales, and then, Show me April, May, June.

A second important tip about natural languages is that queries based on the verbs *be* and *have* tend to save time. What is John's salary? and What salary does John have? are sure bets; What does John earn? requires that you first teach the system where to look for the answer.

While firms often tout "break-throughs" in natural language on PCs, all such software must overcome two major hurdles. The first is the DOS 640K memory limit. Natural-language systems need large chunks of memory in which to process rules and look through their vocabularies. One way packages get around this is to restrict the number of grammatical rules and then swap pieces of the program in and out of memory.

A second and more profound obstacle is the complexity of human dialogue. Theoretical frameworks have been built to handle grammar and syntax, but truly

WHICH COMPANIES HAVE TAX CODE 3?

Shall I do the following?

Create a report showing
the dba and
the owner
from the forms on which
the tcod is 3.

OWN1.DTF
Esc-Cancel
← Continue

Q&A simulates human interaction by asking you to confirm your request before it goes to work.

daunting problems remain in interpreting the contexts of queries. For example, consider this question and response: "Do you want to go the beach tomorrow?" "I think it's going to rain." The response, perfectly understandable to a human, would seem a non sequitur to a computer.

Given today's capabilities and constraints, should you place a

natural-language system between you and your data? Not if you are the creator of the data base, are its only user, or are already proficient in querying it. But if several people use the data base, and they often ask you for help, a natural-language system can save everyone considerable time—once you teach it some not-so-simple English. ●

TEACHING SYNONYMS...

Carefully ENTER the NEW phrase: TAX EXEMPT

Is "TAX EXEMPT" correct? (Y,N,Quit) [Y]

ENTER the KNOWN phrase that it means: xmt

The new synonym will be:

No.	-Learned Phrase-	-Class-	-Meaning-
	TAX EXEMPT	REPLACED by as DATA in	xmt CLRk:

Is this the synonym you want to add? (Y,N,Quit) [-]

This is a Paradox translation of the command 'Show the owners and the business names for companies that are tax exempt.'

Viewing Answer table: Record 1 of 1

Subf	Subm	Tval
>0, calc average		
ANSWER		
Average of Tval		
1-	19,206.43	

Paradox answers a question by setting up a new table. The question here is, 'Calculate the average taxable value of all companies with values greater than zero.' ('Subf' and 'Subm' represent two subtotals that go into the calculation.)

Mickey Williamson is a technical journalist based in Warwick, Massachusetts, and the author of Artificial Intelligence for Microcomputers (Simon & Schuster, New York, 1986).

Clout version 3.0
Microrim, Inc.
3925 159th Ave. NE
Redmond, WA 90873
206/885-2000

List price: \$295, with R:base
5000 \$495, with multiuser
R:base 5000 or R:base System
V \$700

Requirements: 256K for R:base
5000, 512K for R:base System
V; two disk drives (hard disk
for R:base System V); DOS
2.00 or later version

Not copy protected

Paradox release 1.11
Ansa Software
1301 Shoreway Rd.
Belmont, CA 94002
415/595-4469

List price: \$725
Requirements: 512K, two disk
drives, DOS 2.00 or later
version

Not copy protected

Q&A version 2
Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
408/253-9600

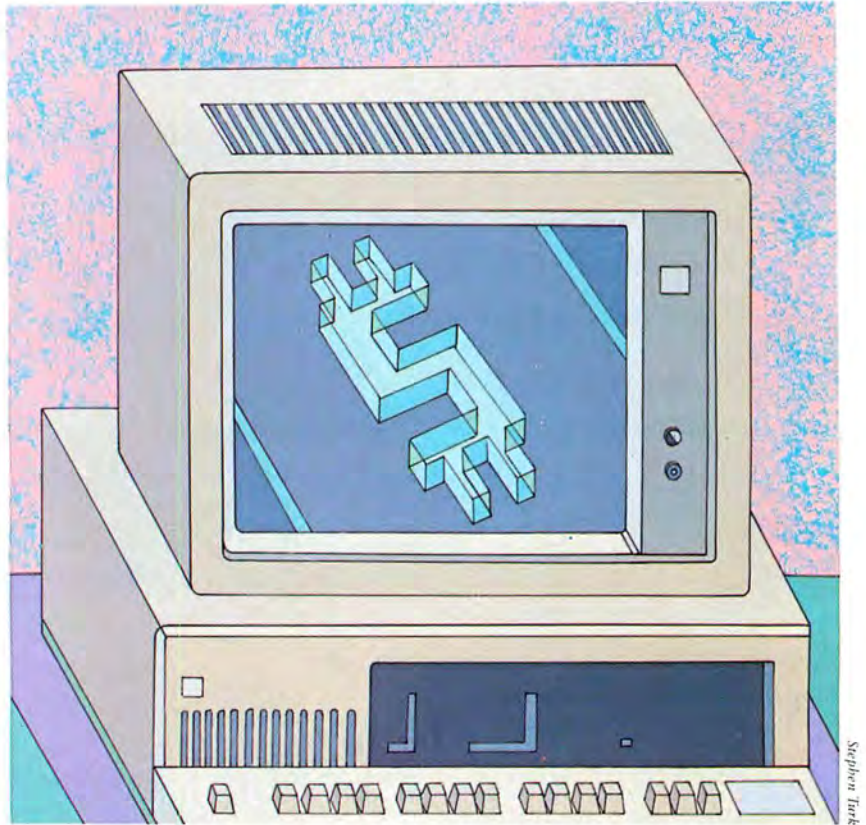
List price: \$349
Requirements: 512K, two disk
drives, DOS 2.00 or later
version

Not copy protected

Autodesk's Lucky Strike

Autodesk brought CAD software to the PC, making millionaires of early employees. But new challenges test the finesse of this rapidly maturing company.

Paul Freiberger and Dan McNeill



Every notable company spawns myths, and Autodesk, the phenomenally successful developer of *AutoCAD*, is no exception. A favorite legend concerns a man who worked in the mail room. Upon joining the company, he received a routine half-percent share. In June 1985 Autodesk went public, and the mail room clerk became a millionaire.

The tale seems apocryphal, since Autodesk didn't have a mail room, yet the story expresses a basic truth. "A lot of people made a lot of money," concedes Auto-

desk spokeswoman Keven Seaver.

Then as now, Autodesk's "Source Perrier" has been *AutoCAD*, a sophisticated computer-aided design (CAD) package for PCs. Introduced in 1982, *AutoCAD* enabled engineers, architects, and other design professionals to mimic the layered drawings of the drafting table.

AutoCAD seemed a vertical-market product—yet it was an im-

mediate hit. Autodesk stock skyrocketed and is now valued at eight times its original asking price. Though sometimes criticized as an aging, overpriced product, *AutoCAD* maintains a robust 40 percent of the PC CAD market. Its more esoteric applications include football playbooks, mortuary plots, and the stacking of planks in lumberyards. The program has even helped design an America's Cup yacht, excavate a sunken ship on the Great Barrier Reef, and arrange the lighting on Michael Jackson's Victory Tour.

■ The Gang of 14

Autodesk didn't start out as a CAD company; the luck of the draw just demanded it. Founders John Walker and Dan Drake had been running a small hardware firm called Marinchip Systems in Sausalito, California. Both adept programmers, they felt they could do well turning out software for the new PCs. So in late 1981, they invited 14 experienced programmer friends to a meeting at Walker's house and explained they wanted to launch a company—one that would be long on talent, if short on capital.

"Most of the people there signed up for this crazy venture," says Drake, even though it meant working in basements, moonlighting, and postponing salaries. Walker provided impetus and leadership but insists he didn't run the company: "If you have the right 16 people, you don't have to."

The cofounders scraped up \$59,030 in seed money and plunged into the PC market. Reluctant to risk precious effort on a single product, they chose instead to take a scattershot approach: develop several products at once, and let serendipity do the rest.

"I didn't have a plan," admits Walker, who resigned as president in November 1986 to spend more time programming, though he remains chairman of the board. "Our goal was to test-market our products and get behind whichever one took off."

Walker, Drake, and company incorporated in April 1982, naming the organization after their

Macintosh-like desktop filing system, *Autodesk*. (They expected that product to thrive, but it vanished, leaving only its name.) Meanwhile, the group was working on a text editor, a text reader, and what would become *AutoCAD*.

■ Early CAD

CAD software wasn't unknown in the early 1980s. Mainframe and UNIX versions existed, but workstations using these cost \$100,000 or more, well beyond the reach of most design professionals. Walker, Drake, et al. felt users would have a real bargain if a workable CAD package could be ported down to the PC.

Luckily, one of the Autodesk gang, Michael Riddle, had written a small CAD program called *Interact*, which the rest of the programmers labored to expand and translate for the IBM PC. They

finished this task in the fall of 1982, just 3 hours before jumping into a station wagon and driving to Las Vegas for COMDEX.

The early *AutoCAD* didn't have the power of mainframe CAD, but it did support vector graphics—a key design decision. Vector graphics defines shapes as a set of x- and y- coordinates, rather than as a set of pixels on the computer's screen (raster graphics). This means you can zoom in on a vec-

petition, we realized we had a big product and should do it right." The firm dropped its other efforts and focused exclusively on *AutoCAD*.

Public Performance

In mid-1985 the firm offered about a million shares at \$11 each, and for the first 90 days on NASDAQ, the price hovered around \$12 and \$13. Then the fun began. By the end of 1986, Autodesk

changed," says director of marketing Sandra Boulton. "We still have folding chairs and used furniture. We still hold beer busts on Friday nights. This doesn't look like a \$50 million company."

No matter what it looks like, Autodesk has done extremely well. *AutoCAD* maintains a 40 percent market share, even though some 200 PC CAD programs are now available. Its closest competitor, T&W Systems' *VersaCAD*, has over 10 percent and is well aware of the *AutoCAD* presence. "We fight that battle every day," says *VersaCAD* spokesman Scott Harlin. "Sometimes it's like the Avis/Hertz situation."

Staff and international presence have boomed too. Autodesk has 320 employees now—215 in Sausalito and another 105 in offices in England, Japan, Switzerland, Sweden, and, most recently, Australia. It sells *AutoCAD* in 40 countries and seven languages (English, Italian, French, German, Spanish, Swedish, and Japanese) and takes a hefty 38 percent of its revenue from international sales.

William Shattuck, an analyst at Montgomery Securities of San Francisco, believes *AutoCAD* will remain high profile because it is "almost as much of a standard in drafting as 1-2-3 is in spreadsheets."

Secrets of Their Success

Certainly luck has played a part in Autodesk's initial success. "They were in the right place at the right time," says Steve Lord, a mechanical engineer with Ektron Applied Imaging in Bedford, Mas-

'We still have folding chairs and used furniture. We still hold beer busts on Friday nights. This doesn't look like a \$50 million company.'

tor image without losing resolution. Moreover, vector graphics treats elements of a drawing as separate entities, so you can manipulate them more easily. At first, entering shapes into the computer may not be much simpler than drawing them on paper. But once they're there, you can move a wall, reroute pipes, or downsize a flange within minutes rather than taking hours or days to make the changes by hand.

Judging from the crowds, *AutoCAD* and its vector graphics aerobatics got "best of show" at COMDEX. "We were surrounded by empty booths, and ours was jammed with people excited by the idea of microcomputer CAD," recalls Drake. "Between the audience reaction and the lack of com-

stock was selling for \$50; in early 1987 it hit \$90.50. On March 6 of this year, a three-for-one split increased the number of shares outstanding from 6.8 million to 20.4 million. At this writing, Autodesk stock is worth about \$65 a share, without adjusting for the split—a breathtaking performance.

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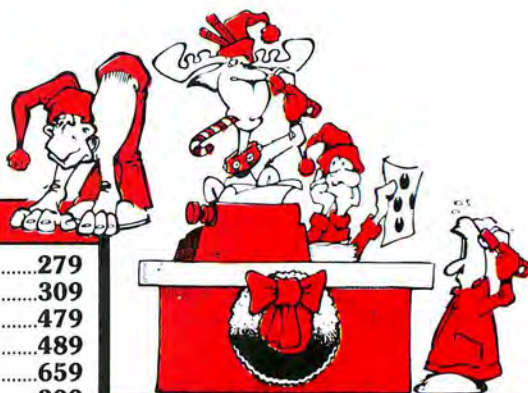
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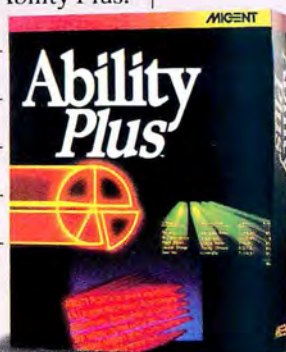
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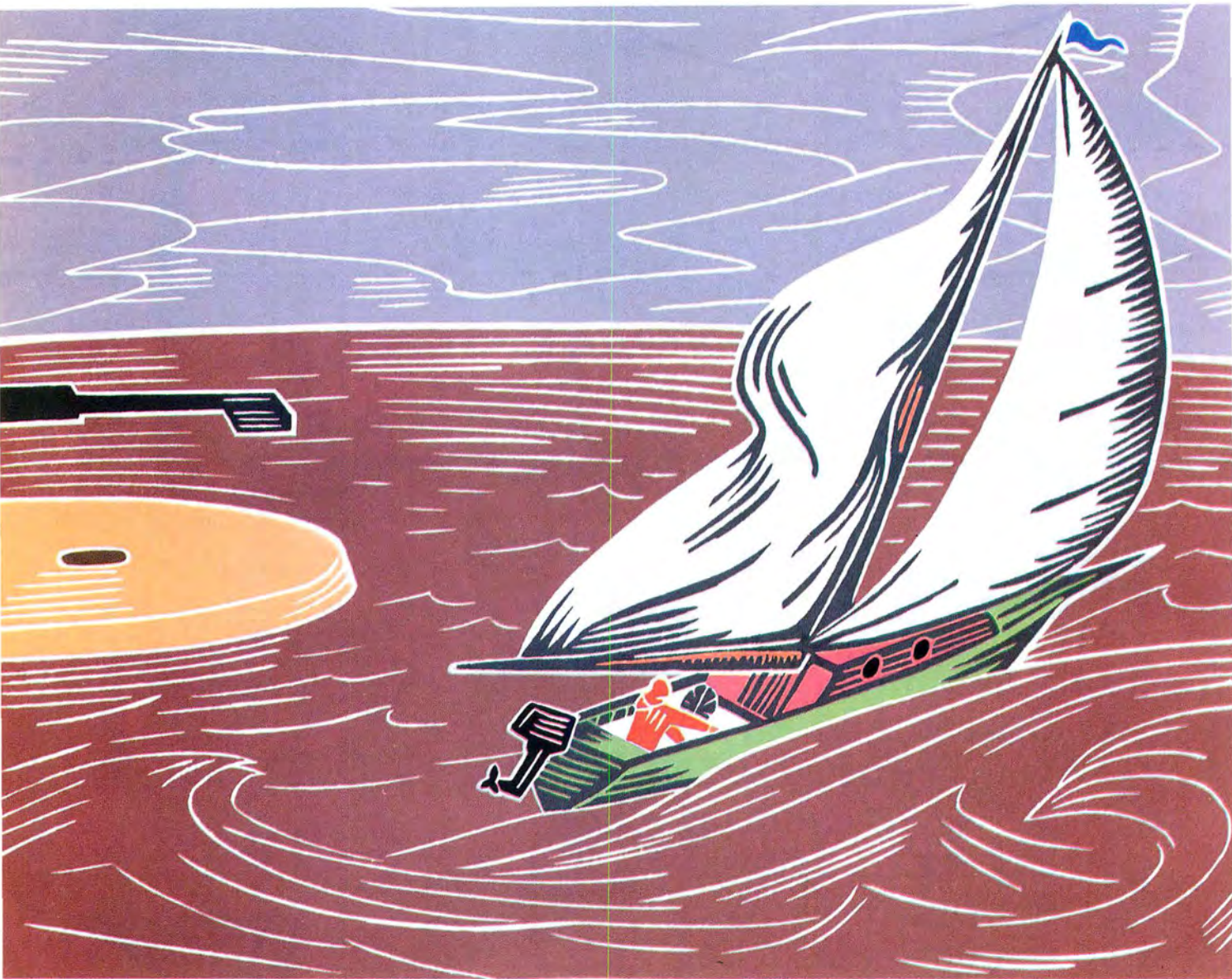
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Hard Disk Navigation Tips



Now that you've got megabytes of room, what do you do with it? A few hints can take the anxiety out of exploring your hard disk's potential.

Michael Goodwin

||||| Many people have never used a hard disk on a day-to-day basis and have no idea what an incredible difference it can make. And no wonder—as recently as three years ago, you had to be in an upper tax bracket to afford one.

Hard disks are no longer big-ticket items—and they are fabulously fast, big, and powerful. Even the slowest hard disk is *much* faster than the fastest floppy. Furthermore, floppy disk users who've resigned themselves to the dreaded 'disk full' error message can usually look forward to at least 20MB of elbowroom when they score a hard disk. They can also say goodbye to the frustrating floppy disk shuffle, gaining nearly instant access to hundreds of applications at any time.

What follows is a hard disk primer, a survival kit for new hard disk owners that includes a few basics, a few tricks from the experts, and a few batch file autopilots. Follow these simple guidelines, and you'll be a pro.

■ Hard Disk Navigation

There's nothing to stop you from treating your hard disk like a giant floppy and putting all your files in one place. But the first time you run a DIR command and

watch hundreds of files scroll off the screen, you'll see the error of your ways.

Because hard disks can hold so many files, most people divide the vast storage area into different directories. Once created, each directory is totally discrete from all others. For instance, typing DEL *.* deletes all files from the logged, or default, directory (the one you are currently working in), but it doesn't touch files anywhere else. If you think of directories as floppies, you can picture your hard drive as a kind of floppy disk jukebox. There's only one trick—you have to know the names of the disks you want to play.

Mastering the naming conventions and syntax associated with hard disk navigation (moving files, or yourself, between directories) is the hardest part of making friends with your hard disk. On this subject the DOS manual is the ultimate source of wisdom and knowledge, but the first time you read it you may feel like you're consulting some obscure alchemical text. Gradually you'll discover that not only does the manual make sense, it's actually full of handy stuff. Eventually, you'll sit down and read it like a mystery

novel, but until that great day, here are a few helpful hints.

Each directory name starts with a backslash (\). The main, or highest, directory is called the *root* directory; if you're logged on to drive C:, the root directory is simply C:\. This is where you keep COMMAND.COM, AUTOEXEC.BAT, and so on. (AUTOEXEC.BAT is the boss batch file that your computer looks for and runs when it starts up. See "Power Your PC With Batch Files" in this issue for more details.)

Creating a logical structure for the contents of your hard disk begins with dividing the root directory into nested *subdirectories*. (There is no difference between a subdirectory and a directory; the prefix *sub* is just a way of emphasizing that one directory is below its parent.) For instance, you

Change Directory. (CHDIR has a handy 2-letter form, CD, which is easier to type and works exactly the same way.) For example, if you're in the root directory of drive C: (C:\) and want to change to the \DATABASE subdirectory, type CD\DATABASE and press <Enter>.

■ In the Beginning Was MKDIR

Where do directories come from? In the beginning, there was MKDIR (and its abbreviation, MD), the command that makes directories.

To create a subdirectory called C:\TEXT from the root directory (C:\), you'd simply type MD TEXT and press <Enter>. Like file names, directory names are limited to 8 letters or characters plus a period and an optional

tory while you're logged into it is like sawing off a tree limb while you're sitting on it.

Otherwise, directory destruction is child's play. To delete the \TEXT\LETTERS subdirectory, for example, you must first delete all the files. Then log into the \TEXT subdirectory, type RD LETTERS, and press <Enter> to delete the LETTERS subdirectory.

■ The Primrose Path

Hard disks often have executable files (that is, files ending in .COM, .EXE, or .BAT) scattered across many directories. Normally when you try to run an application, DOS looks only in the logged drive and directory to find the executable file; if it doesn't find it, you get an error message. Fortunately, DOS provides the PATH command to tell DOS, "If you can't find the command file I asked for in the logged directory, look in the following directories before you tell me you can't find it."

You can change the search PATH at any time from the DOS command line, but normally you set it by putting a PATH command in AUTOEXEC.BAT.

A typical PATH command looks like this: PATH C:\DOS;C:\TEXT;C:\DATABASE. It tells DOS, "If you can't find the command file in the logged directory, look in C:\DOS. If you can't find it there, look in C:\TEXT, then in C:\DATABASE." Note that each directory designation ends with a semicolon.

■ *Creating a logical structure for the contents of your hard disk begins with dividing the root directory into nested subdirectories.*

might have three subdirectories under the root directory C:\, called C:\DATABASE, C:\TEXT, and C:\DOS, respectively. These subdirectories can be subdivided in turn. A subdirectory under C:\TEXT might be called C:\TEXT\WRDPRFCT. The DOS TREE command displays an outline of the entire directory structure on your hard disk.

You can move from one directory to another by using the CHDIR command, short for

3-character extension. To create a subdirectory called \TEXT\LETTERS (that is, a subdirectory LETTERS under the directory TEXT), you log into \TEXT (by using the CD command), type MD LETTERS, and press <Enter>.

RMDIR—and its short version, RD—removes directories. Two conditions must be met: First, the directory to be removed must be empty; it can't contain any files (including hidden files) or have any subdirectories nested beneath it. Second, you must *not* be logged into the directory you want to remove; trying to remove a direc-

Autopilots and Designated Hitters

If you want to avoid typing long subdirectory names every time you change directories, a set of batch file “autopilots” can save you tedious hours of typing.

First, create a directory called `\BATCH` and put it on the search path. All batch files will be placed in this directory. For example, to avoid typing `CD C:\TEXT\WRDPRFCT` every time you want to log on to the *WordPerfect* subdirectory, write an ASCII batch file (with a word processor or with EDLIN, DOS's text editor) called `WP.BAT` that simply contains the line `CD C:\TEXT\WRDPRFCT`. Thereafter, no matter where you are on the hard disk, all you do is type `WP` and press `<Enter>`, and the autopilot will take you directly to the `\TEXT\WRDPRFCT` subdirectory. You can (and should) write autopilot batch files for every directory on your hard disk; you'll never have to use `CD` again.

Another navigational shortcut involves the DOS `SUBST` command, which allows you to substitute a drive letter for a long, tedious subdirectory name—something like a designated hitter coming to bat for the pitcher.

For instance, if you type `SUBST W: C:\TEXT\WRDPRFCT` from the DOS command line, you can use `W:` as a substitute for `C:\TEXT\WRDPRFCT`. Then, instead of `COPY filename C:\TEXT\WRDPRFCT`, you can type `COPY filename W:.` And instead of `CD C:\TEXT\WRDPRFCT`, you can simply type `W:` and press `<Enter>`.

Most people set their drive substitutions automatically at start-up by placing a series of `SUBST` commands in the `AUTOEXEC.BAT` file. (By the way, to `SUBST` all 26 drive letters, you need to put a line in your `CONFIG.SYS` file that reads `LASTDRIVE = Z`; otherwise DOS won't let you use any drive letter past `E:`.)

Trying to remove a directory while you're logged into it is like sawing off a tree limb while you're sitting on it.

Moving files from one directory to another follows the same basic rules, but again, a simple batch file with replaceable parameters can save you loads of time. Create an ASCII file (in the `\BATCH` directory) called `MOVE.BAT`, with the following lines:

```
COPY %1 %2
DEL %1
```

If you're the nervous sort, insert a line containing the `PAUSE` command before the line `DEL %1`. Then if something goes wrong, you can prevent the batch file from executing the `DEL` command by pressing `<Ctrl>-C`.

To use this batch file to move a file called `SHADOW.TXT` to `C:\TEXT\WRDPRFCT`, for example, type `MOVE SHADOW.TXT C:\TEXT\WRDPRFCT` and press `<Enter>`. Or, if you've substituted a drive letter, you can type `MOVE SHADOW.TXT W:.` The batch file will replace `%1` with `SHADOW.TXT` and `%2` with `C:\TEXT\WRDPRFCT` (or `W:.`). Then it will copy `SHADOW.TXT` to `C:\TEXT\WRDPRFCT`, and finally it will delete the original.

Pilot to Navigator, Pilot to Navigator

How can you tell where you are in your hard disk's invisible maze of directories and subdirectories? DOS was written before hard disks became common, and the standard DOS prompt tells you only what drive you're logged on to—so no matter where you hap-

pen to be on your hard disk, the prompt will still read `C>`. Big help!

Fortunately, the `PROMPT` command allows you to change the prompt to display the current directory as well as the current drive. If you enter `PROMPT pg` from the DOS command line, the prompt displays drive *and* directory, like this:

```
C:\TEXT\WRDPRFCT>
Most people place PROMPT $p$g in their AUTOEXEC.BAT file, so it executes automatically whenever they turn on their computer.
```

Use It or Lose It

Doing a daily hard disk backup is every bit as essential as frequently saving work while you're writing a report. One hard disk crash will make a backup believer of even the most hard-headed skeptic. DOS provides a perfectly adequate (slow but reliable) backup utility called `BACKUP`; if you don't use it or some

equivalent, you are virtually guaranteed to lose your data sooner or later. This means you!

BACKUP (and most other similar utilities) provides two basic modes: a total backup that backs up every file on the hard disk to floppies, and an incremental backup that adds new and modified files to the backup set. Start your regime by making a complete backup; thereafter, daily "incrementals" will keep you up to date. Other options allow you to back up all files saved after a given date, all files in specified subdirectories, or specified individual files.

One of the most popular alternatives to DOS's BACKUP utility is *Fastback* from Fifth Generation Systems. As its name might suggest, *Fastback* is much faster than BACKUP. It also creates a handy catalog on your hard disk so you can locate backed-up files easily, compresses files so you can get slightly more than normal floppy disk capacity, and uses an error-correction technique that often allows files to be successfully restored even when the backup floppy has been damaged. Best of all, it lets paranoid types (like me) verify the backup against the original files. Several other good backup programs are available (see "Backing Up Is Hard to Do," PCW, March 1987).

Keep It Clean

No matter how big your hard disk is, it fills up amazingly fast if you fail to follow prudent rules of hard disk maintenance. It's a good idea to look it over every few months with an eye for

outdated files that can be archived to floppies to make room for more current data.

Old .BAK files can eat up astonishing amounts of disk space too. With BAK.BAT, a file consisting of only one line:

```
DEL *.BAK
```

you can clean up subdirectories simply by typing BAK and pressing <Enter>.

Better yet, the public domain utility XT2 (available free from many on-line bulletin boards) will search through every subdirectory on your hard disk, repeating whatever DOS command you've given it as an argument. If you create a file called GBAK.BAT (for Global Bak) that contains the single line XT2 \ DEL *.BAK, it will delete every .BAK file from

your hard disk. You may want to include GBAK as a command in your daily incremental backup routine, so all .BAK files will be deleted before you back up, saving floppy space as well as tidying up your hard disk.

Sometimes in the normal run of things, DOS loses track of small clusters of data on your hard disk. These dreaded lost clusters can accumulate, and after some months you may find that your hard disk is reporting fewer megabytes than it should. Running the DOS CHKDSK command lets you know if you have lost clusters; running CHKDSK/F lets you reclaim the lost clusters to numbered files that have the .CHK extension, which can be deleted

Path: \		FILE: *.*
<ul style="list-style-type: none"> └─BATCH └─DATABASE └─DOS └─TEXT <ul style="list-style-type: none"> └─LETTERS └─WRDPRFCT └─UTILITY <ul style="list-style-type: none"> └─FASTBAK └─NORTON └─XT2 └─XTREE 		DISK: C: ROOT Available Bytes: 20,324,352
AUTOEXEC.BAT COMMAND.COM CONFIG.SYS IBMBIO.COM IBMDOS.COM		DISK Statistics Total Files: 66 Bytes: 741,902 Matching Files: 66 Bytes: 741,902 Tagged Files: 0 Bytes: 0 Current Directory Bytes: 60,795
DIR Available Delete Filespec Log disk Makedir Print Rename COMMANDS ^Showall ^Tag ^Untag Volume eXecute ↑↓ scroll RETURN file commands ALT menu F1 quit F2 help		

Screen 1: Executive Systems' Xtree offers a clear blueprint of directories and their relationships to each other. Note that the program even lists the hidden files IBMBIO.COM and IBMDOS.COM in the root directory.

with normal DOS commands—making the lost disk space available again.

After months of heavy use, your hard disk may slow down perceptibly. Because of the way DOS stores data, files tend to become fragmented, causing the head to skip around the disk looking for scattered clusters of data

No matter how big your hard disk is, it fills up amazingly fast if you fail to follow prudent rules of hard disk maintenance.

to assemble into a complete file. There are two ways to correct this creeping slowdown. The simplest (and cheapest) is to make a complete backup, reformat the hard disk, and then restore all your files from the backup.

Alternatively, you can purchase a disk optimizer—a program that rewrites your hard disk, collecting and combining scattered data sectors into continuous files. Warning! Some disk optimizers have been known to trash hard disks. *Mace* is reliable, and so are others.

For convenient file handling, many hard disk users employ a DOS shell program like *Xtree*, *Direc-Tree*, or *Util*; these menu-based utilities allow you to copy, move, delete, or rename groups of files in one simple operation (see “The Forest Through the Xtrees,” PCW, July 1987). *Xtree* is particularly adept at showing a diagram of your subdirectory structure, a vast improvement of DOS’s TREE command (see Screen 1).

■ Data Insurance

Hard disk users have no corner on inadvertent trashing; it’s just as easy to erase an irreplaceable floppy disk. Nonetheless, hard disk files tend to be larger, and so the lost hours of work can be more traumatic; worse yet, an overly hasty DEL *.* can trigger something close to heart failure.

The Norton Utilities’ file-recovery program provides an essential safety net for the serious hard disk user. Similar packages (like *Mace* and *PC/Tools*) are also available.

That’s the survival kit. Of course, as you become more experienced you’ll accumulate (and invent) your own customized collection of hard disk utilities, batch files, and shortcuts to make life easier and work more efficient. Let us know about anything you invent; the only thing more satisfying than devising a slick shortcut is sharing it. ●

Michael Goodwin is an associate editor for PC World.

Direc-Tree

Micro-Z

4 Santa Bella Rd.

Rolling Hills, CA 90274

213/377-1640

List price: \$49.50

Requirements: 29K, DOS 2.00

or later version

Not copy protected

Fastback

Fifth Generation Systems, Inc.

11200 Industriplex Blvd.

Baton Rouge, LA 70809

504/291-7283

List price: \$179

Requirements: 128K, DOS 2.00

or later version

Not copy protected

Mace Utilities 4.1

Paul Mace Software, Inc.

400 Williamson Way

Ashland, OR 97502

800/523-0285

List price: \$99

Requirements: 256K, DOS 2.00

or later version

Not copy protected

PC/Tools

Custom Software Systems

P.O. Box 678

Natick, MA 01760

617/653-2555

List price: \$49

Requirements: 192K, DOS 2.00

or later version

Not copy protected

Util

Public domain/shareware

XT2

Public domain/shareware

Xtree

Executive Systems, Inc.

15300 Ventura Blvd. #305

Sherman Oaks, CA 91403

818/990-3457

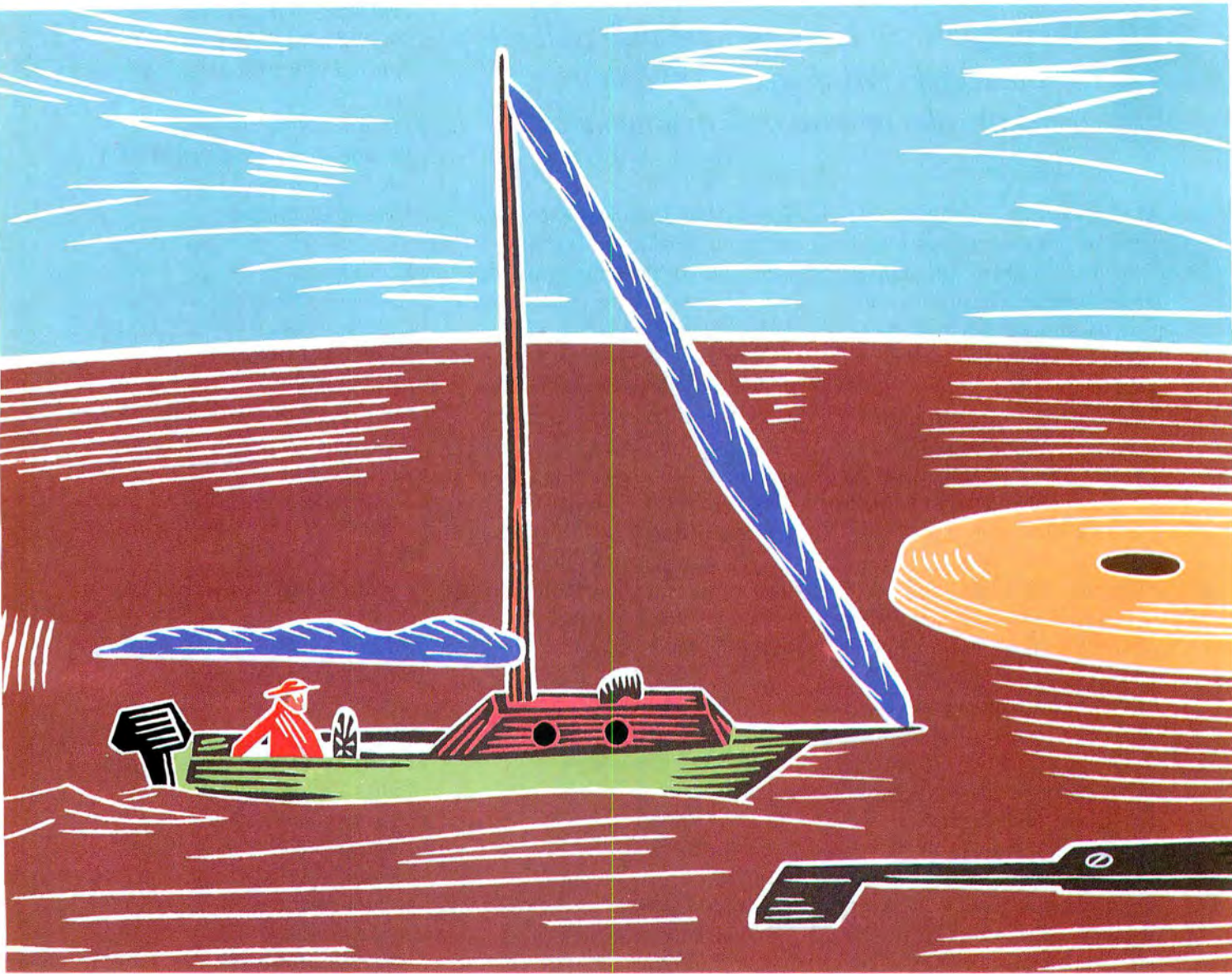
List price: \$49.95

Requirements: 192K, DOS 2.00

or later version

Not copy protected

Power Your PC With Batch Files



A small investment of time can save you work in the long run. This beginner's guide shows how DOS's batch files can boost your productivity.

Peter Norton

||||| One of the secrets to using your PC productively and conveniently is the magic of a DOS feature known as batch files. The tools and tricks of batch files could fill a small book, so I'll only hint at the range of things that batch files can do for you. In the simplest terms, a batch file is just a sequence of DOS commands that are bundled together, traveling under a common name. When you give DOS a command—like DIR, 123, or FORMAT—you're telling DOS to run a single program. A batch file is a list of such simple commands gathered together so that they can be invoked as one unified megacommand.

A batch file is a text file, and the DOS manual shows how to write one by using a line editor, such as DOS's EDLIN, or even the COPY command. But most people use the ASCII mode (also called the nondocument, unformatted, or text in/out mode) of a word processor or a notepad, such as *SideKick*'s. A batch file lists the various commands (CHKDSK, FORMAT, or whatever) that you want to perform, line by line. You give the batch file the file name extension .BAT so that DOS can recognize it as a batch file. The batch file's name itself—the part before the .BAT—is

the command name you enter at the DOS prompt (the command line) when you want to run the batch file.

The simplest kind of batch file does nothing more than combine separate DOS commands into a linear sequence. For example, you might do all of your PC work with a single program, perhaps 1-2-3 or a word processor like *WordPerfect*. All you ever do in the way of executing DOS commands is fire up that one program. But you need to keep your data files organized, so you put the files in a variety of separate disk directories—maybe old projects here, current work there, and tax records somewhere else (see “Hard Disk Navigation Tips” in this issue). Batch files could combine the steps of changing to drive C:, switching to the right directory, and activating your application. For example, a batch file named OLD.BAT might change drives, switch from the current directory to your “old projects” directory, and then fire up 1-2-3, *WordPerfect*, or whatever program you use.

Here's another simple yet common reason people use batch files, even though they work primarily with just one program, such as 1-2-3. To keep track of the time they spend on their work—say, because they charge clients for their time or need to keep a tax record of business and nonbusiness use of their PCs—some people use a time-logging program. Let's assume that the program they use is called LOG. Instead of issuing the command that logs the start time to a client's data file, then issuing the command that invokes 1-2-3, and finally issuing the command that logs the finish time, these people run a batch file that contains those three commands. To give a stylized example, such a batch file, which might be called DO123.BAT, would contain the commands

```
LOG START JONES
123
LOG END JONES
```

It's a very simple batch file, but it logs work time automatically.

■ Replaceable Parameters

In the example that I just gave, a file name for the client's time-logging data file, JONES, is a direct part of the batch file. You wouldn't want to actually "hard code" the name of a client's data file into a batch file, because then you would need a separate batch file for each client—a very clumsy arrangement. This leads us to one of the most useful features of batch files, *replaceable param-*

eters. Instead of putting the name JONES in the batch file, let's use the symbolic name %1. Then instead of starting the batch file by entering just its name, you add the name of the client's data file as a parameter (a string of characters, delimited by spaces, that follows the command) before pressing <Enter>. For example, if you enter the command DO123 JONES,

that change directories, like our first batch file example. For instance, you can modify OLD.BAT so that its third line consists of only replaceable parameters:

```
C:
CD \OLDPROJ
%1 %2
```

OLD.BAT still changes drives and switches directories, but instead of

■ *DOS provides several commands specifically to facilitate batch file processing.*

DOS substitutes the parameter JONES everywhere that %1 appears in your new DO123.BAT file. (As you might guess, batch files can use the symbolic names %1, %2, and so forth up to %9. When the batch file executes, DOS replaces each %1 in the batch file with the first parameter on the command line, each %2 with the second parameter, and so on.)

Suppose you're using *Framework*, *RapidFile*, or one of the few other programs that does not make a backup copy of the data files it modifies. You could add a backup file capability to such a program with a batch file that takes a file name as its first parameter. Here's an example for *Framework* that first makes a backup copy of the specified data file and then runs *Framework*, automatically opening that data file:

```
COPY %1.FW %1.BAK
FW %1.FW
```

Replaceable parameters can also provide more flexibility to "navigational" batch files, those

starting a specific program, the batch file can now be used to start any program with commands like OLD 123 or OLD WP MEMO.

■ Furthering Functionality

DOS provides several commands specifically to facilitate batch file processing. For example, the PAUSE command stops the processing of the batch file until you press a key. PAUSE gives you time to read important screen messages that will be quickly obliterated if your batch file continues at full speed. Or your batch file might contain some dangerous steps (erasing data, for example), and you'd feel safer if the batch file would pause before doing them. With PAUSE, you have the choice of giving the go-ahead by pressing a key or stopping the batch file from proceeding by pressing <Ctrl>-<Break>.

Another command, REM (for remark), is one of the simplest yet most useful batch file commands. It enables you to include notes and comments within a batch file to explain what's going on. REM is particularly useful with PAUSE, since you may need to explain why the batch file is pausing.

While remarks let you clarify a batch file's steps, you may not want all those comments chattering across the screen. You may not even want the commands to appear. The ECHO command lets you control much of what appears on the screen. The command ECHO OFF stops DOS from displaying (echoing) the subsequent batch file commands. (Unless redirected, a command's screen output, such as its messages, is still displayed.) Most batch files follow ECHO OFF with the CLS (clear screen) command. CLS is used to remove any previous information

where *message string* is anything besides ON or OFF. To keep your messages neat and professional looking, you can use the command ECHO followed immediately by a period (ECHO.) to "display" a blank line.

Because *message string* can be redirected to the printer, ECHO is often used in batch files to set a printer's mode, such as choosing between near letter quality and draft. Although a command like ECHO <Ctrl>-O >PRN can be issued from the command line, it's not easy to remember the various codes that a particular printer uses to change pitch, feed the paper, or perform some other function. But who can forget batch file names like 10PITCH.BAT, CONDENSE.BAT, or FORMFEED.BAT?

Furthermore, many printer features are selected by sending the printer an *Escape sequence*, a

The most advanced and interesting batch file commands enable branching to different parts of a file to perform different commands.

(such as the command ECHO OFF) from your screen. The command ECHO ON, as you'd expect, tells DOS to resume displaying the batch file's commands and remarks.

Because remarks are not displayed while ECHO is off, another variation of the ECHO command is used to display screen messages. The syntax is

ECHO *message string*

string of characters beginning with Escape (ASCII 27). The Escape character can't be typed in on the DOS command line, but it can be contained in a batch file (see the sidebar "The AUTO-EXEC.BAT File").

Telling It Where to Go

The batch files mentioned so far are completely linear—they involve no complications such as branching to different parts of a batch file to perform different commands. But the most advanced and interesting batch file commands do just that.

The simplest form of branching is the unconditional loop, which causes the repetition of a command or set of commands. To effect a loop, a batch file contains a label (a string of characters, of which only the first eight are significant, prefixed by a colon), the command(s) to be repeated, and the command GOTO *label* (this is the unconditional branch). For example, FRMTMANY.BAT might consist of the lines

```
:TOP
FORMAT A:
GOTO TOP
```

and be used to automate formatting several disks. (To halt execution of this oversimplified example, press <Ctrl>-<Break>.)

Batch files can also branch unconditionally without looping. For example, if your system's CONFIG.SYS file loads the Extended Screen and Keyboard Control driver, ANSI.SYS (see the DEVICE command in "Configuring Your System" in the DOS manual), you could place the following lines in a file called DOSTEXT.BAT:

```
ECHO OFF
CLS
GOTO %1
:NORMAL
PROMPT $e[0m
GOTO SHOWPATH
```


The AUTOEXEC.BAT File

Karl Koessel

The most important batch file, one that no PC should be without, is the automatically executing batch file called AUTOEXEC.BAT. If a batch file with this name is in the root directory of the disk you use to boot the PC, it is automatically run immediately after your computer starts up.

The point of having an AUTOEXEC file is that it automatically performs all of the commands that you otherwise have to input by hand each time you start your system. AUTOEXEC.BAT file commands generally fall into two categories: those that set up your system to work the way you want, such as initializing a printer, and those that load the memory-resident programs you use, such as Borland's *SideKick* and *SuperKey* or Lotus's *Metro*.

In the setup category, by far the most important command in a hard

disk user's AUTOEXEC.BAT is the PATH command (see Listing A). The PATH command gives DOS a list of directories to search for a program or command if DOS can't find it in the current directory of the default drive. The directories listed in a PATH command are separated

by semicolons, and each includes the directory's drive specifier. When you issue a command, DOS searches the current directory for the command file. If the file isn't present, DOS looks at the PATH command's list and searches the first directory listed for the file.

```
path
d:\batch;d:\wp\word;c:\dos;d:\util\misc;
prompt $e[30;46m$p$g
echo 3>lpt1
c:\dos\mode com1:96,n,8,1,p
c:\dos\mode lpt2=com1
d:\util\cruise\cruise /10 /b
c:\dos\graphics
d:\util\superkey\key
d:\util\sidekick\sk
d:\util\superkey\key
d:\util\superkey\autosk-l/ml
cd c:\junk
cd d:\unfiled
d:
cls
word todolist
```

Listing A: An AUTOEXEC.BAT file typically sets up the system's extended directory search paths, modifies the default prompt and screen colors, initializes the printer(s), installs memory-resident programs, sets the desired current drive and directory, and calls up the application that you start each morning with.

If it's not there either, DOS consults PATH's directory list again and searches the second directory listed. This process continues until DOS either finds the command file and executes it or exhausts the list of directories and returns the error message 'File not found'.

Thus you can keep your hard disk organized and manageable (see "Hard Disk Navigation Tips" in this issue) by placing the programs you use into their own separate subdirectories and still have them all available no matter which directory you're working in. As part of this organization, you should place your batch files in a distinct directory (say, C:\BATCH) so you can keep track of them easily.

The second most essential command for the hard disk user's AUTOEXEC.BAT file is the

PROMPT command, which enables you to change DOS's standard prompt (A>, B>, and so on). Some people make very tricky use of the PROMPT command's capabilities, for example, displaying a multiline prompt that includes the date and time. But for most of us, the most useful command prompt of all tells the current directory as well as the default drive. The \$p\$g at the end of Listing A's PROMPT command instructs DOS to construct a prompt that displays the current drive and path (\$p) followed by the greater-than symbol (\$g). This PROMPT command also includes an ANSI.SYS command (\$e[30;46m) that sets DOS's screen colors to black characters on a cyan background.

The next command uses >lpt1 to redirect an ECHO message to the printer on LPT1. That message (the three characters Escape, x, and 3) instructs my dot matrix printer to use its IBM

character set. Escape appears on the screen as a small left arrow or as ^[. You can use EDLIN to enter the Escape character into a batch file (just insert <Ctrl>-V[at the appropriate point).

The MODE command is another classic candidate for inclusion in an AUTOEXEC.BAT file. The MODE command is generally used to set a serial port's baud rate, parity scheme, number of data and stop bits, and continuous retries of time-out errors for a serial printer. Naturally, you don't want to have to type in that sort of command each time you start your machine, so have AUTOEXEC.BAT do it for you automatically. Note that the MODE command is prefixed by the name of the drive and directory that contains MODE.COM. This is a feature of DOS 3.00 and later versions. Previous versions require you to separately set the default drive (C:), change to the

appropriate directory (CD \DOS), and then issue the command (MODE...). The second MODE command tells DOS to intercept the output that a program sends to LPT2 and send it to COM1 instead. Thus, I can have my programs send output to LPT1 for draft printing and to LPT2 for laser quality.

The next few lines install memory-resident programs. CRUISE is the command that installs Revolution Software's *Cruise Control* program, which speeds up the system's cursor and provides a screen blanker, among other things. GRAPHICS is a memory-resident DOS utility that gives <PrtSc> the ability to print graphics screens. KEY installs *SuperKey*; SK installs *SideKick*. The next line instructs *SuperKey* to load a macro file and execute the <Alt>-L macro, which brings up *SideKick*'s appointment calendar (see "AUTOEXEC SideKick," *The Help*

Screen, PCW, November 1987). The last few commands set the default directories for drives C: and D:, make D: the current drive, clear the screen, and bring up a *Word* document that holds my to-do list.

With these commands, my personal computing environment is custom tailored. Listing A, which at first glance may seem quite formidable, is simply a list of the commands that I otherwise would enter by hand to set up my system and load my selection of memory-resident programs. And AUTOEXEC.BAT does it all automatically.

Karl Koessel is the technical editor for PC World.

```
:BRIGHT
PROMPT $e[0;1m
GOTO SHOWPATH
:INVERSE
PROMPT $e[0;7m
GOTO SHOWPATH
:SHOWPATH
ECHO ON
PROMPT $P$G
```

If this batch file is executed with the command DOSTEXT NORMAL, the unconditional branch becomes GOTO NORMAL (because %1 is replaced by the first parameter after the command), causing execution to branch to the first line after the label :NORMAL. The next command puts the ANSI.SYS command that makes the screen's characters white on a black background into the prompt. (The PROMPT command is a popular means of issuing ANSI.SYS commands, because PROMPT provides a way to insert the Escape character into the prompt, by using the code \$e, and because the prompt is sent to the screen, both of which are required of ANSI.SYS commands.) Then GOTO SHOWPATH, another unconditional branch, directs execution to the line after the label :SHOWPATH. That line turns ECHO on so that the ANSI.SYS command contained in the prompt will take effect. The following PROMPT command yields a prompt that displays the current directory path followed by the greater-than symbol. The commands DOSTEXT BRIGHT and DOSTEXT INVERSE work similarly, yielding bright white text on a black background and black text on a white background, respectively.

On One Condition

If you enter DOSTEXT RED or just DOSTEXT, however, the batch file responds only with the DOS error message 'Label not found'—not very informative. But the IF command, which performs conditional branching, can come to the rescue by checking the acceptability of DOSTEXT's parameter. (IF has lots of other uses, too complex to go into here.)

Look at Listing 1, a revised version of DOSTEXT.BAT. GOTO %1 has been replaced by three IF commands and an unconditional branch. This time let's assume the batch file was called with the command DOSTEXT BRIGHT. That makes the first conditional branch

command read IF !NORMAL==!BRIGHT. Since !NORMAL is not equivalent to !BRIGHT, the remainder of the command is ignored, and execution falls to the next line. The equivalency test on the next line proves true, and DOS executes the remainder of that line (GOTO BRIGHT). If none of the IF commands finds a match, the following unconditional branch sends execution down to the "help" section, which ECHOes instructions explaining how to use DOSTEXT.BAT.

Note that this batch file uses an ECHO. command to put a blank line between lines in the instruction text. Also, a Control G character (entered by holding down

the <Ctrl> key and typing G) has been placed at the end of the first instruction line. It appears on screen as ^G. When Control G is ECHOed, the PC beeps instead of displaying a character; this is quite handy for error messages and warnings.

DOSTEXT.BAT also exemplifies a few other points concerning IF. First, equivalency tests require a double equal sign. Second, a dummy character must be included on both sides of the double equal sign. DOSTEXT.BAT uses the exclamation point, but any character would do. Without the dummy character, an error would halt execution if you called a batch file without using a parameter. Third, replaceable parameters should be placed on the right side of the ==, because some versions of DOS respond improperly when they're on the left. Fourth, although the GOTO command does not distinguish between uppercase and lowercase, IF does. Both sides of an equivalency test must match exactly.

We've taken only a beginner's peek at the possibilities that batch files hold, but I hope it gives you an idea of what can be accomplished. To learn more, you can read more in your DOS manual or turn to one of the many good books that explain the ins and outs of DOS, including the ins and outs of batch files. ●

Peter Norton is president of Peter Norton Computing and author of Inside the IBM PC (Brady Books, New York, 1986).

```
ECHO OFF
CLS
IF !NORMAL==!%1 GOTO %1
IF !BRIGHT==!%1 GOTO %1
IF !INVERSE==!%1 GOTO %1
GOTO HELP
:NORMAL
PROMPT $e[0m
GOTO SHOWPATH
:BRIGHT
PROMPT $e[0;1m
GOTO SHOWPATH
:INVERSE
PROMPT $e[0;7m
GOTO SHOWPATH
:HELP
ECHO DOSTEXT requires an uppercase parameter.^G
ECHO.
ECHO Enter either      DOSTEXT NORMAL
ECHO or                DOSTEXT BRIGHT
ECHO or                DOSTEXT INVERSE
:SHOWPATH
ECHO ON
PROMPT $P$G
```

Listing 1: DOSTEXT.BAT demonstrates a batch file's use of replaceable parameters, conditional and unconditional branching, and variations of the ECHO command.

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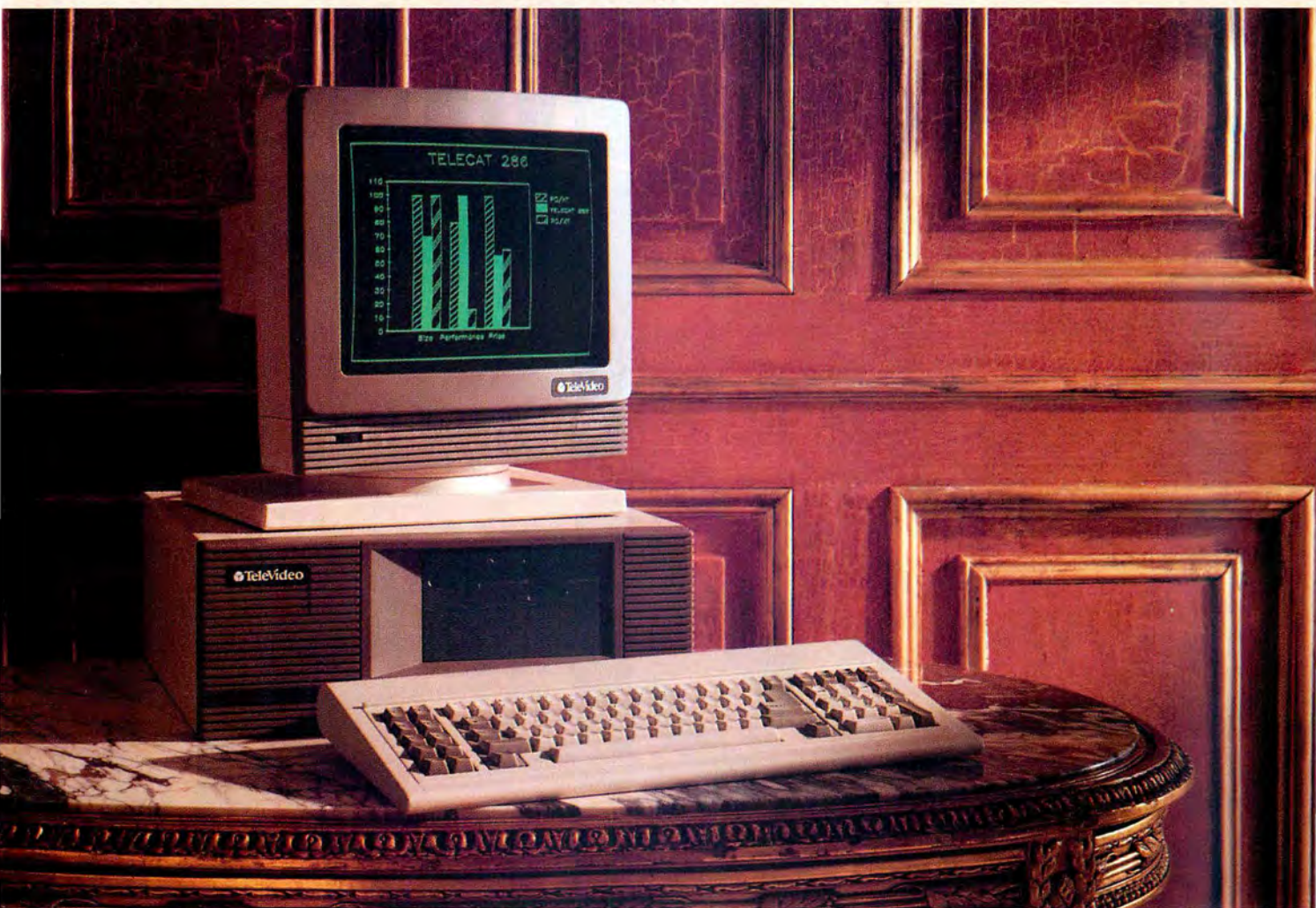


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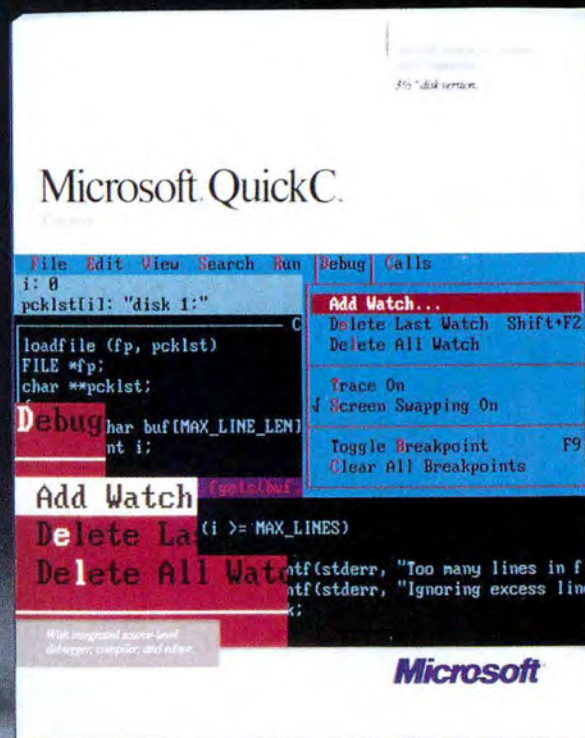
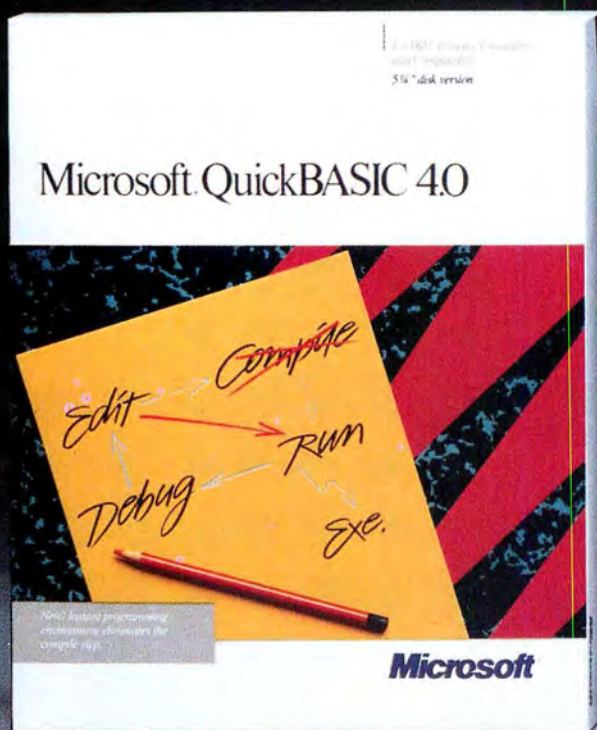
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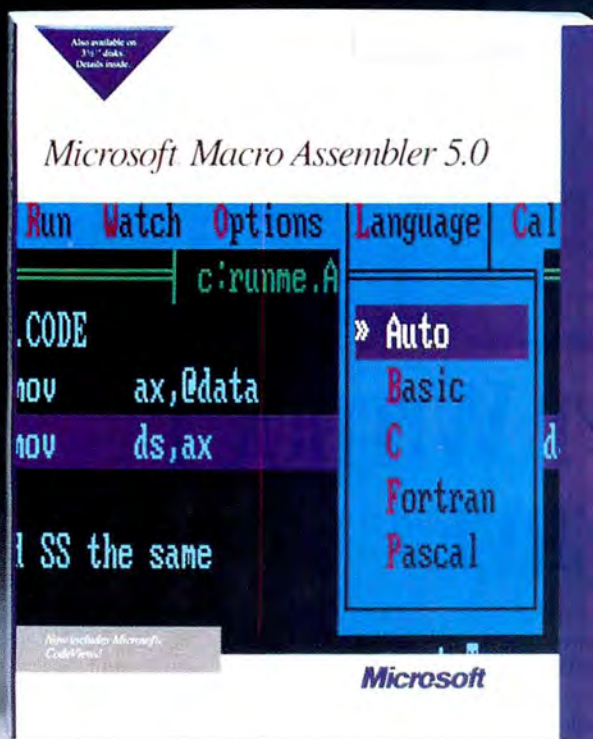
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Consumer Watch

Advice and information for the computer consumer

How to sniff out a scam, where to turn for evaluations of mail-order companies and stores, plus an informative crop of letters from readers

Anita Amirrezvani

Last summer, ads for a Beverly Hills mail-order company named Compusystems appeared in several national computer publications, including *Byte*, *InfoWorld*, and *PC World*. The prices listed were unbelievably low: \$389 for a NEC MultiSync monitor, \$142 for *WordPerfect*. But as some cautious readers soon discovered, there was something fishy about the operation. Calls for information or technical support were taken by an answering service, and the company accepted only personal checks as payment for products.

At press time, Compusystems was under investigation by the post office. The company is suspected of falsifying its credit references, placing a blitz of ads to lure customers, and cashing checks for orders without delivering the goods. Postal Inspector Gary Austin estimates that hundreds of people sent money to Compusystems's swank-sounding address—actually a private post office box—before the post office began returning mail to senders. If you've sent money to Compusystems and received nothing in return, send a copy of your canceled check (both front and back) and a short description of what happened and where you saw the ad to Inspector Gary Austin, P.O. Box 4140, Burbank, CA 91503-4140. The account numbers on the check will help investigators track down the money.

Protecting Yourself From Fraud
Although several government and nonprofit organizations assist consumers after they've been ripped off, not many agencies can help you evaluate a company before buying its products. The Better Business Bureau (BBB) is the only organization whose regional of-

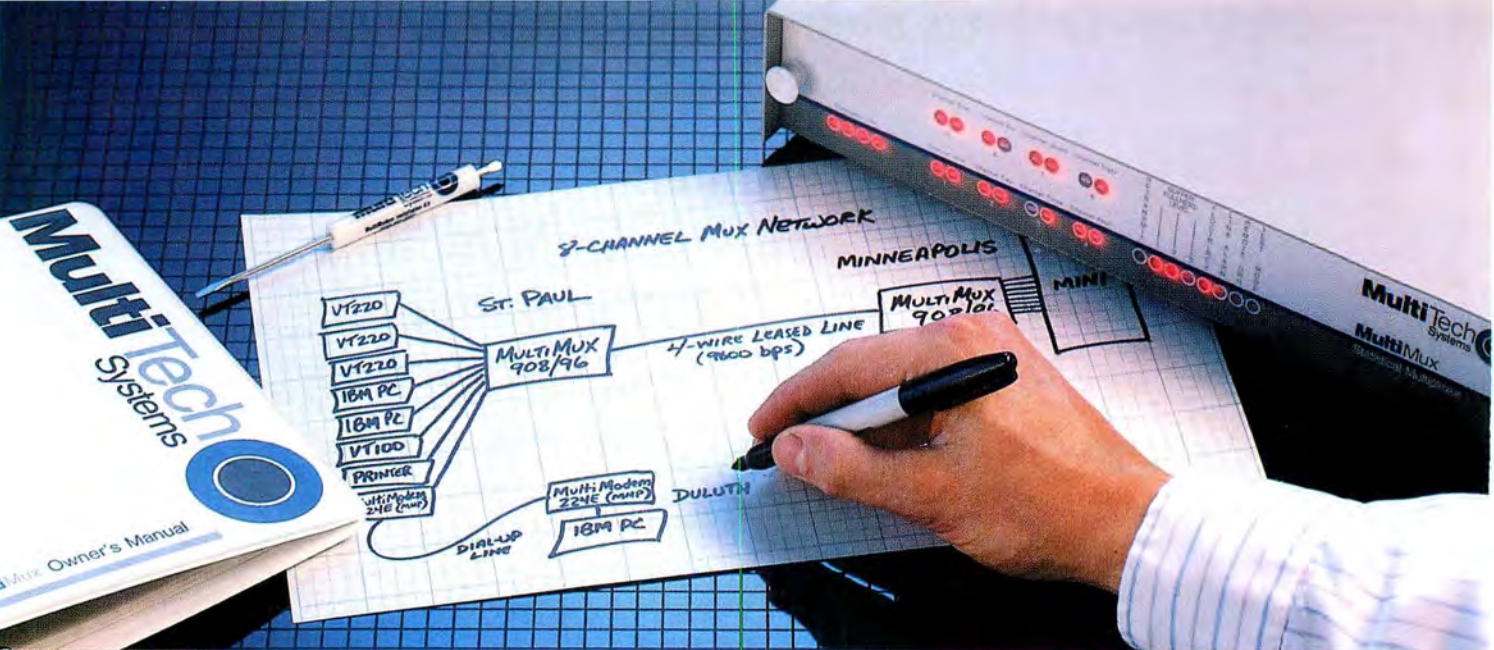
fices keep tabs on hundreds or even thousands of companies. Because the bureaus vary in size, depending on support from local businesses, some are better staffed and more active than others.

Information in a typical bureau's files includes the length of time a company has been in business, its location, what services it provides, and its record in dealing with customers. According to Diane Ward, director of public affairs at the Council of Better Business Bureaus, some bureaus will tell you how many complaints have been filed against the company, if any; others will provide an interpretive rating on whether the business's record is satisfactory or not. An unsatisfactory rating comes with an explanation, such as "the company has a pattern of unsatisfied complaints" or "the company does not respond to the bureau."

The BBB can't keep track of everything, though. "The absence of

(continues)





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negative information about a company really should not be viewed as an endorsement—it's just one piece of the puzzle," says Ward. "That's why we recommend that consumers use a number of sources."

Organizations such as the Federal Trade Commission, the attorney general's office, the state-run consumer protection office, and the U.S. Postal Service will let you know if a company is under indictment. But short of prosecution or conviction—a matter of public record—many agencies can't tell you whether they've received complaints. "We get lots of complaints, but we don't have the staff

to investigate them individually, and by law we are not allowed to give out any information about them," says Ginger Taylor, manager of the advertising review program in California's department of consumer affairs. Some state attorneys general work under the same restriction. Elena Boisvert, business regulation counsel with the National Association of Attorneys General, reports that "some state statutes require absolute confidentiality, particularly when an investigation is under way."

Still, there are some good sources of opinion about retail outlets. User groups can refer you to the mail-order companies or stores that members patronize. In *PC Reports*, the Boston Computer

Society's newsletter, longtime columnist Barbara Chertok keeps an eye on the good and the bad among mail-order companies. The "Vendor Experience" column, edited by Dan Yurman in *Monitor*, the newsletter of Capital PC User Group, describes members' experiences with retail outlets in the Washington, D.C., area. Russ Walter, author of *The Secret Guide to Computers*, will let you know what he's heard about a given company. You can call him for information 24 hours a day at 617/666-2666.

Finally, if you're shopping for a reputable computer store, the Association of Better Computer

(continues)

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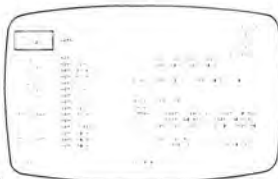
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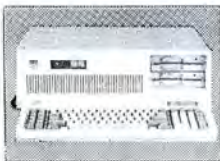
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We call it MemoryMate. A new breed of data manager that reduces your paper clutter and takes the mess off your desk.

Unlike structured data bases, MemoryMate is free-form and works intuitively. Once you enter a record (up to 60 lines each) every single word, phrase, and date is automatically indexed. And cross-indexed.

Which means that MemoryMate can find that record later by using any word, date, or phrase in it. And MemoryMate does it fast. You can search 180K on a PC XT in three seconds!

And since MemoryMate is memory-resident, it's always there. You can access it while other programs are running. You can even cut and paste between MemoryMate and other programs. And vice versa.

Just enter your memos, notes, tables — anything — using the built-in word processor. You can forget designating "keywords." Just like you can forget where you stashed that important scrap of paper or yellow Post-it®.

You can even forget all your to-do lists and deadlines. Because MemoryMate reminds you. Tickler messages pop-up on screen automatically on the days you select.

So how complex is all this to operate? MemoryMate has only 15 simple commands and they're always on screen. So you can access all that power easily — without having to remember a thing.

Find what you need using a single word. Or a sentence.

Let's say you want to call an attorney you met playing tennis last May. But you can't remember his name. All you remember is that you put a note about him in MemoryMate. So you type in the word "tennis" and hit the search key. In seconds, all records containing "tennis" begin to appear. But let's say you also manage a tennis league. You've got tons of "tennis" entries. To narrow your search, you type "tennis and May and attorney". Bingo! You've got his name and phone number.



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Much more, according to Michael J. Miller, InfoWorld: "If you've got lots of unstructured information to keep track of, MemoryMate is a wonder... And at \$69.95, it's a bargain."

PC Week agrees: "Once you've unlocked MemoryMate's power, you'll wonder how you ever got by without it."

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With all this praise and all these incredible features, you'd expect MemoryMate to cost a lot more than \$69.95. But it doesn't.

And, right now you can get a demo disk for less than six bucks — which can be rebated when you buy MemoryMate. So fill in the coupon below and send it in. And be sure to do it now, before you forget.

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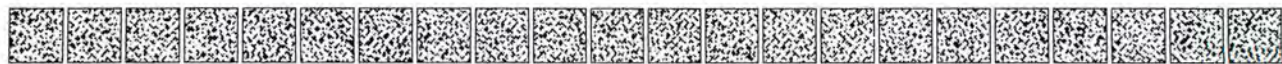
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With a Wary Eye

Your best protection against getting scammed is a healthy sense of skepticism. Unfortunately, ads in even the most reputable publica-

tions don't guarantee an advertiser's legitimacy. Most periodicals don't investigate companies that take out ads beyond checking their credit references, unless they receive consumer complaints.

"One of the ways consumers can check out a company is to call the publication where the ad appears and ask how long the company has been doing business with the publication," says Andrew Eiler, author of *The Consumer Protection Manual* (Facts on File, New York, 1984). "If the ad is a first-time thing, forget it."

When scrutinized, the CompuSystems ads revealed quirks and inconsistencies. First, there was the combination of cut-rate prices and free delivery. "If it's too good

to be true, it's probably a hook," points out Eiler. The ad also contained contradictions, according to Dan Yurman, who with other members of Capital PC User Group informed the weekly computer press of his suspicions soon after the ad appeared. "The ad said the company would 'ship fast anywhere,' but in fine print it said that delivery required four to six weeks. Any reputable company should be able to get a product to you in about five days when you pay by check or credit card." Yurman also notes that the pricing was inconsistent: "dBASE III Plus was selling for \$220, while *Rapid-File*, Ashton-Tate's low-end product, was selling for more—\$250."

(continues)

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Compusystems' check-only policy was also suspicious. Says Eiler, "When companies ask you to pay by check, they're really asking for cash in advance because they can cash the check before sending you the product. And how are you going to sue a post office box 3000 miles away?"

Most consumers are aware that shopping by credit card is safer; if something goes wrong you can write your credit card issuer asking that the charges be removed from your statement. Another safe way to do business is to shop C.O.D., particularly now that the post office has modified its regulations. Since June 7, consumers can

pay for C.O.D. orders using a check made out to the mailer instead of to the post office. "A number of mail-order merchants were sending out fraudulent or misrepresented merchandise, and the rule is you can't open the package before you pay," says Tom Ziebarth, senior attorney in the consumer protection division of the U.S. Postal Service. Now, if the merchandise is defective, you can always stop payment on the check. Although many mail-order companies won't ship orders C.O.D., in some cases this method can protect you against fraud, including nondelivery of goods.

Finally, consumers can learn a great deal by talking to a company's representatives. When you shop at a store, you can take in

firsthand the quality of the help (or lack thereof), the look of the displays, and the prices of products. You can approximate this process by calling a mail-order company and chatting up its employees. Asking the company for references is another quick way to check legitimacy. Advises Postal Inspector Gary Austin, "Call a company and have them send you a credit reference along with the phone numbers of satisfied customers."

Consumers should also beware of companies that move around or change their name to avoid debts and dissatisfied customers. (Sometimes you can recognize that it's

(continues)

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the same company through its ads or product offerings.)

Every corporation is required to file papers with the state or county listing its name and its officers. But it's relatively easy for a business to suspend its activities under one name and then resume them under another. You can check into this by calling the appropriate government agency and finding out if the officers of one corporation are the same as the officers of the other.

When you have doubts about a company, try to minimize risk. Don't buy until you're convinced the company is legitimate. Then, "start off with a small order," advises John Lamb, staff counsel for

California's department of consumer affairs. Or shop from a familiar outlet, even if its discounts aren't as deep: You may get a better bargain in the long run.

Shop Talk

What's in a Word?

After seeing an ad offering "Dysan 100% certified bulk disks," I called MegaSoft in Freehold, New Jersey. To confirm that the disks were indeed Dysan disks I checked with the salesperson before ordering. But when the disks arrived, the invoice proclaimed them to be Xidex. I called MegaSoft and was told that "the disks are Xidex brand made by Dysan."

I complained that the advertising was deceptive and was told that "we always tell people before they order that these are Xidex disks by Dysan."

John D. Toppins
Tuscaloosa, Alabama

Editor's note: Dysan Corporation was acquired by Xidex Corporation in February 1985. As reported in Consumer Watch in September 1987, Xidex sells floppy disks directly to consumers under three labels: Dysan, Storage Master, and Precision, with clip rates of 75, 60, and 40, respectively. The company also sells disks in bulk (i.e., without a label) to distributors. According to Bernadette Sramek,

50 DESKTOP ORGANIZERS.





product manager for Xidex's flexible disk line, "No one has permission to use our name when selling our bulk product."

In a phone interview, MegaSoft spokeswoman Barbara Gall said the ad had been pulled. Mr. Toppins received a refund.

Wanted: A Small Sum

I purchased Rose Associates' medical accounting package in the summer of 1986 and returned it for a refund in September under the company's 90-day guarantee. But after writing to the company several times I've received no response.

J. M. Honaker
Frankfort, Kentucky

Rose Associates responds:

In providing \$69.95 packages designed for the specific needs of 12 different industries, we felt we were offering one of the best bargains on the market, but sales have not borne out our premise.

We are advising all clients validated for refunds that our financial situation has kept us six to nine months behind in sending them their money. We are also telling them that they can request an updated program, in lieu of credit, so that they have something until we are in better shape financially.

We've also discontinued our money-back guarantee, which was badly abused. Some clients re-

turned the package for a refund and later called for support.

Roy H. Rose
Owner

Is Anyone Home?

After buying *Dollars and Sense* from Monogram Software I discovered the disk was defective. A technical support representative agreed to send me a replacement, but after two follow-up letters I have yet to receive it. I've tried to get in touch with the company for two months, but the number rings without being answered.

Carl A. Wales
San Diego, California

(continues)

50 ORGANIZED DESKTOPS.

RIGHT HAND MAN 4.0™ RAM-RESIDENT DESKTOP ORGANIZATION FOR AN ENTIRE NETWORK— OR A SINGLE USER.

Organization isn't just for individuals—it's for organizations. And only one desktop organizer lets you provide more databases, more applications, more productivity and better organized desktops for all the users who need them.

RIGHT HAND MAN 4.0 gives each user immediate access to 60 different windows—a complete library of programs—while using only 48K of memory. RIGHT HAND MAN lets you customize your own databases and store them in RAM until needed.

RIGHT HAND MAN runs on all local area networks, is PS/2 compatible and even has electronic mail. In addition, its record and file locking capability lets you achieve higher group productivity without compromising data security.



UNPRECEDENTED FEATURES, FUNCTIONS AND FLEXIBILITY.

RIGHT HAND MAN includes Auto Install, Appointments with Alarms, In-Application Auto Dialer, Import/Export Module, Macro Keys, Typewriter, Calculator with Tape, Editor, Password Options and EMS support.

The industry's first Multi-User Desktop Organizer is priced at just \$149.00 for 5-user systems,

\$399.00 for 25-user systems, \$695.00 for the 50-user package—and only \$59.00 for the single-user version.

For additional information contact FutureSoft, 665 Tanglewood Lane, P.O. Box 1489, Silverthorne, CO 80498. (303) 468-6346.

For the name of the dealer nearest you, call:

1 (800) 327-8296

FUTURESOFT

Dealers interested in carrying RIGHT HAND MAN should contact Software Resource at (800) 851-9010, in California (800) 851-9009.

Circle 292 on reader service card

ALL IT LACKS IS

A choice of snap-in/out, 24- or 18-pin print heads gives you the versatility and ease of maintenance that other printers lack.

With a top speed of 360 cps, it makes most printers seem downright lackadaisical.

ALPS P2400C

But who needs competition when you've got all this?

Namely, the
ALPS P2400C™
Dot Matrix Printer.

No other printer in its class can do so much for so many for so little.

For instance, the P2400C can easily take on all the work an office full of busy PCs can dish out.

And take care of it faster. Thanks not only to its talents pointed out above, but to its many others, as well.

Like a choice of draft, correspondence and letter quality print modes. A print buffer expandable to 256K. Multiple font cartridges. And full compatibility with the most popular PCs and software.



For letters, seven-color graphics, spreadsheets or whatever, its output is so brilliant, everything else appears lackluster.

COMPETITION.

Most printers lack the good sense to include a paper-saving, push/pull tractor for both bottom and rear feed. Not this one.

You also get conveniences that many other printers are lacking. Like control of everything from the front panel, the feature menu, or from software—without using DIP switches.



Not to mention the ability to run quietly. At under 55dBA, the P2400C is one of the least noisy printers around.

One of the most durable, too. It comes with a full, one-year limited warranty. And if you give it normal care, it'll give you over five years of trouble-free performance.

Of course, there's nothing like a live performance to prove there's nothing like the P2400C.

Circle 2 on reader service card

For a free demo, or more information, call us at **(800) 828-ALPS**. In California, (800) 257-7872.

And see what every other dot matrix printer is lacking.

ALPS
AMERICA

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CopyWrite backs up hundreds of copy protected software packages for the IBM PC. Where feasible, **CopyWrite** removes copy protection entirely.

CopyWrite now includes **ZeroDisk**, allowing you to run some popular software from a hard disk without anything in your floppy drive. Call for the list of software it handles.

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To order, send us a check for \$50 US funds, or call with your credit card. We ship within a day. Available on 3 and 5 inch diskettes.

Quaid Software Limited

45 Charles Street East Third Floor Dept 225
Toronto Ontario Canada M4Y 1S2

(416) 961-8243



Monogram Software responds:

I checked our correspondence files and found no record of Mr. Wales' letter. Because we moved recently and reorganized our technical support department, I suspect his replacement order was lost in the transition. I've forwarded him the new disk along with an apology.

For a month we've experienced difficulties with our incoming support lines. A continual ring rather than a busy signal gave the impression that no one was here to accept the call. This situation has been resolved; we regret the inconvenience.

Richard D. West

Manager, Support Services

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(916)-424-1277



Circle 259 on reader service card

PC Plaudits

In June 1986 I purchased a computer with a 30MB Tulin hard drive from PC Systems in West Palm Beach, Florida. A year later I began to get data-read errors—right after the warranty had expired. So in July 1987, I took my computer to PC Systems' warehouse to buy another hard drive.

Within 30 minutes the new Seagate drive was installed; the service manager asked for \$10 for the installation. When I asked why there was no charge for the new drive, he smiled and said, "Because the Kingfish is crazy." The

(continues)



You can store up to 50 color pictures on this 2-inch magnetic disk. But it's all strictly business, because these aren't ordinary color pictures. They're electronic images created by Kodak still video products.

These new products capture, store, display, and transmit high-quality still video images in continuous-tone color.

For instance, you can put 30 of these disks into a tray and gain immediate access by categories to any of 1500 color pictures with the Kodak SV7500 still video multidisk recorder.

Individually, linked together, or integrated into existing communications and imaging systems, these products can enhance the efficiency of image handling in many areas, including businesses, the professions, industry, government, and education.

For more information about Kodak still video products and the name of a dealer who can arrange a demonstration, call **1 800 44KODAK (1 800 445-6325), Ext 110.** Or, send the coupon below.

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Send me information on the products I have checked.

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- ☐ KODAK SV7400 Still Video Recorder
- ☐ KODAK SV6500 Color Video Printer
- ☐ KODAK SV5000 Video Transfer Stand
- ☐ KODAK SV1300 Color Monitor

Eastman Kodak Company
Dept 412-L
Rochester, NY 14650

☐ Please have a sales representative contact me.

Name _____ Title _____

Organization _____

Nature of Business _____

Address _____ Phone No. (____) _____

City _____ State _____ ZIP _____

Advanced Revelation Paint Main Menu

Quick Paint

Relations

Set Video

Security

Indexing

Key Disable

"Quick painting method when the dictionary is already de

Invoice Entry Window

INVOICE.NO
INVOICE.DATE
CUSTOMER.NO

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Advanced
Revelation
Prompt Options

Option

1>Prompt Window

2 Remove Prompt

3 Drag Prompt

4 Reorder Prompts

5 Edit Dictionary

6 Edit Help Record

7 Hide Settings

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This feature-rich package combines the accumulative benefits of more than a dozen programs into an affordable, integrated package. Check the table for details. At \$199.95, CONNEX is a genuine bargain, so why not use the coupon to order today? We can even bill you later!



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Features XMODEM Binary Transfer

Major Features

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Additional Features

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Full Support For:

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FINALLY!

EASYFLOW

A *on-screen flowchart processor that knows about flowcharts - not just another "screen draw" program that makes you do most of the work. EASYFLOW is a powerful full-screen graphics program dedicated to flowcharts and organization charts. With it you can quickly compose charts. More important, you can easily modify charts so they are always up to date.*

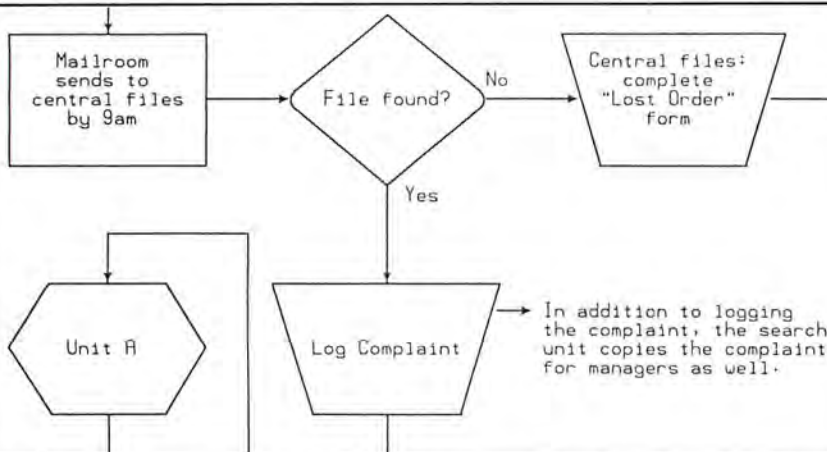
- ▶ **Automatic:** Fully automatic text centering within shapes, both horizontally and vertically. Fully automatic line routing & re-routing.
- ▶ **Fast:** Written in assembly language for speed.
- ▶ **Large:** Charts up to 417 columns wide by 225 lines high. Chart too large for your printer? EASYFLOW automatically breaks the chart up & prints it in page size pieces.
- ▶ **Standard:** All standard flowcharting shapes included. Custom shapes can be ordered.
- ▶ **User friendly:** Don't take our word for it. PC Magazine* says "EASYFLOW lives up to its name. It's hard to imagine any easier and more flexible way to produce basic and even complex flowcharts".
- ▶ **Mouse:** Optional but fully supported.
- ▶ **It prints:** On most popular matrix printers including IBM, Epson, Toshiba, HP LaserJet, LaserJet-Plus and many others.
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- ▶ **It works:** We are contractually prevented from mentioning the name of the "big eight" accounting firm that purchased a world-wide site license, but we can tell you that they spent months evaluating all available flowcharting packages before choosing EASYFLOW.
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EASYFLOW works on IBM PC's, IBM PS/2 and compatibles. Requires 384 K memory, DOS 2.0 or higher and an IBM CGA/EGA/VGA or Hercules monochrome compatible adapter card.

Order direct for only **\$149.95** + \$2.00 S&H (USA/Canada), \$10.00 (foreign). Payment by M.O., cheque, VISA, Mastercard or Company PO.

* March 10, 1987 issue, page 278.

** Rush orders are shipped by Purolator Courier and normally arrive the next business day to most locations. Remote destinations take longer.



The chart fragment above was produced on an HP LaserJet-Plus and is actual size and unretouched. Publication quality charts like this can be produced using only minutes of preparation time and seconds of print time.

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Telefax(G3): (613) 544-9632



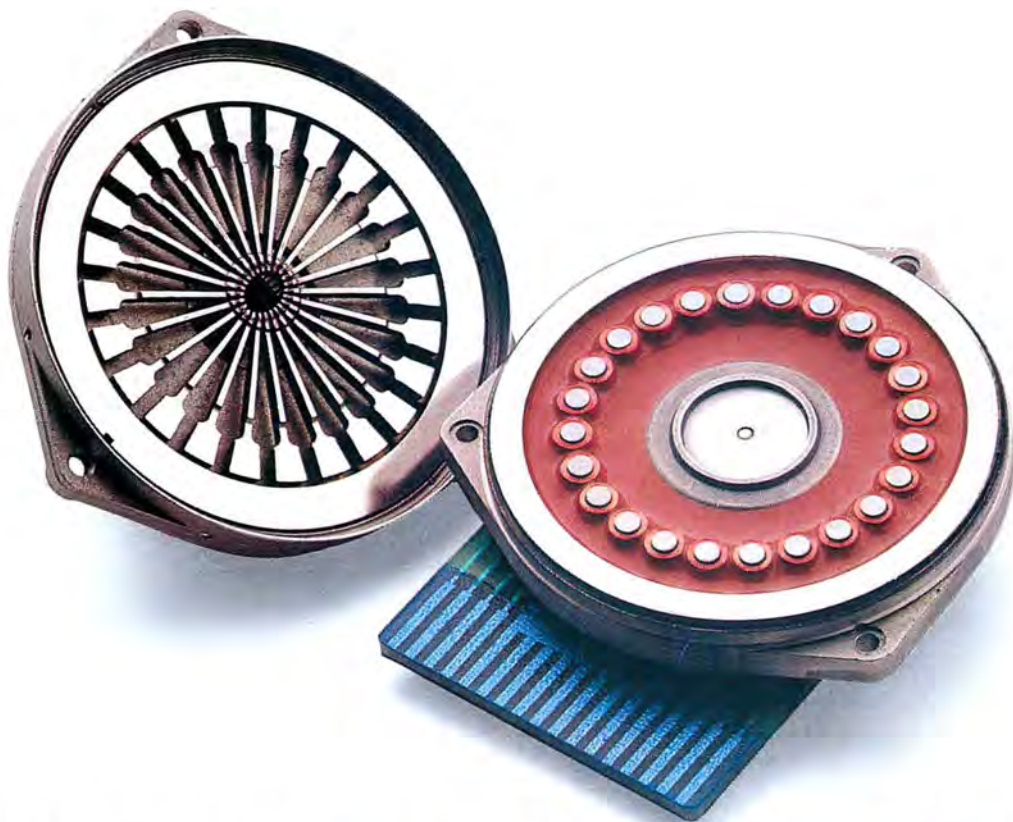
puzzle was solved when I went home and read PC Systems' company flier, written by the owner, Stewart E. Fason, a.k.a. the Kingfish.

Fason writes, "Last June we sold over 500 Tulin 30MB hard drives for \$395. The warranty has expired and data-read errors are becoming chronic. If yours has not failed...it probably will. This is gonna hurt but fair is fair. Call for RMA [return merchandise authorization] number and return the \$%#&@#\$ thing by 8/10/87 and we will replace with a new Seagate or refund your money. Anybody want 500+ paper-weights...cheap?"

For over a year I've gotten this kind of first-class service from PC Systems. Perhaps the Kingfish is not so crazy after all.

J. M. Brooks
Singel Island, Florida

Got a gripe? Want to set the record straight? Write Consumer Watch, PC World, 501 Second St., San Francisco, CA, 94107, or use MCI Mail PCWORLD/179-3813, CompuServe 74055,412, or The Source STE908. Include your name, city, state, and daytime telephone number with all correspondence. Letters may be edited for length and style. Due to volume, we cannot acknowledge every letter. ●



HEADS UP, JAPAN.

Above you see the most ingenious printhead developed in years.

It's a new stored-energy head that uses less energy and delivers more speed than traditional ballistic printheads.

And according to *Infoworld**, delivers constantly superior print quality, with letter quality comparable to a laser.

You'll find this printhead, with its seven patents on design, materials, and production process, only on Mannesmann Tally's newest family of printers. Including the 24-needle MT330 word processing printer, a 10,000 page-per-month, 300 cps printer. And

the 18-needle MT340 data processing and industrial graphics printer, a 13,000 page-per-month, 400 cps machine.

We invite you to compare either of these heavy-duty printers to their Japanese counterparts.

Because head to head, we win.

And body to body? Again from *Infoworld*: "...most plastic and metal components appear quite a bit sturdier than their Japanese equivalents."

Again, bad news for Japan. But very good news for you.

To take advantage of this news at a pleasantly surprising

price, call the number below for the name of your nearest dealer.



MT340

MT330 with optional dual bin sheet feeder

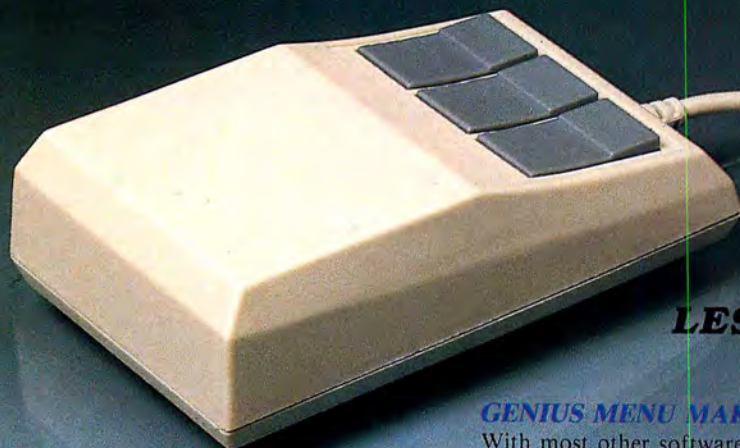
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Circle 112 on reader service card

Genius Mouse \$99



GM-6 PLUS MOUSE

**MENU MAKER SOFTWARE
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**MORE PRACTICAL
MORE CONVENIENT
LESS EXPENSIVE**

The Genius Mouse GM-6 Plus is the most versatile and convenient Mouse there is. It comes in its own handy casing, ready to use any time you need it. No matter what your set-up is nor what program you use, the Genius Mouse GM-6 Plus will run its mazes.

Product	Genius Mouse GM6	Logimouse C7
Price	\$99	\$99
Function	Genius	Logi Mouse
	Microsoft PC Mouse	
Interface	Serial	Serial
Power Supply	Internal	Internal
Resolution (dot/inch)	22-200 dpi	200 dpi
Button clicks	1 million	0.3 million
Menu maker	YES	NO
Driver	YFS	YES
Paint software	DR. HALO III	NO
Slide show	DR. HALO III	NO
Pad	Mouse/cutting pad	NO
pocket	YES	NO

Click a button, flip a switch and your Genius Mouse GM-6 Plus is compatible with PC Mouse and Microsoft Mouse. It compares favorably with other, in its category, even with Logitech Mouse.

A house for your mouse, makes it more practical, more convenient to use. When the surface is not smooth, it has its own running pad. Flip the pad, and you have a very convenient cutting board.



Genius Mouse Pocket and Pad

GENIUS MENU MAKER

With most other software is too hard to create a pop-up menu. Even with built-in software, you cannot create your own. Using the Genius Menu Maker, you may create a special pop-up menu for any applications. For example, DBASE II, DBASE III, WORDSTAR, SYMPHONY, MS WORD, GBASIC, FRAME WORK, PERSONAL EDIT, VISICALC, SUPERCALC & SMART WORK... etc.



Create a Pop-up Menu and Run in Your Applications

PROFESSIONAL PAINT & SLIDE SHOW-DR. HALO III

The Professional Graphics Software:

- * Includes 256 color types
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Lotus 123, Wordstar, Logitech, Microsoft, PC Mouse, Hercules, DR. Halo III are registered trade markers.

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CSS

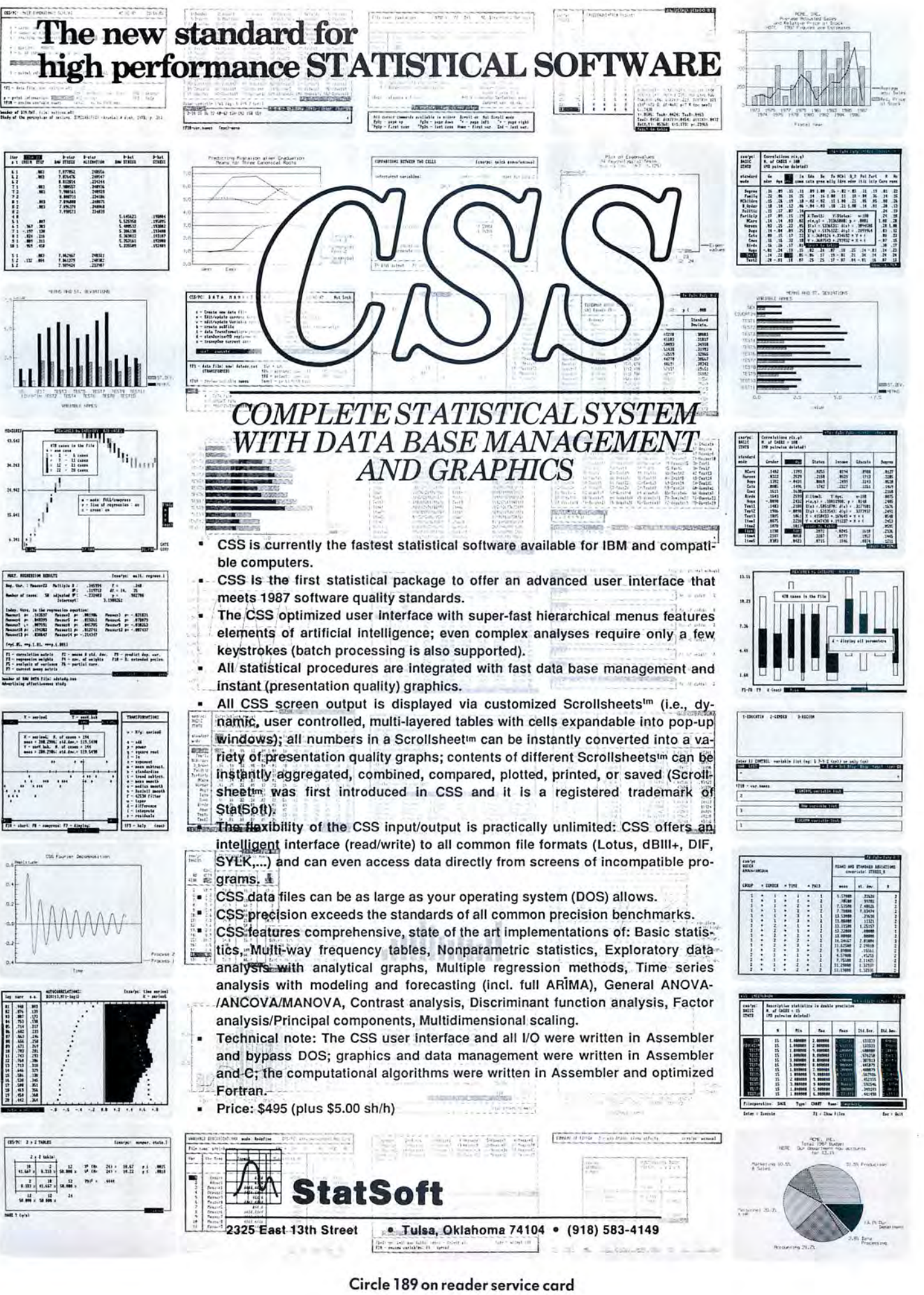
COMPLETE STATISTICAL SYSTEM WITH DATA BASE MANAGEMENT AND GRAPHICS

- CSS is currently the fastest statistical software available for IBM and compatible computers.
- CSS is the first statistical package to offer an advanced user interface that meets 1987 software quality standards.
- The CSS optimized user interface with super-fast hierarchical menus features elements of artificial intelligence; even complex analyses require only a few keystrokes (batch processing is also supported).
- All statistical procedures are integrated with fast data base management and instant (presentation quality) graphics.
- All CSS screen output is displayed via customized Scrollsheets™ (i.e., dynamic, user controlled, multi-layered tables with cells expandable into pop-up windows); all numbers in a Scrollsheet™ can be instantly converted into a variety of presentation quality graphs; contents of different Scrollsheets™ can be instantly aggregated, combined, compared, plotted, printed, or saved (Scrollsheet™ was first introduced in CSS and it is a registered trademark of StatSoft).
- The flexibility of the CSS input/output is practically unlimited: CSS offers an intelligent interface (read/write) to all common file formats (Lotus, dBase, dBase III, SYLK, etc.) and can even access data directly from screens of incompatible programs.
- CSS data files can be as large as your operating system (DOS) allows.
- CSS precision exceeds the standards of all common precision benchmarks.
- CSS features comprehensive, state of the art implementations of: Basic statistics, Multi-way frequency tables, Nonparametric statistics, Exploratory data analysis with analytical graphs, Multiple regression methods, Time series analysis with modeling and forecasting (incl. full ARIMA), General ANOVA/ANCOVA/MANOVA, Contrast analysis, Discriminant function analysis, Factor analysis/Principal components, Multidimensional scaling.
- Technical note: The CSS user interface and all I/O were written in Assembler and bypass DOS; graphics and data management were written in Assembler and C; the computational algorithms were written in Assembler and optimized Fortran.
- Price: \$495 (plus \$5.00 sh/h)

StatSoft

2325 East 13th Street • Tulsa, Oklahoma 74104 • (918) 583-4149

Circle 189 on reader service card





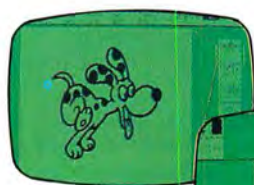
\$299.^{xx}/_{xx}
HANDY
SCANNER
HS-1000

We put Desktop Publishing in Your Hands

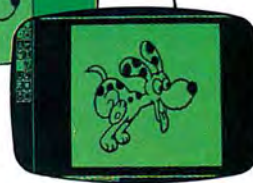
Introducing the new Diamond Handy Scanner HS-1000, for IBM PC XT, AT, and compatibles. It's portable, easy to operate, and convenient — you won't believe how much you can do with it. A page in a book or a photograph — just pass the Handy Scanner over the image to



display it on your screen: none of the hassles of feeding into page scanners.



The HS-1000 is loaded with features, including the following: scans 6cm or 200DPI in each direction; 4 encoding methods, including B & W and 3 half-tones; push button scan control; viewing window to ease scanning; user adjustable brightness control; can be used with Hercules, CGA, and EGA boards. The Handy scanner comes complete with everything you'll need,



including the scanner mechanism, scanner adapter card, utility disks and instruction manual. For Desktop publishing applications, you may use the utility kit to convert files to MICROSOFT WINDOW, GEM, or DR. HALO II. The Handy Scanner HS-1000. You'll wonder how you ever got along without it.

Microsoft is a registered trademark of Microsoft Corp.
 Dr. Halo II is a registered trademark of Media Cybernetics, Inc.
 GEM is a registered trademark of Digital Research Inc.

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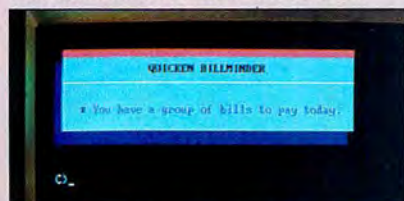
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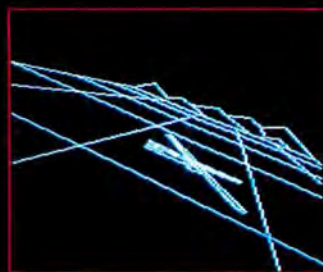
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Does High-Tech Need DARPA?

Targeting the Computer: Government Support and International Competition

Kenneth Flamm

The Brookings Institute, Washington, D.C., 1987

266 pages

\$31.95 hardcover; \$11.95 softcover

In 1981 the Japanese government announced plans to spend \$450 million on "fifth-generation" computers. Dedicated to building computers that can converse, learn, and reason, the Japanese project has fueled an ongoing debate in America. Should the U.S. government likewise fund basic high-tech research? Or do market forces provide all the impetus America needs to stay competitive?

Targeting the Computer: Government Support and International Competition by Kenneth Flamm, a research associate at the prestigious Brookings Institute, advocates direct government intervention. Here's his argument: U.S. economic survival depends on maintaining our status as an "inventor" country because high-tech inventions for export pay for our imports. Since there's no guarantee the private sector will invest in basic research, the government must develop formal mechanisms to fund it.

Flamm believes America's lead in computer technology thus far is largely due to the military. The computer revolution occurred, he says, because of "the willingness of military services to push development when civil authorities seemed to lack the interest, the will, or the resources."

He points out that much basic research *not* focused on particular military applications was funded by the Defense Advance Research Projects Agency (DARPA). Among the technologies benefiting from DARPA research are AI, graphics, electronic mail, time-sharing, and networking.

Flamm's argument is timely because DARPA's focus has changed in recent years. DARPA's budget has been slashed in favor of "Star Wars," and what remains is narrowly application-oriented. Furthermore, these funds end up in industry rather than academic research labs. America's commanding lead in high-tech research, claims Flamm, has shrunk correspondingly. His recommendation: Create a National Technology Office to fund basic research and to act as a clearinghouse for generic, precommercial technologies.

Flamm's argument is compelling, and his evidence fresh, extensive, and valuable. He analyzes the rate of return on private as well as public investments in technological research and development, for instance, clearly laying out the relative importance of factors (such as potential foreign sales) that a firm must take into account before making substantial commitments.

(continues)

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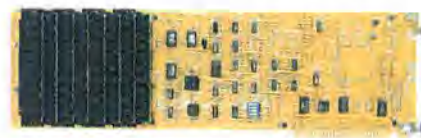
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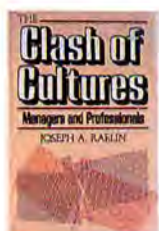
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Question Authority

The Clash of Cultures: Managers and Professionals

Joseph A. Raelin

Harvard Business School Press,
Boston, 1986

299 pages

\$19.95 hardcover

Another area in which Japanese industry poses a challenge to America is management expertise. Optimizing productivity means constantly seeking the right blend of worker autonomy and management supervision. Yet this blend can be especially difficult to maintain when the worker is a professional operating in a corporate environment, a description that fits some 75 percent of all American professionals.

As Joseph A. Raelin argues in *The Clash of Cultures: Managers and Professionals*, American corporations include two separate

cultures—the managerial and the professional. Style and tactics in these two camps are typically as different from each other as *The Odd Couple's* Felix and Oscar.

A manager identifies with the company, Raelin points out. The professional's chief loyalty, however, is to a larger professional community with its own standards, traditions, and organizations. A professional views the corporation as a place to practice a profession, and may change employers often in pursuit of broader expertise and experience.

Today's professionals—many of whom are baby boomers—won't stand for what Raelin calls the "overemphasis by most American managers on control over their professional employees." He claims that professionals who came of age alongside civil rights marches, Vietnam War protests, and the Watergate hearings have a definite distrust of authority. As a group they're more committed to personal creativity and self-expression than to corporate goals.

The Clash of Cultures identifies many areas of potential conflict between managers and the professionals who work with them. Raelin analyzes these conflicts in terms of cultural determinants and devotes a final, 100-page chapter to "mediation strategies" that management can implement. Some are relatively simple, such as having a weekly beer bust or doing away with reserved parking places. Others may demand wholesale restructuring of management, promotion policies, and other areas. This may sound like a

tall order, but Raelin's many concrete examples suggest that a major overhaul can sometimes prove quite productive.



Case Studies in Cultural Clash

Programmers at Work: Interviews
Susan Lammers

Microsoft Press, Redmond,
Washington, 1986

383 pages

\$14.95 softcover

If you don't believe Raelin's argument about warring cultures, listen to top professional programmers talk about their work lives. Macintosh developer Andy Hertzfeld's explanation of why he left Apple is a textbook example: "I clashed with the new engineering manager, who turned out to be a control and authority freak. The guy thought I was too big for my britches and figured he could break my spirit."

The careers of the 19 programmers interviewed by Susan Lammers tend to support Raelin's

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claim that professionals—especially the most productive ones—are uncomfortable with the constraints of corporate culture. Programmers such as John Page (*pfs:file*), Dan Bricklin and Bob Frankston (*VisiCalc*), Jonathan Sachs (*I-2-3*), Ray Ozzie (*Symphony*), and Bob Carr (*Framework*) all have fascinating things to say about computing in general and programming in particular. Few of them, however, have warm words for corporate politics.

Not counting people like Microsoft founder Bill Gates (who developed BASIC for the Altair while still an undergraduate and

who has always worked for himself), the only programmer in the book who stayed with the company where he launched his career is *Pac-Man* designer Toru Iwatani. Interestingly, both he and the company are Japanese.

Other interviewees typically held a variety of posts in different organizations, sometimes moving to and fro between public and private sectors and often achieving autonomy by starting their own commercial ventures.

Jef Raskin, who came up with the Macintosh idea in the first place, recalls “trying to keep the

project away from [Steve] Jobs’ meddling.” Raskin wanted the Macintosh to be “a computer that would be easy to use, mix text and graphics, and sell for about \$1000.” After Jobs took it over, claims Raskin, “the machine became much larger, more complicated, and much more expensive. It now runs like a tub of molasses. Have you ever used *MacWrite*? We call it *MacWait* around here.”

Raskin quit, took a teaching post in Denmark, and then returned to Silicon Valley to form his own company. His comment on Steve Jobs highlights the credibility gap that can develop between professionals and man-

(continues)



Quick—turn the page.

Call for Nominations

Second Annual

Andrew Fluegelman Award 1988

- Purpose** The Andrew Fluegelman Award is given annually to encourage personal computer software excellence and to recognize a software programmer or team of programmers. We are looking for people who have made a substantial, innovative contribution to the personal computer community in commercial, shareware, or public-domain software.
- The award was established in 1986 by PCW Communications, Inc., to commemorate Fluegelman's contributions to the software field. Fluegelman developed *PC-Talk*, the first easy-to-use and powerful communications program for the IBM PC. His concept of freeware remains one of the most innovative means of sharing and marketing software. Fluegelman died in July 1985, and a fund was established in his name. The annual award, sponsored by PCW Communications and the Software Publishers Association, is made possible through the Andrew Fluegelman Fund.
- Eligibility** Any commercial, shareware, or public-domain personal computer software—including utilities, applications, and languages—developed by an individual or a team is eligible. The program must have been released between January 1, 1984, and December 31, 1987. Nominations can be submitted by anyone who did not participate in the software's development. Companies are encouraged to submit nominations for software that they market; but only individuals, not companies, are to be nominated.
- Prize** The award winner will receive \$5000 and a commemorative plaque. The award will be presented at the Software Publishers Association annual awards dinner in California in March 1988.
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 - It demonstrates orientation to personal computer users.
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- Program Copies** Finalists will be asked to submit six copies of their program for the judges' evaluation. These will be returned after judging. Please do not send programs until you are notified that you are a finalist.

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Creator (if more than one, designate team leader): _____
Software marketer: _____ Release date: _____
Brief description of program (100 words or less): _____

Reason for your nomination (100 words or less): _____

Nomination submitted by: _____
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NOMINATION FORM

agers: "He has not designed a single product. Woz [Steve Wozniak] designed the Apple II. Ken Rothmuller and others designed Lisa. My team and I designed the Macintosh. Wendell Sanders designed the Apple III. What did Jobs design? Nothing."

A programmer needn't have worked at Apple to feel unhappy with management. *dBASE* designer C. Wayne Ratliff, who became vice president of Ashton-Tate, complains that managers there "don't feel they can trust individuals. Marketing figures what the program is supposed to do; then marketing tells development what they think that is; then development spends several months

and writes down a very detailed spec of what they think they heard; then many people in the company review that spec and negotiate exactly what it's supposed to do." In this scenario the programmer's job is reduced to coding somebody else's specs—hardly a role that capitalizes on professional pride.

Ratliff concedes that it takes a businessperson to run a company, but laments that "people coming into the business at this late date don't empathize with what software really is. They're in the *business* business, not in the software business."

Lammers' book also points up exactly why programmers (and their professional ilk) need people

who *will* tend to the business of business. Raskin, for instance, paints a hilarious picture of a hapless user confronted with a toaster designed by computer engineers. "First it does a 2-minute toaster check, then you type Load TOASTED.CODE. Up comes the menu. If it's a California program, it'll say croissant, bagel, English muffin, whole wheat, and at the bottom, white bread."

What can companies do to keep the peace between warring internal factions—and maintain productivity? John Warnock, who worked with NASA and Xerox PARC before starting Adobe Systems, suggests: "Keep the number

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Books in Brief

■■■■■

So you've decided not to succumb to the lure of 386 machines, but you still need to soup up your present configuration to remain competitive. *Supercharging Your PC: A Do-It-Yourself Guide to Expanding the PC* by Lewis Perdue ably covers the principles of hardware upgrading, including chapters on memory expansion, storage, graphics, modems, and file servers. But one primer can't cover all PC variations, and Perdue devotes only 10 pages to the latest technology—such as 386 expansion boards, optical disks, and PC-Fax ensembles. Moreover, in those 10 pages you don't get much more than press release coverage of the latest products. His book is a start on the upgrade path, though, and a well-illustrated one at that. \$19.95, Osborne/McGraw-Hill, Berkeley, California, 1987; 370 pages, softcover.

■■■■■

If you travel, a supercharged AT-size machine is too much to lug around. When you're on the road you have to scale down. Dick

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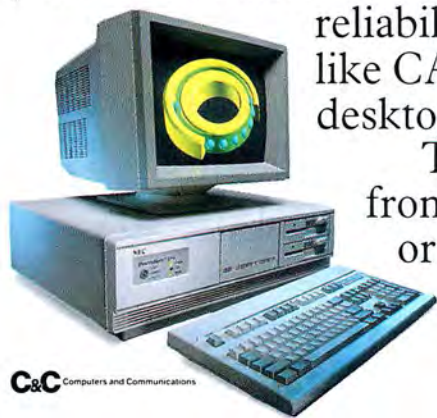
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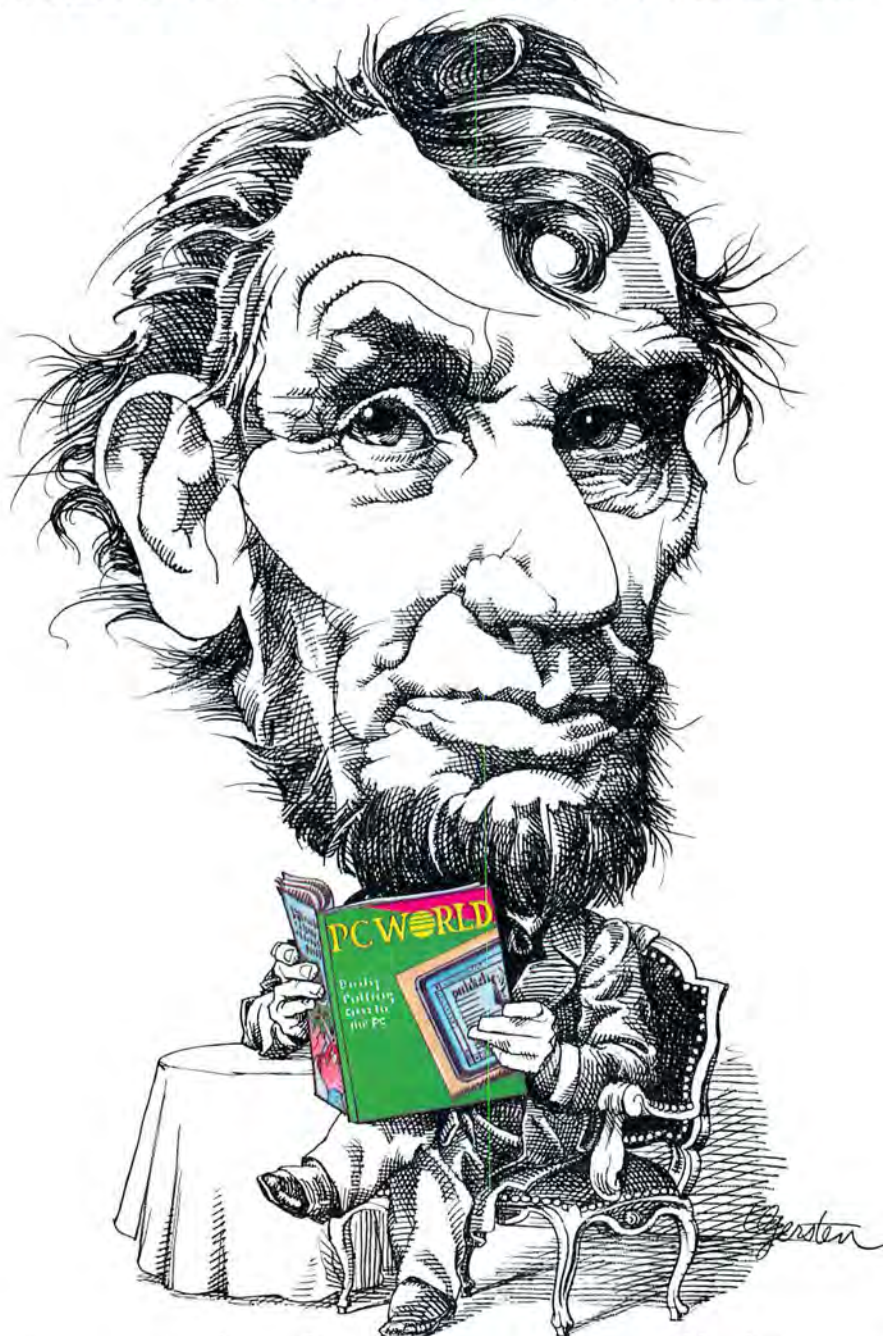
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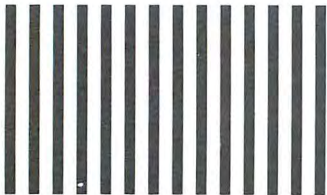


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Conklin's new book, *Power Portable Computing: The IBM PC Convertible*, delivers the Big Blue solution. Beginning chapters focus on system hardware and software, and on such machine-specific matters as the Convertible's function key deployment. Later chapters cover application areas such as data management, spreadsheets, word processing, and—especially important for laptop users—communications. Each of these includes a glossary of relevant terms, listings of compatible products, and a primer of basic concepts. Proving that he's not paid by Boca Raton for nothing, Conklin's thorough, graceful narrative is peppered with juicy computing proverbs. A sensible format, a wealth of illustrations, an exhaustive table of contents, a good index, and useful appendices will help you get the smartest mileage from your machine. \$19.95, John Wiley & Sons, New York City, 1987; 386 pages, softcover.

Those who use their spreadsheets as glorified adding machines can skip this review. Those who work with complex numerical reports (some managers and most financial analysts), however, should keep *A Topical Dictionary of Statistics* by Gary L. Tietjen close at hand. A member of the statistics group at Los Alamos, New Mexico, Tietjen provides an exhaustive index of terms at the back of his book. Definitions for the terms are provided *in vivo* in the chapters, along with suggested applications and allied techniques.

(continues)

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Sourcebooks

Chapter titles include Summarizing Data, Some Useful Distributions, Multivariate Analysis, Survey Sampling, and Regression. Not for the faint of heart or the numerically naive, this reference work from venerable Methuen, Inc., will tell you more than you ever thought possible about stochastic processes. \$22.50, Chapman & Hall, New York, 1987; 171 pages, hardcover.



Another excellent resource, *Fast Facts Online: Search Strategies for Finding Business Information*, by Dan Ness, Jr., is aimed at those who use on-line services extensively—or are planning to. Three initial chapters provide an overview of types of on-line services, principles for measuring the value of on-line information, and general search strategies. But the bulk of the book lists data bases—by subject and by name—spreadsheet style, showing the number of records in the data base, its update cycle, and some indication of its coverage (number of journals or magazines indexed, for example). Too big to handle easily, and poorly bound with rings that are sure to rip the thin paper, this volume is best suited to helping plan a search—its usefulness diminishes in the heat and expense of on-line hookup. \$37.50, Dow Jones Irwin, Homewood, Illinois, 1986; 548 pages, softcover. —M. N. ●

Michael Harper teaches English at Scripps College in Claremont, California. Marlene Nesary is an assistant editor for PC World.

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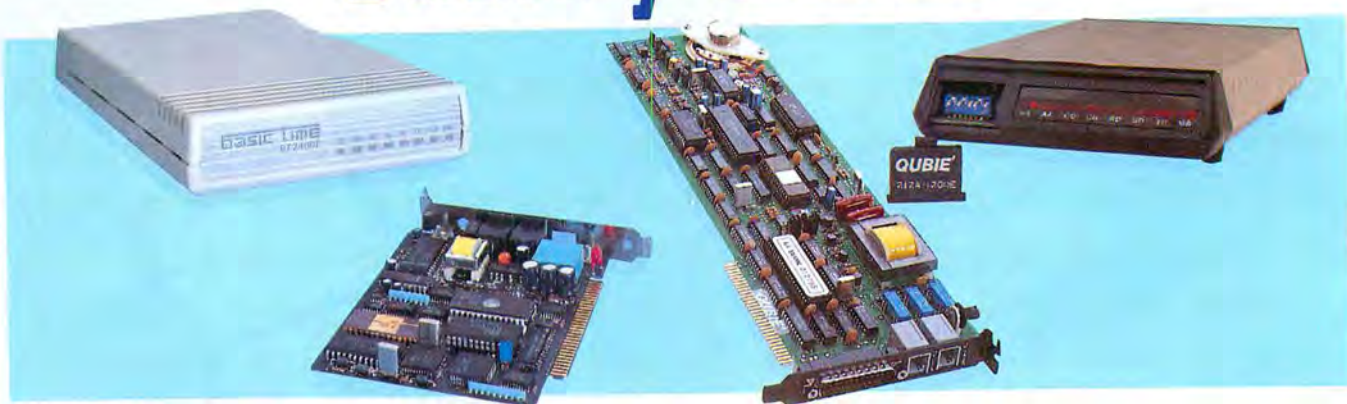
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Robert Carr

Tech Notes: Up Against the 640K Wall

OS/2 means the end of terminate-and-stay-resident programs—or does it?

If you're among the multitude who've occasionally felt boxed in by DOS's constraints on memory and multitasking, RAM-resident pop-ups have probably eased your computing life immeasurably.

RAM-resident—technically, terminate-and-stay-resident (TSR)—programs seem to dispute the notion that DOS tolerates only a single program at a time. TSRs like *SideKick*, *Ready*, and *Metro* were fermented in a brew of user claustrophobia and developer creativity. Developers were quick to exploit a deliberate loophole in DOS, while users whose appetites were whetted by a taste of multiple programs eagerly sought more.

Although both IBM and Microsoft have acknowledged that DOS 3.xx represents a cul-de-sac, there is still life in the operating system. DOS continues to surprise even as the firms jointly cook up OS/2, an operating system that, on paper, could render today's RAM-resident pop-ups relics of an archaic age. But TSRs—or at least the computing mentality they foster—may bridge that operating system gap.

TSR applications have demonstrated DOS's greatest underlying flexibility. DOS still isn't up to true multitasking—which implies hardware protection—but a combination of programmer ingenuity and user enthusiasm has eked out a fair bit of multiple-application capability from an ostensibly single-tasking operating system.

Just what is a TSR? Strictly speaking, it's any application that relies on a special DOS service known as interrupt 39. The key word is *resident*. When most applications cease operations, they issue a request to DOS that they be terminated—which DOS promptly does, expunging the program from memory. TSR programs, however, request termination in a different fashion. They ask that DOS retake control (so you can presumably load and run another program) but that they be permitted to hang around in memory in a kind of suspended animation.

(continues)

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All-Stars Clinch Division Title

Heavy hitting powers All-Stars to the top

Last night, the All-Stars won the game, the title and a chance to shuffle off to Buffalo next week for the championships. The All-Stars powered themselves to the top with a 9-5 victory over the Grass Stains, who had been tied with the All-Stars for first place. The game was tight until the bottom of the fourth when the All-Stars blasted into the lead with two home runs to the upper deck in left field.

The game was highlighted by a most improbable play in which three All-Star players, each running at different speeds, ended up on third base at the same time. Fortunately, the third baseman missed the throw from centerfield, allowing two of the runners to score.

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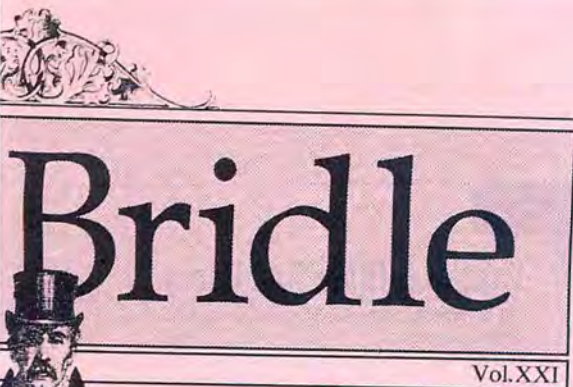
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Given that DOS isn't multitasking, what good is a TSR program luxuriating in memory but not executing? Not much, unless the TSR can grab control back when necessary. And TSRs do regain control, by monitoring special events inside the system and placing themselves on notification lists called interrupts. Whenever the requested event occurs (an internal timer ticks, or you press a key), DOS notifies the TSR and yields control so the suspended application can reappear. It's as though you'd placed yourself on a standing list of invitees to public meetings; you'd always be asked into the meeting when it oc-

curred, and you'd have a chance to speak your piece during the session.

DOS originally sanctioned TSRs so that compact, well-defined utilities could extend the operating system's usefulness. That's why the first onslaught of TSRs consisted of keyboard macro processors and affiliated trinkets. These days, TSR technology has been exploited to put any kind of program imaginable literally at your fingertips. Press a specific key combination, and your TSR spreadsheet, word processor, outliner, C compiler, or utility will instantly materialize. Most appear to neatly work around DOS's single-mindedness in order to forge a multiple-program environment.

But is DOS hardy enough to satisfy rising expectations among PC users? TSR magic does in fact hold some peril. For openers, TSRs must work too hard to make the system function; accordingly, *you* must work too hard as well. Even when users and TSRs do everything they can to make the entire chorus hum, the resulting system isn't all that harmonious.

If you look closer, you'll notice that DOS 3.xx does little for TSRs other than leave them alone in memory. The TSR is responsible for attaching itself to special interrupts (meeting lists) so that it can eventually reassert control. Finess-

(continues)

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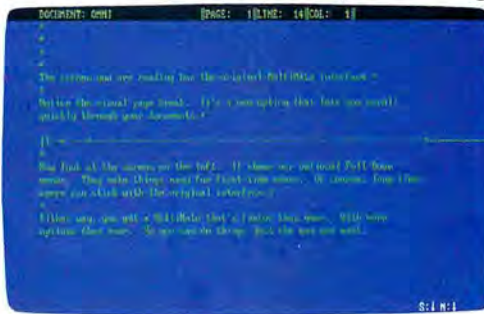


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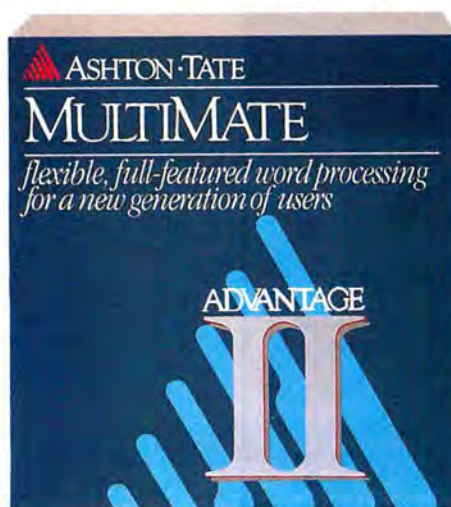
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ing this meeting list registration can, however, be tricky when other TSRs are present. Issues of TSR etiquette—for example, can two TSRs attend the same meeting?—may result in hallway collisions and a system crash if each TSR isn't mindful of the others.

Furthermore, ultimate responsibility for TSR management rests with you: You enforce the loading order, the memory consumption, the (sometimes arcane) key combinations that invoke TSRs. All of this forces you to usurp much of the traditional operating system role; it's DOS, after all, that should be managing requests and providing an easy and consis-

tent way for users to invoke applications.

Finally, the TSR universe is innately unreliable, because the RAM that one application claims as its own isn't shielded from accidental overwriting by another. In DOS, any application is free to write to any address in memory. Wayward behavior may be discovered hours later, when the tainted application is running—and blithely corrupting data. Finding the perpetrator can be impossible.

Users have been remarkably stoic in their acceptance of this madcap RAM traffic; unexplained crashes are tolerated and even expected. But in the long run, too many TSR buffs get bitten—some badly. Bitter experience affirms

that TSRs can be imprudent system-building tools.

Although the TSR revolution is helping to perpetuate DOS 3.xx indefinitely, both TSRs and DOS possess certain fundamental limitations that new-age hardware and operating systems address. The multitasking OS/2 running in 80286 or 80386 protected mode will indeed avert interapplication accidents.

Will TSRs exist under OS/2? If you regard them as applications that coexist in RAM with the other active programs in your quiver, the answer is yes. Giving users the ability to piece together their own

(continues)

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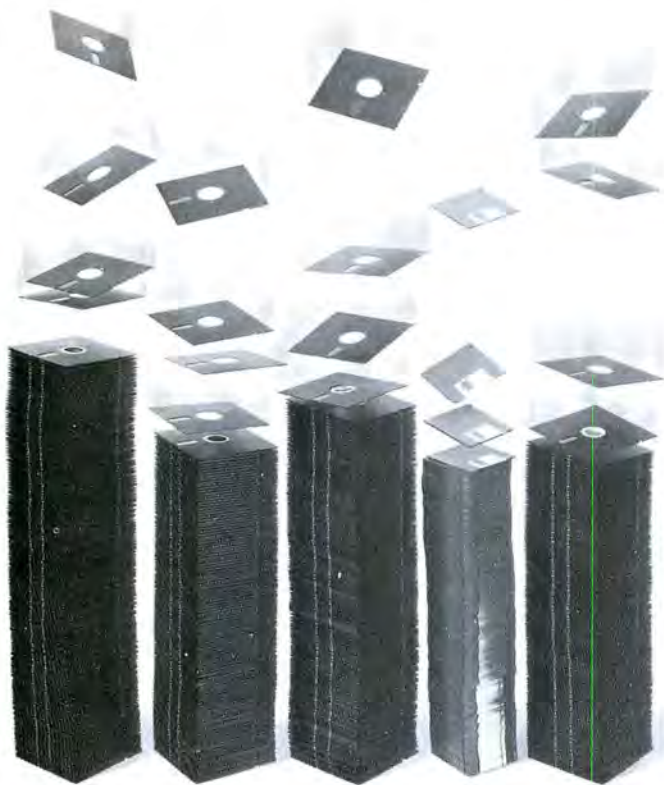
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working suites of concurrent applications is what OS/2 is all about.

But if you define TSRs as those programs that invoke DOS interrupt 39, don't bank on support from OS/2. In this brave new operating system world, every application you run will in effect be a TSR. All of them will be active in RAM (or seem to be, through OS/2's virtual memory) and at your disposal.

OS/2 comprehensively addresses the major limitations of TSRs under DOS 3.xx. Applications will no longer need to invoke themselves or manage their relations with other programs; OS/2's internal multitasking will send control their way as a matter of course. Likewise, users will no longer need to think about TSRs. OS/2's virtual memory component will supervise memory allocation, its virtual machine facility will govern loading order, and its uniform user interface for context switching will handle program choice.

Even though TSRs as we know them will no longer exist, their spirit—as the glue that binds together major stand-alone productivity applications—will flourish under OS/2. In OS/2, a TSR application will not be defined by the technical tricks it plays on the operating system but by the function it provides. Within OS/2, four major application software categories are likely to evolve, of which the first two are logical descendants of today's TSRs.

Utilities will largely deal with extending the operating system, as they do under DOS, particularly

(continues)

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by enhancing software access to hardware devices such as key-boards (via macro processors and cursor accelerators), disks, and printers (via caches and buffers).

Niche applications will be smaller and more specialized than general-purpose productivity packages. Members of this class are apt to include "day timer" calendars, calculators, expense report generators, and the like.

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Compositional applications will tie together the output and the processing energies of the other three application classes. They will orchestrate the entire application environment, acting as super-charged DOS batch files.

These four classes nicely fit an architectural metaphor: The major applications will be the building blocks; the niche applications and utilities will be the mortar that cements those blocks; and the compositional applications will serve as the floor plan that determines how everything fits and where and when information flows.

And the TSRs you've known, usually loved, and occasionally cursed? They'll be but a memory. ●

Robert Carr is vice president of software for the San Francisco-based GO Corporation, former chief scientist at Ashton-Tate, and the creator of Framework.

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Karl Koessel

Library BASICS

Q. I can run WordPerfect from the WordPerfect Library, but I would also like to be able to access BASICA via the Library. Since I don't know how, I take several steps to run BASIC programs. First I insert my DOS disk in drive A:, reboot the computer, enter the date and time, and type BASICA at the A> prompt. I then LOAD and RUN the BASIC program.

Because BASICA.COM is in the root directory of my IBM AT's 30MB hard disk (along with the rest of the files from the DOS disk), I suspect there must be some way to run BASICA without using my DOS disk. Is wanting BASICA to be a choice on the WordPerfect Library menu expecting too much? Can you help?

Frank T. Dezelsky
Sarasota, Florida

A. You are correct. You can run BASIC from your hard disk's root directory. If you're using DOS 3.00 or a later version, just enter the command C:\BASICA at any DOS prompt. If you're using an earlier version of DOS, log on to the root directory of drive C: with the commands C:<Enter> and CD\<Enter>, and then type BASICA<Enter>.

You can run also run BASICA from the WordPerfect Library in a number of ways. You could choose 'I Go to DOS;' or 'D - DOS Command' from the Library's main menu and use the method previously described for your version of DOS. You could also tell the Library which directory contains the DOS files. Then, after choosing 'D - DOS Command', you could execute BASICA or any DOS command simply by entering the command.

To inform the Library of the DOS directory, start the Library

and press 4 for Setup. Then press D to highlight the DOS Command selection, and press 1 to edit the Program Information screen for DOS commands. Press <Cursor-Down> twice and enter C:\<Enter> at the 'Default directory:' prompt. Press <F7> twice to return to the Library's main menu.

Those are the simple, quick-and-dirty ways to run BASIC and other DOS commands from your hard disk or from the Library. They simply demonstrate that to run a program from your hard disk, you must first log on to the drive and directory containing the program (or if you use DOS 3.00 or a later version, you can opt to prefix the program command with the appropriate drive and path). However, DOS, your hard disk, and the Library have much to offer, and the simple "solutions" just described belittle their abilities.

First of all, the DOS disk's files needn't be in the root directory of the hard disk. In fact, COMMAND.COM, CONFIG.SYS, and AUTOEXEC.BAT are the only files that should be in the root directory of a well-managed hard disk. Your WordPerfect files aren't kept there. Your Library files aren't there either. Instead, because you followed the installation instructions, those programs and their support files are kept in their own directories. And the DOS disk's files belong in their own directory, too. (To learn more about using subdirectories and your hard disk, read "Hard Disk Navigation Tips" in this issue.)

I call my DOS directory \DOS. It's not a very creative name, but it is informative. I suggest that you also make such a directory. First print a list of the names of the

(continues)



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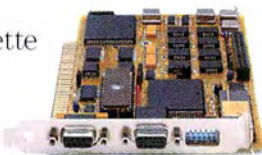
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files on the DOS disk by placing the DOS disk in drive A: and typing **DIR A: > PRN** at the DOS prompt. Then delete those files from drive C:’s root directory. At the **C>** prompt, type **MD \DOS** and press **<Enter>** to make the \DOS directory. Next issue **CD \DOS <Enter>** to change to that directory, and copy the files from the DOS disk in drive A: with **COPY A:.* C:.** (For safety’s sake, delete the file named RECOVER.COM. If you want to know what this utility does, read about it in the DOS manual. Don’t execute it—its action is devastating.) Your copy

liar), so that C:\DOS\ appears between the equal sign and the file name. For example, if the command **DEVICE = ANSI.SYS** is present, change it to **DEVICE = C:\DOS\ANSI.SYS**. The drive and directory prefix will tell DOS where to find the device driver file, since it’s no longer in the root directory. Now save the DOS text file with **<Ctrl> - <F5> 1** (don’t use **<F7>**).

Using **<Ctrl> - <F5> 2**, retrieve **C:\AUTOEXEC.BAT**. Find the command that begins with **PATH** and append **;C:\DOS** to the end of that line. Save the file with **<Ctrl> -**

(Now that your DOS files are in C:\DOS, you should correct the *Library*’s Program Information screen for ‘D - DOS Commands’.)

WordPerfect Library makes running other programs, including BASIC programs, very easy. If you use several BASIC programs regularly, study the *Library* manual to learn how to make each of them a selection of the *Library*’s main menu.

3½-Inch 360K Format

Q. I found Hal Nieburg’s comments on the Toshiba ND354A 3½-inch disk drive [“Double Your Storage,” The Upgrade Path, PCW, May 1987] very interesting because I have an AST Premium with an internal 720K 3½-inch drive B: and a hard disk. However, TJ Byers’ review of the Toshiba product [From the Hardware Shelf, PCW, August 1987] suggested an answer to Mr. Nieburg’s rhetorical question: Why would you want to format a 720K disk for 360K?

Mr. Byers states that a 360K 3½-inch disk is a miniature version of its 5¼-inch counterpart; you can use DISKCOPY to make a 3½-inch copy of a 5¼-inch disk. That made me realize that the disk utilities I have (for “unerasing” files, and so forth), which don’t yet support the 720K format, would work with 360K 3½-inch disks. I have, however, been unable to format my 3½-inch disks for 360K. Is it possible?

*Kenneth B. Scott
Aberdeen, Washington*

(continues)

For safety’s sake, delete the file named RECOVER.COM—its action is devastating.

of DOS also came with a DOS Supplemental Programs disk. From that disk, copy to the \DOS directory only those files that you use. There’s no sense in wasting hard disk storage.

Now change to the *Library* directory and run *WordPerfect*. Issue **<Ctrl> - <F5> 2** to retrieve a DOS text file, and type **C:\CONFIG.SYS <Enter>**. (If the file doesn’t exist, create a CONFIG.SYS file containing the command **DEVICE = C:\DOS\ANSI.SYS**.) Edit each **DEVICE =** command that specifies a DOS file (one that’s on the list you printed ear-

<F5> 1. If you don’t have an AUTOEXEC.BAT file in drive C:’s root directory, make one that contains the command **PATH C:\LIBRARY;C:\WP;C:\DOS** on the first line (assuming, of course, that those are the names of your *Library*, *WordPerfect*, and DOS directories) and the command **PROMPT \$P\$G** on the second line. Then take a break, put your feet up, and read “Power Your PC With Batch Files” in this issue to learn more about AUTOEXEC.BAT and the PATH command.

Reboot the computer with **<Ctrl> - <Alt> - **. Because of the PATH command, you can now run BASICA, or any other command in the \DOS directory, by entering the command at any DOS prompt, or in response to the ‘Enter DOS Command:’ prompt generated by selecting ‘D’ from the *Library*’s main menu.

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A. Look at your hard disk's CONFIG.SYS file. You'll see the command `DRIVPARM=/D:1/F:2` listed along with other commands. This command tells DOS that drive 1 (which means drive B:; 0 is drive A:) is a type 2 device (that is, it uses a 720K format). Assuming that your DOS files are in a directory of drive C: called `\DOS`, add the line `DEVICE=C:\DOS\DRIVER.SYS /D:1/F:0` to the end of the CONFIG.SYS file. When you reboot the Premium, that command will assign the 3½-inch drive a second drive specifier. For example, assume the last DEVICE command in your original CONFIG.SYS file creates RAM disk D:. The new DEVICE command will

assign the drive specifier E: to the 3½-inch drive. Because of the `/F:0` in the new DEVICE command, issuing `FORMAT E:` from the DOS prompt will produce a 360K disk. (`FORMAT B:` will still yield a 720K disk.) If you need more than the five drive specifiers that DOS allows by default (for instance, if you have RAM disks D: and E: and want the 360K 3½-inch drive to be assigned F:), you must add the command `LASTDRIVE=F:` to your CONFIG.SYS file.

Environmental Impact

Q. I need to increase the amount of DOS environment space in my system. As you know, this space holds information such as the

COMSPEC (the drive, directory, and name of the command processor; usually A:\COMMAND.COM or C:\COMMAND.COM), as well as the names of the directories listed in the last PATH command and the current PROMPT definition. This area also stores DOS variables and strings that an application can examine and use, for example, to determine what directory it needs for various purposes. The explanation of the SET command in the DOS manual states that the default size of the environment space is 127 bytes, but doesn't say how to make it bigger. My PROMPT and PATH commands use up much of this space, and I am

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therefore unable to run certain programs that set environment strings or use DOS variables.

Danny A. Moran
Mesa, Arizona

A. To increase the size of the environment space to 512 bytes, add the command `SHELL C:\COMMAND.COM /E:512 /P` to the end of your `CONFIG.SYS` file. That `SHELL` command will cause the default command processor to be replaced by the one specified in the `SHELL` command. In this case, `COMMAND.COM` is replaced by itself, but the `/E` parameter sets a new environment space size. The `/P` parameter causes `AU-`

`TOEXEC.BAT` to be executed after the new `COMMAND.COM` is installed.

You are not limited to a 512-byte environment space. You can set aside anywhere from 160 to 32,768 (32K) bytes for that purpose. Any value that is less than 160 or that contains a nonnumeric character defaults to 160. Any value greater than 32,768 sets the size to 32,768. All values between are rounded up to the nearest multiple of 16.

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Q. My clone is now a couple of years old. It has always been, and continues to be, quite dependable. Recently, however, its hard disk

developed a high-pitched whine. It's very annoying; my dog leaves the house when I turn on the computer. What's causing this screech, and what can I do about it?

Ted Aames
Petaluma, California

A. The high-pitched noise you hear comes from the hard disk's static discharge wire. This tiny wire (or small metal tab) rests against the disk's spindle to draw off the static electricity that can build up as the disk spins. I assume that after a relationship of years you are familiar with the inside of your system. Back up the

(continues)



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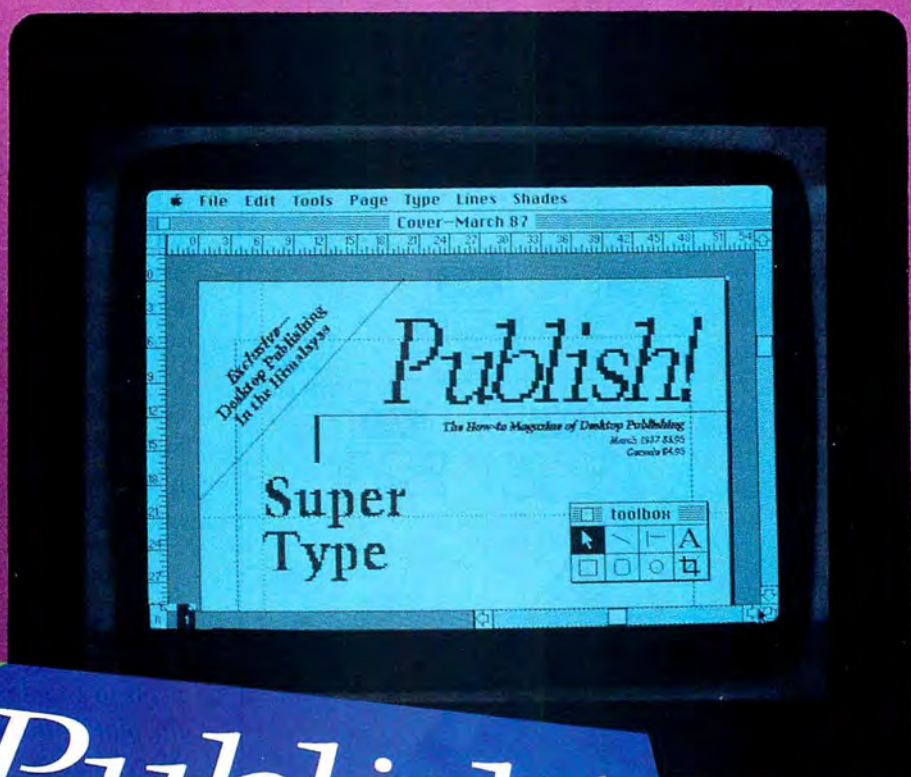
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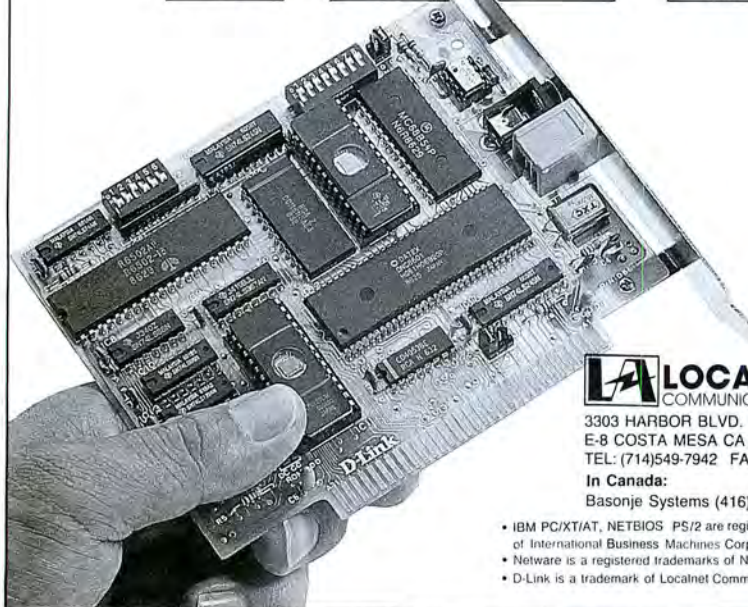
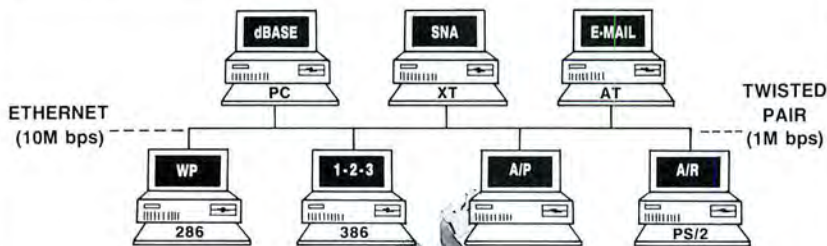
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hard disk and remove it. Then turn it upside down. In the middle of the drive you'll find the nipplelike end of the spindle (to see it, you may have to remove a paper backing). Apply a small amount of synthetic grease (such as polydimethylsiloxane "fusing fluid") to the spindle, and put the system back together. Don't use oil or real grease. Ask your dealer for the right lubricant—you may get a drop for free. If you oversee a number of hard disks, you may want to purchase your own tube of synthetic grease. You can order two tubes for \$26 from Xerox Supplies at 800/822-2200. Just mention fusing fluid, reorder number 8R983.

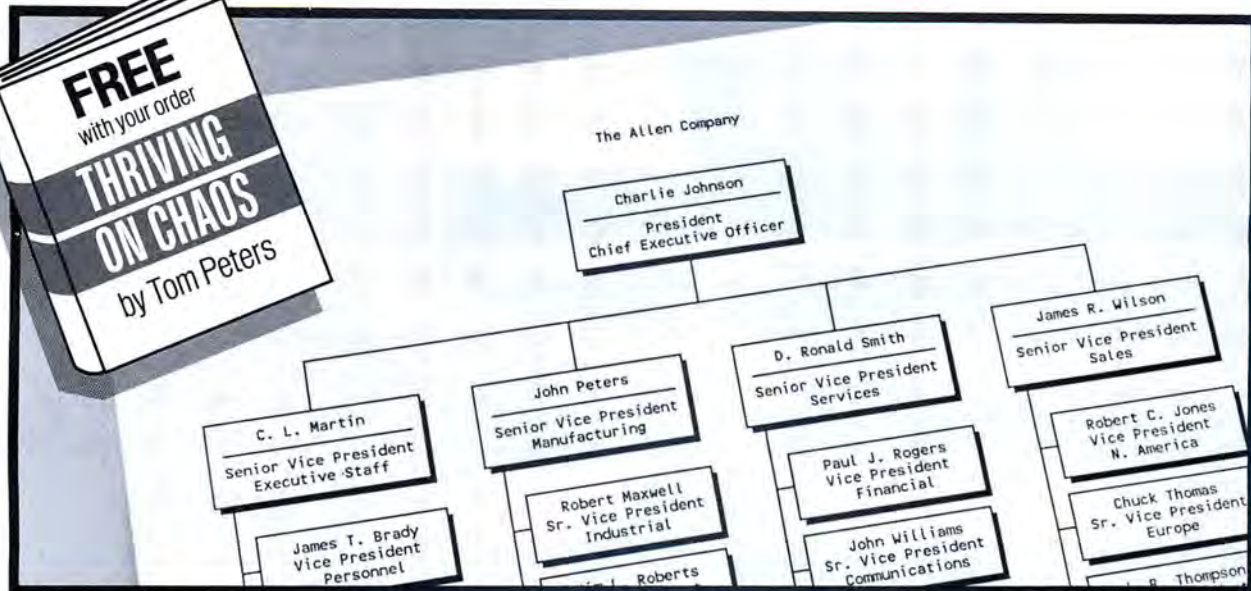
Serial Spoolers

Q. I am using VersaCAD and want to spool output destined for the plotter through my company's Novell ArcNet network to free up my machine during plotting. I can currently use the network to spool parallel printer output, so I figure there must be a way to spool serial output as well. I know I can use the MODE command to redirect serial output to a parallel port, but that doesn't help because the plotter is a serial device. Is there such a beast as a serial spooler?

*Jim Bieschenk
Dallas, Texas*

A. Both hardware and software serial spoolers are available. Because you have a network at your disposal, I recommend that you look at the software variety. I haven't used any of the following, so you'll have to see for yourself how they compare.

(continues)



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Q. I'd like to be able to change the state of NumLock and CapsLock in the BASIC programs that I write. I remember seeing a BASIC program in PC World a long time ago that manipulated NumLock's state but can't remember what issue it was in. Would you show me how it's done?

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(continues)

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The Help Screen

A. That's an impressive memory you have. The program you remember is from "Digital Deduction" in our second issue, nearly five years ago. This simple number-guessing game controls the state of NumLock by using POKE to set a bit in the keyboard status byte. When the bit is a 1, NumLock is on; when it's a 0, NumLock is off. Another bit in that same byte controls CapLock's state.

The keyboard status byte is the 24th byte of the BIOS data area, which begins at the 1025th byte of memory. Because programmers generally work in hexadecimal, the byte is more commonly known as offset 17h of segment 40h, or 0040:0017. The NumLock state bit is bit 5 (bit 0 being the least significant bit); the CapsLock state bit is bit 6 (the ScrollLock state bit is bit 4).

To manipulate those bits without affecting the keyboard status byte's other bits, a "mask" is used. In Boolean terminology, if the value in that byte is ORed with 40h (0100 0000 in binary), CapsLock is turned on. OR it with 20h (0010 0000 binary) and NumLock is turned on. OR it with 60h (0110 0000b) and both NumLock and CapsLock are turned on. If the value of that byte is ANDed with BFh (1011 1111b), CapsLock is turned off. AND it with DFh (1101 1111b) and NumLock is turned off. AND it with 9Fh (1001 1111b) and both CapsLock and NumLock are turned off.

You should be aware that not all keyboards with status indicator lights are bidirectional like the

(continues)

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Circle 92 on reader service card


```

1 '          Digital Deduction
2 '          PC WORLD
3 '          karl koessel

10 DEFINT A-Z          'Integer numeric variables
20 GUESS(2)=8          'Set constants. Number of...
30 GUESS(3)=12         '...digits determines number...
40 GUESS(4)=15         '...of guesses allowed
50 DEF SEG=&H40:KBS=PEEK(&H17) 'Save current keyboard status
60 POKE &H17,(KBS OR &H20) 'Set NumLock ON
70 SCREEN 0,0,0,0      'Set text-mode screen
80 WIDTH 80            '80-characters-per-screen line
90 COLOR 7,0           'White characters, black field
100 KEY OFF            'Turn off soft keys' display
110 CLS                'Clear the screen
120 COLOR 0,7          'Inverse characters
130 LOCATE ,30:PRINT " Digital Deduction! " 'Center title on top line
140 COLOR 7,0          'Standard characters
150 GOTO 240           'Check if length already chosen
160 LOCATE 3,1         'Choose secret number's length
170 PRINT "In this game, you try to guess the computer's secret number."
180 PRINT "Would you like a 2-, 3-, or 4-digit secret number? ";
190 COLOR 0,7:PRINT " "; 'Print an inverse (white) space
200 LOCATE 4,POS(0)-1,1 'Cursor on (flashing) in space
210 COLOR 7,0          'Standard characters
220 DIGITS=VAL(INPUT$(1)) 'Length = value of single input
230 LOCATE 4,1:PRINT SPACES(80) 'Clear line 4 of all characters
240 IF DIGITS<2 OR DIGITS>4 THEN 160 'Invalid secret number length?
250 RANDOMIZE(VAL(RIGHT$(TIMES,2))) 'Reseed RaNDom number generator
260 NUMBER=0:GUESS=0   'Initialize variables
270 FOR I=1 TO DIGITS  'Construct secret number
280   D(I)=RND*9 MOD 9+1 'Pick a RaNDom digit (1 thru 9)
290   USED=0            'Reset USED flag
300   FOR J=1 TO 1-1    'Check previously picked digits
310     IF D(I)=D(J) THEN USED=-1 'Has digit already been USED?
320   NEXT J
330   IF USED THEN 280  'Don't use same digit twice
340   NUMBER=NUMBER*10+D(I) 'Value of secret number
350 NEXT I

```

(continues)

Listing 1: LOCKKEYS.BAS shows the code BASIC programs can use to manipulate the state of CapsLock, NumLock, and ScrollLock.

IBM AT's. The AT keyboard's indicator lights reflect the actual keyboard status set by the bits in the status byte; change a status bit with software and the appropriate light changes too. But many clone keyboards with lights in the <CapsLock>, <NumLock>, and <ScrollLock> keys toggle the lights on and off only with each press of those keys. The indicator lights of such keyboards will alter-

nately be in and out of sync when software changes the state of the lock keys.

The number-guessing game not only turns NumLock on, it resets NumLock to the state in which it was found when the program started—a courtesy all programs should observe. This is done by saving the keyboard status byte in a variable and then using that variable to reset the status byte prior to ending execution. LOCKKEYS.BAS, shown in Listing 1,

(continues)



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```

360 LOCATE 3,1:PRINT "Ok, the computer has chosen a ": 'Print instructions
370 PRINT USING "#_-digit number. Zero is not one of the digits.": DIGITS
380 PRINT "You may use the numeric keypad on the right side of the keyboard."
390 LOCATE 5+GUESS,4+DIGITS 'Locate next to window
400 PRINT "<--- Enter your guess" 'Print prompt
410 COLOR 0,7 'Inverse characters
420 LOCATE 5+GUESS,3:PRINT SPC(DIGITS); 'Make 'window'
430 IF INKEYS="" THEN 430 'Clear keyboard buffer
440 FOR I=1 TO DIGITS 'Fill window with guess
450 LOCATE 5+GUESS,2+I,1 'Locate in window, cursor on
460 GS(I)=INPUT$(1) 'Get single-character input
470 IF GS(I)=CHR$(27) THEN 1080 'Quitting?
480 IF GS(I)=CHR$(8) THEN GOSUB 760:GOTO 450 'Backspace?
490 IF GS(I)<"1" OR GS(I)>"9" THEN 450 'Invalid input?
500 PRINT GS(I); 'Print digit in window
510 NEXT 'Window is full
520 COLOR 7,0 'Standard characters
530 LOCATE 5+GUESS,1:PRINT SPACE$(80) 'Erase line with window, prompt
540 GUESS=GUESS+1 'Keep track of # of guesses
550 IF GUESS=1 THEN GOSUB 800 'Time to print table headings?
560 RP=0:WP=0 'Initialize variables RP and WP
570 FOR I=1 TO DIGITS 'Compare guess to secret number
580 IF D(I)=VAL(GS(I)) THEN RP=RP+1:GOTO 630 'Right digit in right place?
590 FOR J=1 TO DIGITS 'Check for right digit in wrong place
600 IF I=J THEN 620 'If same place, skip wrong place check
610 IF D(I)=VAL(GS(J)) THEN WP=WP+1:J=DIGITS'Digit in wrong place?
620 NEXT
630 NEXT
640 LOCATE 4+GUESS,3 'Indent each guess on new line
650 FOR I=1 TO DIGITS
660 PRINT GS(I); 'Print each digit of guess
670 NEXT
680 LOCATE ,25 'Print # of correct digits...
690 PRINT RP; '...in the right place
700 LOCATE ,54 'Print # of correct digits...
710 PRINT WP '...in the wrong place
720 IF DIGITS=RP THEN 900 'Do all places have the correct digits?
730 IF GUESS=GUESS(DIGITS) THEN 940 'Reached maximum # of guesses allowed?
740 BEEP 'Guess isn't secret number,...
750 GOTO 390 '...GOTO guess again!
760 IF I=1 THEN RETURN 'Subroutine to backspace digit of guess
770 LOCATE ,POS(0)-1:PRINT " "; 'A destructive backspace erases
780 I=I-1 'Decrement guess digit index
790 RETURN
800 LOCATE 3,1 'Subroutine to print table headings
810 PRINT SPACE$(160) 'Clear lines for table headings
820 LOCATE 3,1:PRINT "Number"SPC(10) 'Print top line, space columns
830 PRINT "# of correct digits"SPC(10)"# of correct digits" 'Finish top line
840 IF (PEEK(&H10) AND &H30)=&H30 THEN COLOR 1,0 'If monochrome monitor, then...
850 PRINT "Guessed"; '...underline characters of...
860 LOCATE ,17:PRINT " in the right place"; '...the bottom lines of the...
870 LOCATE ,46:PRINT " in the wrong place" '...table headings
880 COLOR 7,0 'Standard characters
890 RETURN
900 SOUND 440,5:SOUND 880,15 'Guess is secret number!!!!!!
910 PRINT "You guessed the number! "; 'Print congratulations
920 PRINT USING "Your score is ##.":GUESS; 'Print score
930 GOTO 1000 'GOTO 'play again?' routine
940 SOUND 100,20 'Number not found and all guesses used!
950 PRINT "You have had"GUESS"tries. The number "; 'Print number of tries
960 COLOR 0,7 'Inverse characters
970 PRINT USING STRING$(DIGITS,"#");NUMBER; 'Reveal secret number
980 COLOR 7,0 'Standard characters
990 PRINT " "; 'Punctuate revealed secret #

```

(continues)

Listing 1 (continued)



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```

1000 COLOR 16,7           'Play again? routine-----Inverse, blinking characters
1010 LOCATE 25,16,0:PRINT " Press ";           'Cursor off, begin prompt
1020 COLOR 0,7             'Inverse characters
1030 PRINT "ESC to quit; any other key to play again. ";
1040 COLOR 7,0             'Standard characters
1050 IF INKEY$="" THEN 1050 'Clear keyboard buffer
1060 AGAIN$=INPUT$(1)      'Get 'play AGAIN?' input
1070 IF AGAIN$<>CHR$(27) THEN DIGITS=VAL(AGAIN$):GOTO 110 'Play again?
1080 COLOR 7,0:CLS         'Not playing again
1090 POKE &H17,KBS        'Reset NumLock's original state
1100 END

```

Listing 1 (continued)

```

100 CLS
110 DEF SEG=&H40 : KBS=PEEK(&H17) 'Save keyboard status byte (xCNS xxxx)
120 POKE &H17,(PEEK(&H17) AND &HBF) 'Turn off the lock keys (1000 1111)
130 PRINT "The keyboard status byte has been saved"
140 PRINT "and the lock keys have been turned off."
150 GOSUB 380
160 POKE &H17,(PEEK(&H17) OR &H10) 'Turn ScrollLock on (0001 0000)
170 PRINT "ScrollLock is on"
180 GOSUB 380
190 POKE &H17,(PEEK(&H17) OR &H20) 'Turn NumLock on (0010 0000)
200 PRINT "NumLock is on"
210 GOSUB 380
220 POKE &H17,(PEEK(&H17) OR &H40) 'Turn CapsLock on (0100 0000)
230 PRINT "CapsLock is on"
240 GOSUB 380
250 POKE &H17,(PEEK(&H17) AND &HEF) 'Turn ScrollLock off (1111 1111)
260 PRINT "ScrollLock is off"
270 GOSUB 380
280 POKE &H17,(PEEK(&H17) AND &HDF) 'Turn NumLock off (1101 1111)
290 PRINT "NumLock is off"
300 GOSUB 380
310 POKE &H17,(PEEK(&H17) AND &HBF) 'Turn CapsLock off (1011 1111)
320 PRINT "CapsLock is off"
330 GOSUB 380
340 POKE &H17,KBS 'Restore original state
350 PRINT "The keyboard status byte has been restored and the"
360 PRINT "lock keys have returned to their original state."
370 END 'Quit
380 PRINT :PRINT "Press the <Space> bar" :AS=INPUT$(1) :CLS
390 RETURN

```

Listing 2: DIGIDUCT.BAS is a simple game whose object is to guess the computer's secret number.

shows the BASIC code you'll need for your programs. And just for fun, the game is reprinted here in Listing 2.

Do you have any questions concerning the IBM PC or compatibles? Send them to The Help Screen, PC World, 501 Second St., San Francisco, CA 94107, or electronically to MCI Mail PC-WORLD/179-3813, CompuServe 74055,412, or The Source STE908. ●



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- 6/10 MHz clock w/0 wait state
- 640K 100 Nano Seconds, 0 wait state DRAM installed, expandable to 1024KB

System Price \$1049⁰⁰

STANFORD 286-10/2

6/10 MHz

Same configuration as in System 286-16 except,

- Regular size AT main board & chassis
- 640K (120 N/S) DRAM on board
- Phoenix BIOS

System Price \$949⁰⁰

STANFORD 4.77/10

- 4.77/10 MHz, software switchable M/B
- Phoenix BIOS, Norton SI:3.3
- Socket for 8087 math co-processor
- 640K 120 N/S DRAM on board
- Floppy drive controller
- 360K floppy drive
- AT/XT style keyboard
- AT Jr. case, XT size with AT features
- Hardware Reset and Turbo L.E.D.
- Keyboard lock. Power LED
- 150 watt power supply
- 8 expansion slots
- High quality, heavy duty packaging

System Price \$529⁰⁰

STANFORD 286-16

**10/12 MHz Zero Wait State
16 MHz Throughput**

- Compact size AT main board
- Intel 80286-12 CPU, 10/16 MHz software (keyboard) switchable clock
- Award BIOS, Norton SI:15.8
- 1024KB (one megabyte) 80 Nano Seconds, 0 wait state DRAM, installed
- High capacity floppy controller card
- 1.2 MB floppy drive
- Serial port (Com 1), optional 2nd serial port (Com 2), parallel port, and game port
- 8 expansion slots (6-16 bits, 2-8 bits)
- Built in setup program
- Clock/calendar with rechargeable battery backup
- Hardware Reset and Turbo L.E.D.
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STANFORD 4.77/8

Same configuration as 4.77/10 MHz XT, except,

- XT slide case
- 640K 150 N/S DRAM. Norton SI:1.7
- Stanford or Phoenix BIOS

System Price \$474⁰⁰

STANFORD 386-18

**9/18 MHz Zero Wait State
21 MHz Throughput**

- Intel 32 Bit 80386 CPU (18 MHz), 9/18 MHz software (keyboard) switchable clock
- Norton SI: 21 (Processor Speed)
- 200 watt P/S, 110/220V selectable
- CMOS memory, 16 channel Interrupt, 7 DMA channels
- 512K interleaved 32 bit RAM on board
- RAM can be expanded to 16 MB of 32 bit high speed interleaved memory
- 2-32 bit, 4-16 bit & 2-8 bit expansion slots
- Supports 80387 math co-processor
- Phoenix or Award BIOS
- High capacity floppy controller card
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STANFORD 386-16/1

**6/16 MHz Zero Wait State
19 MHz Throughput**

Same configuration as in System 386-18 except,

- Intel 32 Bit 80386 CPU (16 MHz), 6/16 MHz software (keyboard) switchable clock
- Norton SI: 18.7 (Processor Speed)

System Price \$1979⁰⁰

STANFORD 386-16/2

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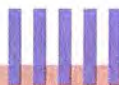
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- ☐ 4. College/university
- ☐ 5. Elementary/high school
- ☐ 6. Engineering/architecture
- ☐ 7. Finance, banking, accounting, insurance, real estate
- ☐ 8. Government
- ☐ 9. Health/medical services
- ☐ 10. Legal services
- ☐ 11. Manufacturing
- ☐ 12. Military
- ☐ 13. Other business services
- ☐ 14. Publishing/advertising/public relations
- ☐ 15. Research & development
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- ☐ 17. Transportation, communications, utilities
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- ☐ 22. Service bureau
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- ☐ 99. Other (please specify) _____

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- ☐ 3. Controller/treasurer/accountant
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- ☐ 99. Other (please specify) _____

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- ☐ 10. Sales/marketing/distribution
- ☐ 99. Other (please specify) _____

4a. Does your company own or lease any mainframe computers at this location?

☐ Yes ☐ No

	Existing (quantity)	Plan to buy (quantity)
<input type="checkbox"/> 1. IBM	_____	_____
<input type="checkbox"/> 99. Other (specify)	_____	_____

4b. Does your company own or lease any minicomputers at this location?

☐ Yes ☐ No

	Existing (quantity)	Plan to buy (quantity)
<input type="checkbox"/> 1. IBM	_____	_____
<input type="checkbox"/> 2. DEC	_____	_____
<input type="checkbox"/> 3. Sun/Apollo	_____	_____
<input type="checkbox"/> 99. Other (specify)	_____	_____

5. Does your firm have or plan to buy any of the following types of personal computers or microcomputer systems at your location?

☐ Yes (indicate quantity below) ☐ No

Manufacturer	Currently own (quantity)	Plan to buy within 1-12mos 13-24mos
<input type="checkbox"/> 1. Macintosh 128/512	_____	_____
<input type="checkbox"/> 2. Macintosh Plus	_____	_____
<input type="checkbox"/> 3. Macintosh SE	_____	_____
<input type="checkbox"/> 4. Macintosh II	_____	_____
<input type="checkbox"/> 5. Apple IIe/IIc/IIgs	_____	_____
<input type="checkbox"/> 6. IBM Compatible (Compaq, Tandy, etc.)	_____	_____
<input type="checkbox"/> 7. IBM PC/XT/AT/RT	_____	_____
<input type="checkbox"/> 8. IBM Personal System/2	_____	_____
<input type="checkbox"/> 9. Sun/Apollo workstation	_____	_____
<input type="checkbox"/> 99. Other scientific or engineering workstations (non-mini)	_____	_____

6a. Please indicate your involvement with each of the following types of personal computers or microcomputer systems (check all that apply):

	Macintosh	Micros	Software	Networks & Peripherals
<input type="checkbox"/> 1. Approve purchase	_____	_____	_____	_____
<input type="checkbox"/> 2. Develop/manufacture	_____	_____	_____	_____
<input type="checkbox"/> 3. Evaluate/select vendor	_____	_____	_____	_____
<input type="checkbox"/> 4. Own (at least one)	_____	_____	_____	_____
<input type="checkbox"/> 5. Own (two or more)	_____	_____	_____	_____
<input type="checkbox"/> 6. Purchase or acquire	_____	_____	_____	_____
<input type="checkbox"/> 7. Establish specifications	_____	_____	_____	_____
<input type="checkbox"/> 8. Recommend to others	_____	_____	_____	_____
<input type="checkbox"/> 9. Sell	_____	_____	_____	_____
<input type="checkbox"/> 10. Train people to use/ or provide support	_____	_____	_____	_____
<input type="checkbox"/> 11. Use	_____	_____	_____	_____
<input type="checkbox"/> 12. No involvement	_____	_____	_____	_____
<input type="checkbox"/> 99. Other (please describe by name and quantity)	_____	_____	_____	_____

If you have no involvement with any of the above, skip to question 8.

6b. For approximately how many total personal computers or microcomputer systems do you have the above involvement? (check only one)

- ☐ A. 1-3 ☐ B. 4-9 ☐ C. 10-19 ☐ D. 20-49
☐ E. 50-99 ☐ F. 100-499 ☐ G. 500 +

7. For approximately how many Macintosh personal computers do you have involvement described in question 6 above? (check only one)

- ☐ A. 1-3 ☐ B. 4-9 ☐ C. 10-19 ☐ D. 20-49
☐ E. 50-99 ☐ F. 100-499 ☐ G. 500 +

(Over please, additional questions on reverse side)

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8a. How many people work at your location? (check only one)

- ☐ A. 1-9 ☐ F. 1000-2499
☐ B. 10-24 ☐ G. 2500-4999
☐ C. 25-99 ☐ H. 5000-9999
☐ D. 100-499 ☐ I. 10,000 or more
☐ E. 500-999

8b. How many people are employed by your entire company? (check only one)

- ☐ A. 1-9 ☐ F. 1000-2499
☐ B. 10-24 ☐ G. 2500-4999
☐ C. 25-99 ☐ H. 5000-9999
☐ D. 100-499 ☐ I. 10,000 or more
☐ E. 500-999

9. What percentage of people who work at your location actually use a personal computer (check only one)

- ☐ A. 1-24% ☐ D. 75%-100%
☐ B. 25%-49% ☐ E. None
☐ C. 50%-74%

10. The personal computer purchased for this location would be: (check all that apply):

- ☐ 1. for internal use ☐ 2. for resale
☐ 99. other (please specify)

11. How are personal computers normally obtained for this location? (check all that apply)

- ☐ 1. direct from manufacturer
☐ 2. manufacturer's representative
☐ 3. distributor or wholesaler
☐ 4. retail computer store
☐ 5. mail order
☐ 6. VAR/systems house
☐ 7. in-house (company or university store)
☐ 99. other (please specify)

12. Personal computers or microcomputer systems at your location are or soon will be used for the following communications activities: (check all that apply)

- ☐ 1. Communicate with internal company mainframe or mini
☐ 2. Communicate with other micros via modem
☐ 3. Communicate with outside mainframe or mini through service bureau, database or time-sharing service
☐ 4. Local area network
☐ 5. Voice/data
☐ 6. None of the above
☐ 99. Other (please describe)

13. Are you involved in any of the areas shown below?

☐ Yes (check all that apply) ☐ No

☐ A. Recommend ☐ B. Influence ☐ C. Specify ☐ D. Buy
(check all that define your involvement)

Software

- ☐ 1. spreadsheets
☐ 2. word processors/outline processors
☐ 3. database management
☐ 4. accounting
☐ 5. statistics
☐ 6. communications/networking
☐ 7. graphics
☐ 8. presentation
☐ 9. project management
☐ 10. desktop publishing
☐ 11. CAD/CAM
☐ 12. programming language
☐ 13. back-up systems
☐ 14. utilities
☐ 15. other _____

Computers

- ☐ 16. personal computers
☐ 17. multiuser microcomputers
☐ 18. laptop microcomputers
☐ 19. portable microcomputers
☐ 20. engineering workstation
☐ 21. minicomputers
☐ 22. mainframe computers
☐ 23. others _____

Peripherals

- ☐ 23. dot matrix printers
☐ 24. letter quality printers
☐ 25. plotter
☐ 26. laser printer
☐ 27. local area network
☐ 28. file server
☐ 29. optical disk
☐ 30. monochrome monitor
☐ 31. color monitor (standard)
☐ 32. hi-res color monitor
☐ 33. add-on board
☐ 34. external hard disk
☐ 35. internal hard disk
☐ 36. back-up systems
☐ 37. modem
☐ 38. other _____

Outside services

- ☐ 39. on-line services
☐ 40. education/training
☐ 41. maintenance
☐ 42. custom application
☐ 43. service bureau
☐ 44. other _____

14. Over the course of one year, how would you quantify your level of involvement in total microcomputer systems products?

☐ A. Recommend ☐ B. Influence ☐ C. Specify ☐ D. Buy
(please check all that define your involvement)

- ☐ 1. less than \$10,000 ☐ 5. \$100,000-\$249,999
☐ 2. \$10,000-\$24,999 ☐ 6. \$250,000-\$499,999
☐ 3. \$25,000-\$49,999 ☐ 7. \$500,000 +
☐ 4. \$50,000-\$99,999 ☐ 8. None of the above
(check only one)

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Numbers without **<NumLock>** in 1-2-3, an improved envelope macro and simple underlining for WordPerfect, rolling up your batch files in one big batch, and running programs from ProComm

Edited by Mike Cushman

Knocking **<NumLock>**

If you routinely enter columns of numbers into worksheets, you know how frustrating it is to fumble with **<NumLock>**. However, the inconvenience doesn't justify throwing an otherwise functional keyboard in the trash or spending extra bucks for an add-on keypad. I wrote a 1-2-3 release 2 macro for anyone who doesn't have separate numeric and cursor keypads. The macro uses **<get>** and **<if>** commands to temporarily trap a few keys and use them to move the cursor. You don't have to toggle **<NumLock>**, and you need only one hand.

First, prepare a new worksheet. Start 1-2-3, issue the command */Worksheet Column Set-Width*, and type **12 <Enter>** to set the width of column A to 12. Now enter the macro's two columns exactly as shown in Figure 1. [Don't omit any blank rows—they're significant. Enter all uppercase text in capitals. To enter text that begins with a plus sign, minus sign, backslash, or slash, you must type an apostrophe first.] After checking your work, issue the command */Range Name Labels Right* and type **A1.A43 <Enter>**. Now issue */Range Name Create* and type **assignkeys <Enter> A14.B43 <Enter>**. Finally, save the worksheet as NUMLOCK.

To test the macro, move the cell pointer to cell F1. Press **<Alt>-N**. When the 'Turn **<NumLock>** on' request appears, check the bottom of the screen for the 'NUM' indicator. If it's on, just press **<Enter>**. Otherwise, press **<NumLock>** and then **<Enter>**. The word 'INPUT' should appear as the mode indicator in the upper right corner of the screen. Type **123** using the numeric keypad. Note that that number does not appear

on the control panel's second line. Press **<Enter>**. When the macro is in effect, **<Enter>** acts as **<CursorDown>**, so the number should appear in cell F1 and the cell pointer should move down one cell. If that happens, press **<Esc>** to end the macro. If not, press **<Ctrl>-<Break>** and check your work.

Although using **<Enter>** for **<CursorDown>** is sufficient for entering columns of numbers, the **<Alt>-N** macro employs several other keys for cursor movement: **<Backspace>** for **<CursorUp>**; right bracket (**]**) for **<CursorRight>**; left bracket (**[**) for **<CursorLeft>**; **<GrayMinus>** for **<PgUp>**; and **<GrayPlus>** for **<PgDn>**. Pressing any of these keys will cause the cursor to move in the indicated direction. You can even use the asterisk for the **<End>** key. (Note, however, that **<Ctrl>-]** and **<Ctrl>-[** do not cause the cursor to move right or left one full screen, as would **<Ctrl>-<CursorRight>** and **<Ctrl>-<CursorLeft>**.) For safety's sake, all of the actual cursor keys work when NumLock's status is off or, if NumLock is on, when they are used with the **<Shift>** key.

Of course, if you enter a number (or text) and then press any of **<Alt>-N**'s "cursor" keys, the data will appear and the cursor will move in the desired direction. If you enter a number followed accidentally by any nonnumeric characters, 1-2-3 will beep and display the entry on the control panel for editing, although the mode indicator will continue to display 'INPUT' rather than 'EDIT'. You can use **<Alt>-N**'s

(continues)

STATEMENT OF OWNERSHIP,
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10. Extent and nature of circulation

Average no. copies each issue during preceding 12 months: A. Total no. copies (net press run), 450,967 B. Paid and/or requested circulation 1. Sales through dealers and carriers, street vendors and counter sales, 91,511; 2. Mail subscription (paid and/or requested), 266,324; C. Total paid and/or requested circulation (sum of 10B1 and 10B2), 357,835 D. Free distribution by mail, carrier or other means samples, complimentary, and other free copies, 6,716; E. Total distribution (sum of C and D), 364,551 F. Copies not distributed 1. Office use, left over, unaccounted, spoiled after printing, 18,694; 2. Return from News Agents, 67,721; G. Total (sum of E, F1 and 2—should equal net press run shown in A), 450,967.

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11. I certify that the statements made by me above are correct and complete.
Margaret O'Reilly, Publisher



	A	B	C	D	E	F	G
1	entry						
2							
3	trap						
4							
5	\n	(menucall numlockon){esc}{quit}					
6	numlockon	Turn <NumLock> on					
7		Press <Enter> when ready					
8	getkey	(restart){indicate INPUT}{get entry}					
9		(if @vlookup(entry,assignkeys,0)+1){dispatch entry}					
10	getnext	(get trap){if @vlookup(trap,assignkeys,0)+1}{setandcont}					
11		(let entry,entry&trap:value){getnext}					
12	setandcont	(entry){dispatch trap}					
13							
14	-	{down}{branch getkey}					
15	{BACKSPACE}	{up}{branch getkey}					
16	}	{right}{branch getkey}					
17	[{left}{branch getkey}					
18	-	{pgup}{branch getkey}					
19	+	{pgdn}{branch getkey}					
20	*	{end}{branch getkey}					
21	=	{re-}{branch getkey}					
22	^	{del}{branch getkey}					
23	{ESC}	{esc}{blank entry}{blank trap}{calc}{indicate}{quit}					
24	/	{trap}{blank entry}{blank trap}{indicate}{quit}					
25	{DOWN}	{down}{branch getkey}					
26	{UP}	{up}{branch getkey}					
27	{RIGHT}	{right}{branch getkey}					
28	{LEFT}	{left}{branch getkey}					
29	{PGUP}	{pgup}{branch getkey}					
30	{PGDN}	{pgdn}{branch getkey}					
31	{BIGRIGHT}	{bigright}{branch getkey}					
32	{BIGLEFT}	{bigleft}{branch getkey}					
33	{HOME}	{home}{branch getkey}					
34	{DEL}	{del}{branch getkey}					
35	{EDIT}	{branch getkey}					
36	{NAME}	{branch getkey}					
37	{ABS}	{branch getkey}					
38	{GOTO}	{branch getkey}					
39	{WINDOW}	{branch getkey}					
40	{QUERY}	{branch getkey}					
41	{TABLE}	{branch getkey}					
42	{CALC}	{branch getkey}					
43	{GRAPH}	{branch getkey}					

Figure 1: If you're a 1-2-3 release 2 user who doesn't have separate numeric and cursor keypads, this <Alt>-N macro will enable you to single-handedly enter numbers and move about the worksheet without using <NumLock>.

cursor keys to position the cursor, and the open single quote instead of to delete characters (<Backspace> will not remove characters because it is acting as <CursorUp>). When the entry is correct, press <Backspace> or <Enter>.

To change a cell, use <Alt>-N's cursor keys to move to the cell, and press the equal-sign key, which erases the cell. Then enter the correct data. (While active,

<Alt>-N disables the function keys, including Edit.)

The NumLock macro is a "looping" macro; it continues to accept keystrokes until stopped. <Esc> stops the macro without entering data into the current cell. The slash key also stops the macro, but does enter data (if any)

(continues)

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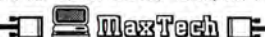
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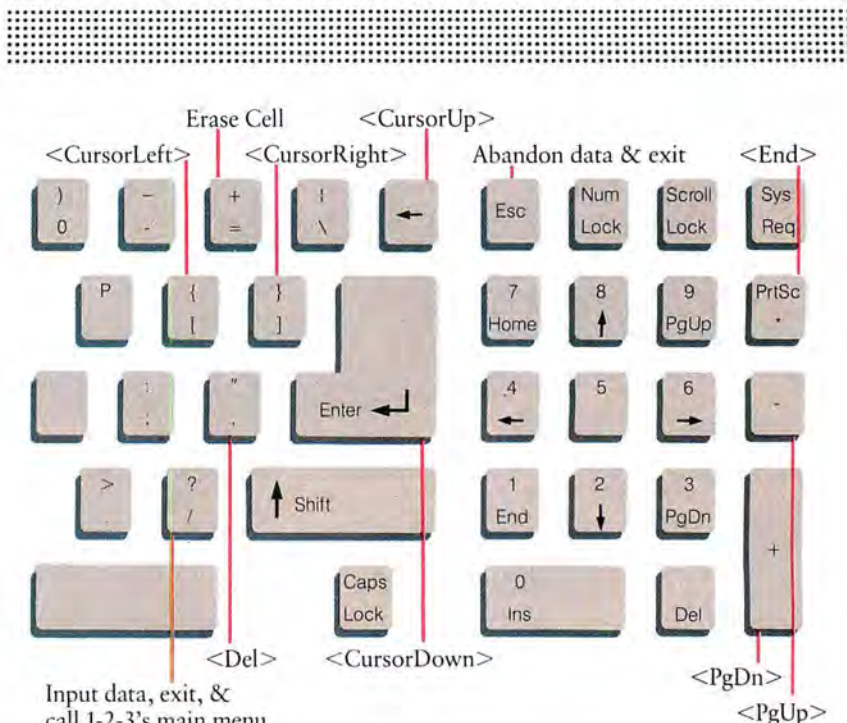
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Because **<Alt> -N**, a 1-2-3 macro, lets you use a few keys to move the cell pointer, the numeric keypad can be devoted to input.

into the current cell and invokes 1-2-3's menu.

Obviously, you'll want to use the macro in a real worksheet. To do so, you must merge it into the chosen worksheet. First retrieve that worksheet (or start a new one) and check for any range names matching those in NUMLOCK.WK1. You must rename any that match (change the conflicting range names in the worksheet, not those in the macro).

To merge the macro worksheet, press **<End>** and then **<Home>** to position the cell pointer at the lower right corner of the worksheet. Issue the command **/File Combine Copy Entire-File**, type **NUMLOCK**, and press **<Enter>**. Without moving the cell pointer, issue the command **/Range Name Labels Right**. Press **<PgDn>** twice and **<CursorDown>** twice (high-

lighting the entire column from 'entry' to '{GRAPH}'), and press **<Enter>**. Then press **<CursorRight>**, issue the command **/Range Unprotect**, and press **<Enter>**. Press **<CursorDown>** twice, issue **/Range Unprotect**, and press **<Enter>**. (Those last two commands unprotect the cells to the right of 'entry' and 'trap'. The macro will not function in a protected worksheet if you omit those steps. Also, note that entering a number in a protected cell will produce an error message and stop the macro.)

Now press **<F5>**, the Goto key. Type **<Enter>**. Issue the command **/Range Name Create**, type **assignkeys**, and press **<Enter>**. Define the range by pressing

(continues)

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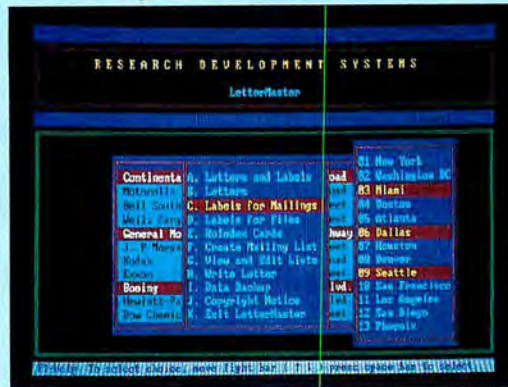
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<CursorLeft> once, <PgDn> once, and <CursorDown> nine times so that both columns are highlighted down to the cell containing '{GRAPH}'. Then press <Enter>. Save the worksheet. You can now call the macro in this worksheet with <Alt>-N.

A. E. Foote
Burbank, California

More Perfect WordPerfect Envelopes

Robin Perry's envelope macro presented in "Another Perfect Envelope" [*, PCW, August 1987] is not so perfect if you wish to save the letter after printing the envelope. The macro leaves the letter a mess of hard page breaks and extraneous formatting commands.

If the pitch setting of the original page isn't the default 10, an even more serious problem arises. The macro shifts the position of the address on the envelope.

To solve these problems, I've modified Perry's macro to format this new page to envelope size, added a 2-inch top margin, allowed five lines for the address, and set the pitch and font to the default settings of 10 and 1. After printing, the macro searches back for the hard page break and temporary formatting commands and deletes them.

The top margin, left and right margins, form-length settings, and number of lines can all be modified to meet individual needs. Because letters often use different styles of dates and line spacing before the inside address, position the cursor at the beginning of the

(continues)

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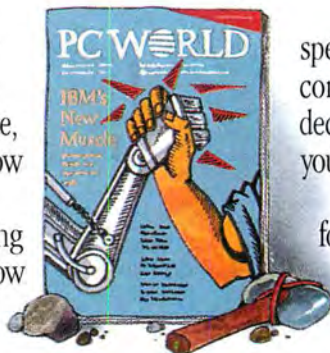
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<Ctrl>-<F10>	Turn on the macro recorder
<Alt>-E	Name the macro
<Ctrl>-<Enter>	Insert a hard page break
<F2>	Turn on search forward
<Enter>-<Enter>	Search for two blank lines
<F2>	End search
<CursorUp>	Move up one line
<Ctrl>-<Enter>	Insert a hard page break
<PgUp>	Move to top of page
<Shift>-<F8>	Bring up the Line Format menu
3	Set margins
30<Enter>	Set left margin to 30
80<Enter>	Set right margin to 80
<Alt>-<F8>	Bring up the Page Format menu
5	Top margin
24<Enter>	Set top margin to 24 half lines
4	Bring up the Page Length menu
3	Other length
25<Enter>	Set form length to 4 1/4 inches (25%)
7<Enter>	Set page length to 5 lines
<Enter>	Exit the Page Length menu
<Ctrl>-<F8>	Print format
1	Pitch and font
10<Enter>	Set pitch to 10
1<Enter>	Set font to 1
<Enter>	Exit the Print Format menu
<Shift>-<F7>	Bring up the Print menu
2	Print a page (the envelope)
<Shift>-<F2>	Turn on search backward
<Ctrl>-<Enter>	Search for the hard page break
<F2>	End search
<Backspace>	Backspace over the hard page break
	Delete the margin setting
Y	Yes to delete
	Delete the top margin setting
Y	Yes to delete
	Delete the page length setting
Y	Yes to delete
<F2>	Turn on forward search
<Ctrl>-<Enter>	Search for the hard page break
<F2>	End search
<Backspace>	Backspace over the hard page break
<Ctrl>-<F10>	Turn off the macro recorder

Figure 2: This WordPerfect macro, ALTE.MAC, addresses an envelope from a letter's inside address and then cleans up after itself.

(continues)

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first line of the address before creating the macro. Then issue the keystrokes shown in Figure 2.

Michael G. Reed
 New York, New York

Macro Underscores a Need
 Underlining existing text in *WordPerfect* is something I have to do frequently, but it isn't very easy. I have to mark the beginning and end of the "block" of text to be underlined and then press the underline key. A single keystroke that would advance the cursor through the text, underlining as it goes, would be much nicer.

So I wrote the macro ALTU-.MAC. With this macro active, you just hold down <Alt>-U and the cursor moves through the document, underlining existing text. When the cursor nears the end of the text to be underlined, press <Alt>-U repeatedly rather than holding it down, so you don't overshoot the end.

To create ALTU.MAC, start *WordPerfect*, type in a word, and place the cursor on the first letter. Then press <Ctrl>-<F10> to turn on the macro recorder. Press <Alt>-U to name the macro. Press <Alt>-<F4> to mark the beginning of the block. Press <CursorRight> to extend the block one character. Press <F8> to underline the character. Finally, press <Ctrl>-<F10> to turn off the macro recorder.

Note that by simply changing the macro's underline command (<F8>) to any command that

modifies a block, you can create new macros that make existing text bold, uppercase, redlined, and so forth.

Dave Tocus
 Gaithersburg, Maryland

Editor's note: Remember that this macro is intended for changing small amounts of existing text. When you are writing in WordPerfect and you know you want underlined text, press <F8> to turn on underlining, type the text, and then press <F8> to turn off underlining. If you need to underline large amounts of text, revert to marking the beginning and end of a block and then pressing <F8>. The <Alt>-U macro makes each underlined character a "block"—begin-underline and end-underline codes surround each character. This means that each underlined character takes up 3 bytes instead of just 1. Furthermore, it takes three cursor strokes to move from one <Alt>-U underlined character to the next.

One Big Happy Batch

Frustrated by the fact that every little batch file on my XT's hard disk consumes a hefty 2048 bytes, I decided to do something about it. The result is two BASIC programs, DOBAT.BAS and UNDOBAT.BAS [Listings 1 and 2].

DOBAT.BAS combines all of a subdirectory's .BAT files (with the exception of AUTOEXEC.BAT and DO.BAT) into one batch file named DO.BAT and, if you choose, purges the individual .BAT files. To invoke any of the

(continues)



```

100 CLS          'DOBAT.BAS by Mohammad Dadashzadeh
110 SHELL "dir *.bat > dobat.lst"
120 DIM FS(100)
130 OPEN "dobat.lst" FOR INPUT AS #1
140 BAT.COUNT = 0
150 WHILE NOT(EOF(1))
160   LINE INPUT #1,AS$
170   IF INSTR(10,AS$, "BAT") <> 10 THEN GOTO 210
180   FS = LEFT$(AS$, INSTR(AS$, " ")-1)
190   IF (FS = "AUTOEXEC") OR (FS = "DO") THEN GOTO 210
200   BAT.COUNT = BAT.COUNT + 1: FS(BAT.COUNT) = FS
210 WEND
220 CLOSE #1: KILL "dobat.lst"
230 IF BAT.COUNT = 0 THEN PRINT "No .BAT files were found!";: BEEP: GOTO 690
240 OPEN "do.bat" FOR OUTPUT AS #1
250 PRINT #1, "ECHO OFF"
260 PRINT #1, "REM Created by DOBAT.BAS on "; DATE$; " "; TIME$
270 PRINT #1, "IF 'X1==' GOTO DO_SYNTAX_ERROR"
280 FOR I=1 TO BAT.COUNT
290   PRINT #1, "IF %1=="; FS(I); " GOTO "; FS(I)
300   SMALL.FS = FS(I)
310   FOR J=1 TO LEN(FS(I))
320     IF MID$(SMALL.FS,J,1) < "A" THEN GOTO 350
330     IF MID$(SMALL.FS,J,1) > "Z" THEN GOTO 350
340     MID$(SMALL.FS,J,1) = CHR$(ASC(MID$(FS(I),J,1))+32)
350   NEXT
360   PRINT #1, "IF %1=="; SMALL.FS; " GOTO "; FS(I)
370 NEXT
380 PRINT #1, "ECHO."
390 PRINT #1, "ECHO %1 not found!"
400 PRINT #1, "ECHO."
410 PRINT #1, "ECHO Is the command misspelled?"
420 PRINT #1, "ECHO Have you mixed uppercase and lowercase letters?"
430 PRINT #1, "ECHO Is the command simply not defined?"
440 PRINT #1, "GOTO DO_END"
450 PRINT #1, " :DO_SYNTAX_ERROR"
460 PRINT #1, "ECHO Syntax is: DO batch_filename [batch_file_parameters]"
470 PRINT #1, "GOTO DO_END"
480 FOR I=1 TO BAT.COUNT
490   PRINT #1, "REM <<<<<<<<< "; FS(I); " >>>>>>>>>"
500   PRINT #1, " :"; FS(I)
510   PRINT #1, "SHIFT"
520   FS = FS(I)+".BAT": PRINT "Processing "; FS: OPEN FS FOR INPUT AS #2
530   WHILE NOT(EOF(2))
540     LINE INPUT #2, AS$
550     PRINT #1, AS$
560   WEND
570   PRINT #1, "GOTO DO_END"
580   CLOSE #2
590 NEXT
600 PRINT #1, " :DO_END"
610 CLOSE #1
620 PRINT "DO.BAT has been successfully created.": BEEP
630 PRINT: PRINT "Do you wish to purge the individual .BAT files? ";
640 K$=INPUT$(1)
650 ON INSTR("YyNn",K$)+1 GOTO 640, 660, 660, 690, 690
660 FOR I=1 TO BAT.COUNT
670   FS = FS(I) + ".BAT": PRINT: PRINT "Deleting "; FS;: KILL FS
680 NEXT
690 PRINT
700 SYSTEM

```

Listing 1: DOBAT.BAS is a BASIC program that combines all of a subdirectory's batch files into one batch file called DO.BAT.

(continues)

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```

100 CLS 'UNDOBAT.BAS by Mohammad Dadashzadeh
110 DIM FS(100)
120 OPEN "do.bat" FOR INPUT AS #1
130 ON ERROR GOTO 420
140 LINE INPUT #1, AS 'Ignore the ECHO OFF
150 LINE INPUT #1, AS
160 IF INSTR(AS,"Created by DOBAT.BAS") <> 0 THEN GOTO 180
170 PRINT "Unrecognized DO.BAT!";: BEEP: GOTO 410
180 LINE INPUT #1, AS 'Ignore the test for missing parameter
190 BAT.COUNT = 0
200 LINE INPUT #1, AS
210 WHILE LEFT$(AS,7) = "IF X1=="
220 BAT.COUNT = BAT.COUNT + 1
230 FS(BAT.COUNT) = MID$(AS,8,INSTR(8,AS," ")-8)
240 LINE INPUT #1, AS 'Bypass the lowercase test
250 LINE INPUT #1, AS
260 WEND
270 IF BAT.COUNT = 0 THEN PRINT "No .BAT files to extract!";: BEEP: GOTO 410
280 FOR I=1 TO BAT.COUNT
290 WHILE AS <> ":" + FS(I) 'Look for the label
300 LINE INPUT #1, AS
310 WEND
320 LINE INPUT #1, AS 'Bypass the SHIFT
330 FS = FS(I) + ".BAT": PRINT "Creating "; FS: OPEN FS FOR OUTPUT AS #2
340 LINE INPUT #1, AS
350 WHILE AS <> "GOTO DO_END"
360 PRINT #2, AS
370 LINE INPUT #1, AS
380 WEND
390 CLOSE #2
400 NEXT
410 SYSTEM
420 IF ERR <> 62 THEN GOTO 440
430 PRINT "Unexpected end of file encountered!";: BEEP: RESUME 410
440 CLOSE: ON ERROR GOTO 0

```

Listing 2: UNDOBAT.BAS is a BASIC program that recreates the individual batch files from a DO.BAT file created with DOBAT.BAS (see Listing 1).

combined batch files, simply precede the normal command with DO. For example, suppose one of the batch files is FRMT.BAT, normally invoked by FRMT and a drive letter parameter, such as FRMT B:. After the batch files are combined into DO.BAT, the command DO FRMT B: runs the same commands that FRMT.B: would.

To restore the individual batch files, use UNDOBAT.BAS. It extracts the .BAT files from DO.BAT. This procedure is required if you wish to update the DO.BAT file with new batch files or to copy single batch files to another destination.

Mohammad Dadashzadeh
Novi, Michigan

Editor's note: DOBAT.BAS and UNDOBAT.BAS are great utilities for every DOS computer. Remember, however, that some batch files may use other support files—for example, to display help screens. Such support files must accompany DO.BAT. Also, if a batch file calls another batch file, either directly or as a subroutine by using COMMAND /C, the parent batch file will not work correctly from DO.BAT until you have inserted the command DO before the second batch file call. Likewise, any such modifications must be removed from the batch files that UNDOBAT.BAS creates.

(continues)

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Bar charts show how easy or how difficult the testers found each program in routine situations.

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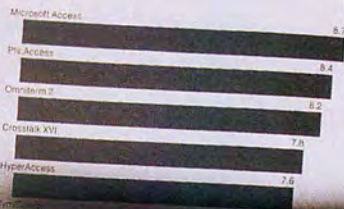
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An accurate table of checklists rates the packages side-by-side for their ability to handle hundreds of tasks typically performed by the application. So you know exactly what a program will and won't do.

EASE OF USE Summary

Communications Programs

Analysts
The ease of use ratings compare closely to those in other publications. Every program rating is based on the ease of learning, ease of use, and ease of actually using the program.



VERSATILITY

INTRODUCTION

Pages 46-57 present over 175 specifications/features for side-by-side comparisons of versatility for the 15 word processing programs tested for this issue. NSTL staff experts created a master list of features and verified each one for the chart.

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CURSOR MOVEMENT FUNCTIONS								
Word right/left (# of keystrokes)	0	1	1	1	1	1	1	1
Beginning/end of line (# of keystrokes)	0	1	1	1	1	1	1	1
Beginning/end of sentence (# of keystrokes)	0	1	1	1	1	1	1	1
Top/bottom of screen (# of keystrokes)	0	1	1	1	1	1	1	1
Beginning/end of document (# of keystrokes)	1	2	2	2	2	2	2	2
Go to a specific page (# of keystrokes)	1	2	2	2	2	2	2	2
Horizontal scrolling	1	1	1	1	1	1	1	1
Jump to bookmark	1	1	1	1	1	1	1	1
Go to first character in marked line	1	1	1	1	1	1	1	1
Go to last character in marked line	1	1	1	1	1	1	1	1
Go to first character in marked line	1	1	1	1	1	1	1	1
Go to last character in marked line	1	1	1	1	1	1	1	1
Go to first character in marked line	1	1	1	1	1	1	1	1
Go to last character in marked line	1	1	1	1	1	1	1	1

Paradox ★★★★★

SPECIFICATIONS

Version

1.1 (Released March 1986)

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Operating system: PC-DOS 2.0, 2.1, 3.0, 3.1, 3.2, 3.3

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Program can be copied

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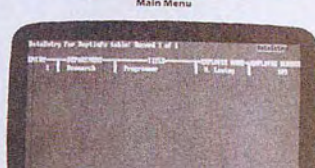
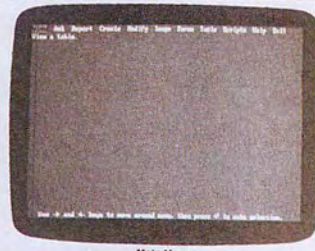
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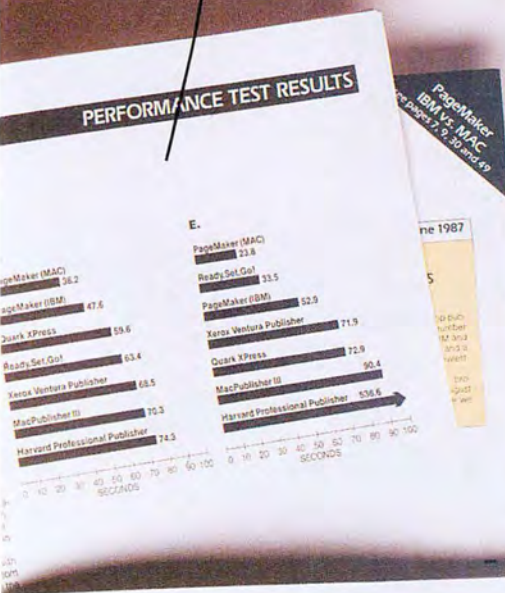
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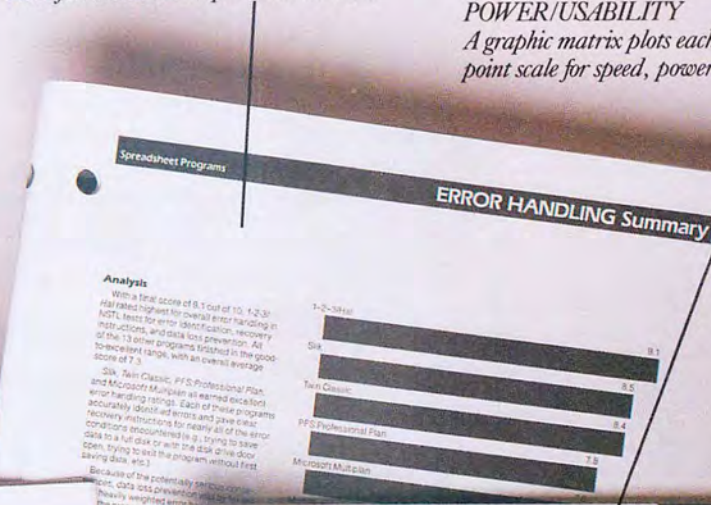
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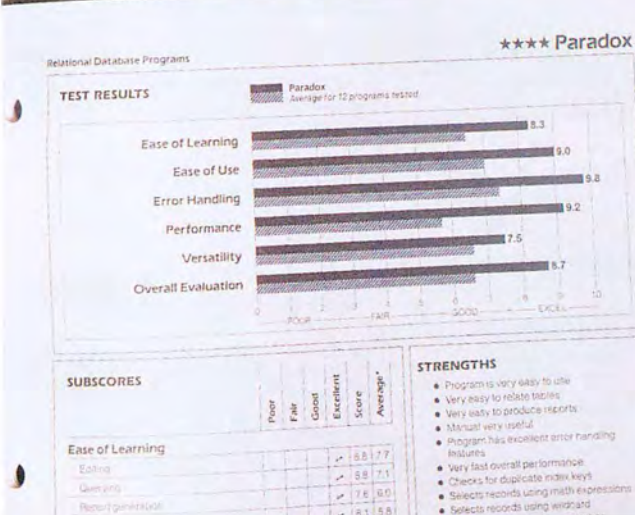
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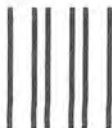
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ProComm, the Executioner

After recently receiving a copy of DataStorm's user-supported communications program, *ProComm*, I quickly realized that the <Alt>-A option, which lets you use your favorite text editor while remaining in *ProComm*, can also be used to run any executable (.BAT, .COM, or .EXE) file. Simply invoke Setup (<Alt>-S), press 4 to select the General Setup option, and press 1 to indicate that you wish to change the name of your text editor. Now insert the name of whatever executable file you wish to run when you press <Alt>-A. For instance, you could have <Alt>-A run a program that tells you whether the phone number you wish to call involves a toll charge. When you exit the program, you will be sent right back into *ProComm*.

Alex Roosakos
Millbrae, California

FORM.BAT Correction

The lines of FORM.BAT (see "Elegance or Simplicity?" *.* , PCW, October 1987) that contain ^G should each be ECHO ^G instead.

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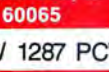
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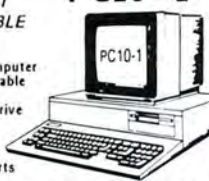
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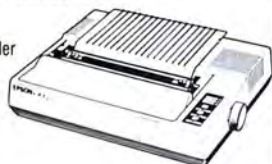


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- Front panel selectable
- IBM Pro Printer character set

Options

- 32K buffer
- Cut Sheet Feeder
- Tractor Feeder



LX-800

- 180 cps (12 CPI) in draft mode
- 30 cps in Letter Quality mode

Options

- Cut Sheet Feeder



All new Epson LQ Series 24 Pin Printers

LQ-2500

- 324 cps print (Elite 12 CPI) in draft mode
- 405 cps (Elite 15 CPI) in ultra-high speed mode
- 108 cps (Elite 12 CPI) in Letter Quality mode
- 8K internal buffer

Options

- Single and Dual Bin Cut-Sheet Feeders
- 32K buffer

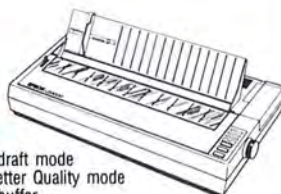


LQ-1050

- 220 cps in draft mode
- 73 cps in Letter Quality mode
- 6K internal buffer

Options

- Tractor Feed
- Cut Sheet Feeder
- 32K buffer

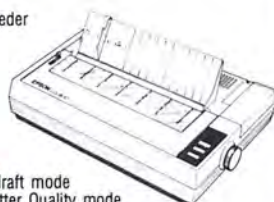


LQ-850

- 220 cps in draft mode
- 73 cps in Letter Quality mode
- 6K buffer for downloadable characters

Options

- Tractor Feed
- Cut Sheet Feeder
- 32K buffer



All new Epson EX Series Dot Matrix Printers

EX-1000

- 300 cps (Elite 12 CPI) in draft mode
- 54 cps (Elite 12 CPI) in Near Letter Quality mode
- Paper up to 16-inches wide

Options

- Color Option Kit
- Single and Double Bin Cut Sheet Feeders
- 32K buffer

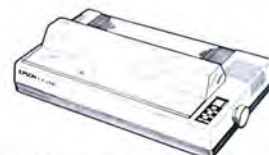


EX-800

- 300 cps (Elite 12 CPI) in draft mode
- 54 cps (Elite 12 CPI) in Near Letter Quality mode
- 8K internal buffer

Options

- Color enhancement
- 32K buffer



*LX-80

- 120 cps (Pica 10 CPI) in draft mode

Options

- Cut Sheet Feeder
- Tractor Feed
- Interface boards for additional buffer



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- c. MIS or micro manager
- d. Engineering or R&D
- e. Finance or accounting
- f. Reseller/VAR
- g. Other

2. Number of employees in your company:

- 1. 25 or fewer
- 2. 26-99
- 3. 100-499
- 4. 500-999
- 5. 1000 or more

3. Plan to buy:

- a. Now
- b. In 4-6 months
- c. In 7-12 months
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4. For how many IBM PCs and compatibles do you buy products? (Include both company and personal units, please.)

- 1. 1
- 2. 2-4
- 3. 5-9
- 4. 10 or more

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- g. Other

2. Number of employees in your company:

- 1. 25 or fewer
- 2. 26-99
- 3. 100-499
- 4. 500-999
- 5. 1000 or more

3. Plan to buy:

- a. Now
- b. In 4-6 months
- c. In 7-12 months
- d. More than 12 months from now
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4. For how many IBM PCs and compatibles do you buy products? (Include both company and personal units, please.)

- 1. 1
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- 3. 5-9
- 4. 10 or more

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Mark Chussil

Another Angle: Abuse of Power

More than any other application, financial modeling has put personal computers on the map. But it also has given us the means to sail off the edge of the earth.

One \$795 business forecasting package claims to "allow business professionals with little or no knowledge of statistical forecasting to use the most sophisticated techniques." A major university sponsors a business seminar promising a 1-2-3 model that "will write your strategic plan." Another software advertisement boasts, "Instant answers. Instant analysis. Instant understanding."

While business software has become more powerful and convenient, it has not become safer to use. Business analysis on the PC still requires skills unfamiliar to most businesspeople. Instruction manuals tell us only which buttons to push to run a program, not how to generate meaningful results.

Unrecognized errors often are hidden among that sea of cells; and the bigger the spreadsheet model, the more hiding places. For example, I know of one major corporation that nearly lost millions when an algebraic error in an analyst's spreadsheet wildly

overvalued an acquisition candidate. That error was caught, but others go unnoticed—and uncorrected—for years. A financial model builder who enters equations correctly 99 percent of the time is almost certain to make at least one error every hundred equations; today's superpowered spreadsheets can hold thousands of equations.

Some business factors—such as the effects of market share, product quality, and customer leverage—are not easily quantifiable in a spreadsheet template. Also, simplistic equations are often too simplistic. I saw a series of 1-2-3 sales-forecast macros published recently that would work fine for a relatively stable business but would amplify errors when applied to cyclical or seasonal markets.

A spreadsheet auditor will catch some errors. But it won't bounce the equation $B1 * X1 + B2 * X2 + B3 * X3 + B4 * X4 + B5 * X4 + B6 * Y6 + B7 + X7$. Although the equation syntax is correct, it contains at least four possible errors. And it has no way of letting you know the important business factors that you left out of your profit projections.

If you are dealing only with a simple worksheet of your department's budget, you have little cause for concern. Accounting relationships are straightforward

and well understood. But if you're stretching spreadsheet analysis doing, say, mergers and acquisitions, you may want to step back from the numbers occasionally to ask a few common-sense questions like:

- Does the model or modeler promise performance or turnaround times that seem too good to be true? Beware of oversimplification.

- Are any of the assumptions on which the equation's model is built out of date? Don't analyze today's problems under yesterday's conditions.

- Has the model been tested with known data? If not, you're blazing a new trail.

- Is your spreadsheet reliable? Remember that your data is only as good as the typing skills of your data entry person—watch for typos.

Regardless of ad claims, don't blindly rely on computers—after all, they only know what we tell them.

Mark Chussil is director of the Business-Unit Strategy Program for the Strategic Planning Institute of Cambridge, Massachusetts.

Have a different perspective on computing? Send your opinions to Another Angle, PC World, or MCI Mail PCWorld/179-3813. ●

Switch on a serious surge suppressor.



With test after test proving that 70-90% of all PC malfunctions can be traced to power problems, a surge suppressor is the first accessory you should buy for your PC. But don't put your trust in just any surge suppressor. Get one that gives your whole system superior protection. One that's engineered to the highest specifications.

Get a Kensington Master Piece® or Master Piece Plus.

They're the most popular PC surge suppressors. And the most serious. Because at Kensington, we're dedicated to giving your PC the best possible protection.

That's why Master Piece and Master Piece Plus are equipped with our unique two-stage surge suppression circuit, containing a high-speed silicon semiconductor for the quick reaction necessary and heavy-duty metal oxide varistors for the brute force required to keep even the largest surges from penetrating into your system.

That's why the plus in Master Piece Plus is additional modem surge suppression circuitry to protect your modem from surges, spikes and noise on the telephone line.

And that's why the circuitry in both models can handle anything an electrical storm or your local power company can offer — up to 6,000 volts with a 3,000 amp follow-on current. (That's the kind of superior performance that passes not only UL* testing, but Categories A and B of the strict IEEE† specification 587-1980 as well.)

Now, this may look to you like we're taking more than the necessary precautions. And actually, we are. But after all, isn't that what you expect from a serious surge suppressor?

Master Piece (\$149.95) and Master Piece Plus (\$159.95). For more info, or a dealer near you, call (800) 535-4242. In NY (212) 475-5200.

Meets IEEE 587-1980 Category A	✓
Meets IEEE 587-1980 Category B	✓
UL Listed	✓

The right surge suppressor passes all the tests.

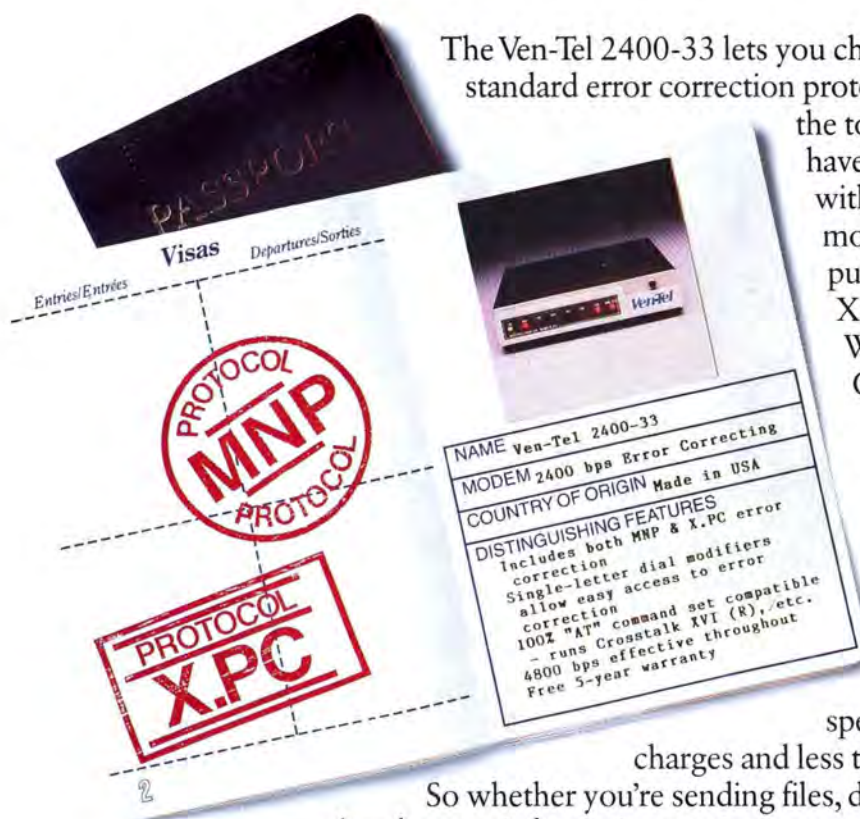


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Circle 98 on reader service card

The error correcting modem that ensures safe passage for your data—no matter where it's traveling.



The Ven-Tel 2400-33 lets you choose between the two standard error correction protocols (X.PC and MNP) at the touch of a key. So you'll have error free connections with over 350,000 MNP modems *and* with major public data networks using X.PC—like Tymnet, MCI, Western Union and GE Geisco.

And the 2400-33 not only protects your data, it's faster than *any* non-error corrected modem. MNP Level 5 data compression can double your throughput up to 4800 bps—and higher speeds mean reduced phone

charges and less time spent transmitting.

So whether you're sending files, downloading expensive data from an information service or managing your personal portfolio, you'll know that your critical data is 100% correct.

The Ven-Tel 2400-33. The only modem that guarantees your data a flawless trip... no matter where it's traveling.

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Modems

Our free booklet, "How To Select The Correct Modem," contains specific information about the 2400-33 and our full line of modems. To request your copy, call 800-538-5121.

Circle 213 on reader service card