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MAY 15, 1990 THE INDEPENDENT GUIDE TO IBM-STANDARD PERSONAL COMPUTING VOLUME 9 NUMBER 9

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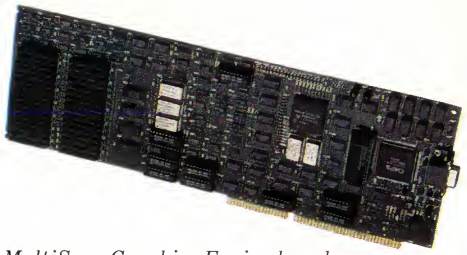

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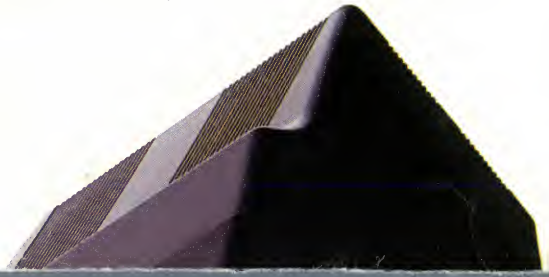

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What the ex driving

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perts will be this year.

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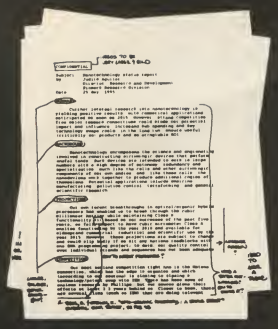

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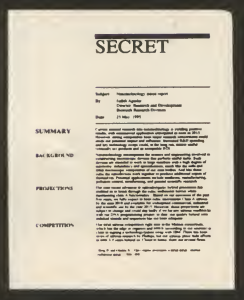

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CIRCLE 280 ON READER SERVICE CARD

Inside

Increased productivity. Products claim it; pundits acclaim it. Perestroika and quality time notwithstanding, can you think of a phrase more often heard today?

Productivity has long been our goal. On January 28, 1986, *PC Magazine* introduced its Productivity section, devoted to helping you work smarter and faster as you gained a better understanding of computers.

And in 1990 productivity is still our goal. In this spirit we've introduced three new columns to make your workaday computing more fulfilling: "The Working Word," "Windows," and "Databases."

Three of our productivity experts, Craig L. Stark, Trudy Neuhaus, and William S. Hall, offer brand new columns.

"The Working Word," devoted to word processing technology, is written by Craig L. Stark—a name many of you will recognize from these pages over the last five years. Others of you may know him from *Stereo Review*, where he's been a contributing editor for more than two decades.

Stark's love for computers comes second only to his passion (and Ph.D.) for philosophy, so as you follow Stark and explore popular word processors, you just might find an analogy between Kant and fonts hidden among the add-ins and accessory products.

The *Windows* column brings a new face to *PC Magazine*, William S. Hall. Hall has worked with *Windows* since 1985 and he currently develops *Windows* applications as a software engineer for Novell Corp. At *Programmers Journal*, where he is a contributing writer, Hall is affectionately known as the *Windows* Wizard.

When you want to know where *Windows* is headed, look no further. There'll be plenty of indispensable tips, as well as in-depth examinations of life under *Windows*. In keeping with our tradition of Utilities to boost productivity, you'll find *Windows*-based gems in the offing.

I will be tackling Databases with you. I've spent the last two years ensuring that every line of code and word of advice in the Productivity section work when you need them. It's here that you'll find database tips and techniques, plus columns that sift through the hype, dissect the issues, and hone popular terminology.

One unparalleled characteristic of the Productivity section has always been its editor-reader dialog. Reader submissions and tips make this section special. So keep sharing your thoughts, and join us in what we lovingly refer to as "the back of the book."

But hold on! Don't gloss over this month's features. *Selecting a VGA* monitor is perhaps the most personal choice you make when buying a new computer system. Our look at 28 VGA monitors makes sure you'll be ready for the challenge. From cover to cover, the operative word for this issue is *productivity*.—**Trudy Neuhaus** ■

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PC Week

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Jim Heid - Macworld

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Electronic Publishing & Printing

"If you're looking for a laser printer with a PostScript language controller (and the famous 35 Adobe fonts built into ROM), take a look at QMS's superb PS 810."
Jim Seymour - PC Magazine

The QMS-PS 810

The QMS-PS 820

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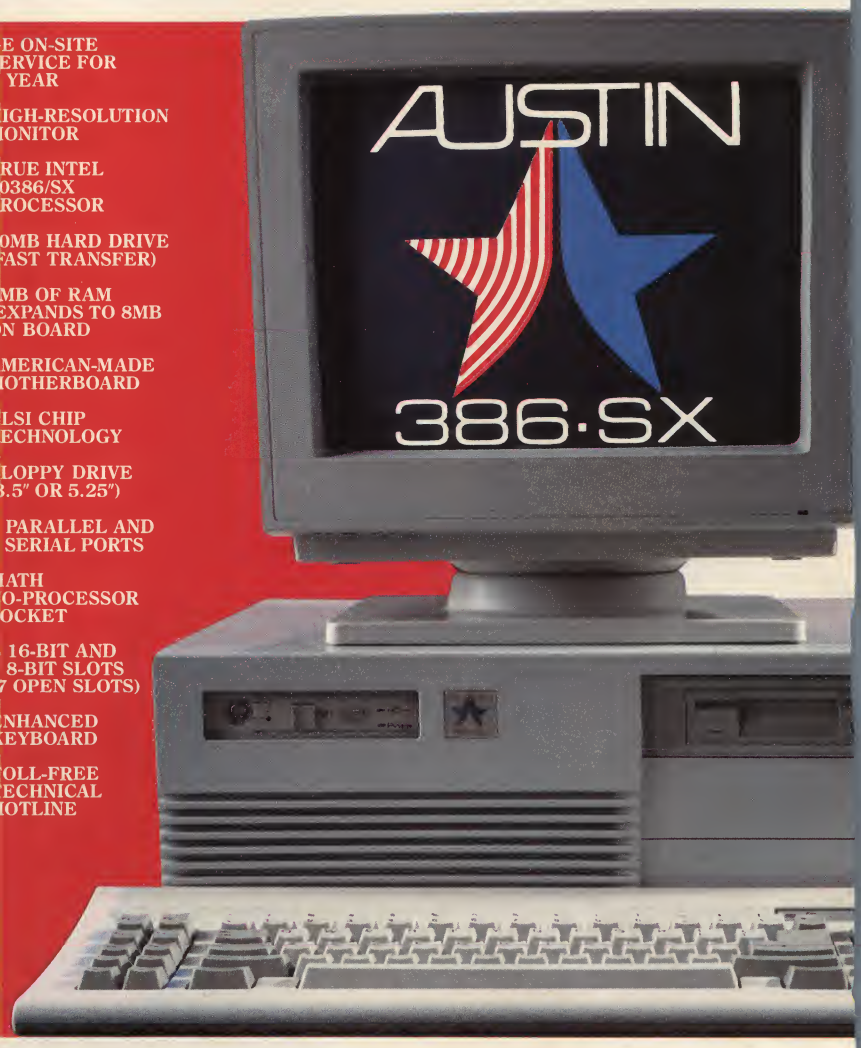

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PC MAGAZINE EDITOR'S CHOICE

THE AUSTIN 386/SX EDITOR'S CHOICE PC MAGAZINE (USA) JANUARY 30, 1990

PC MAGAZINE EDITOR'S CHOICE

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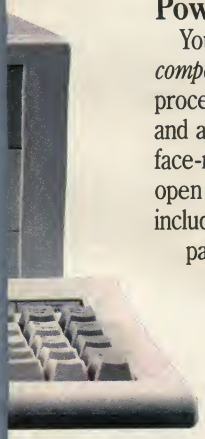

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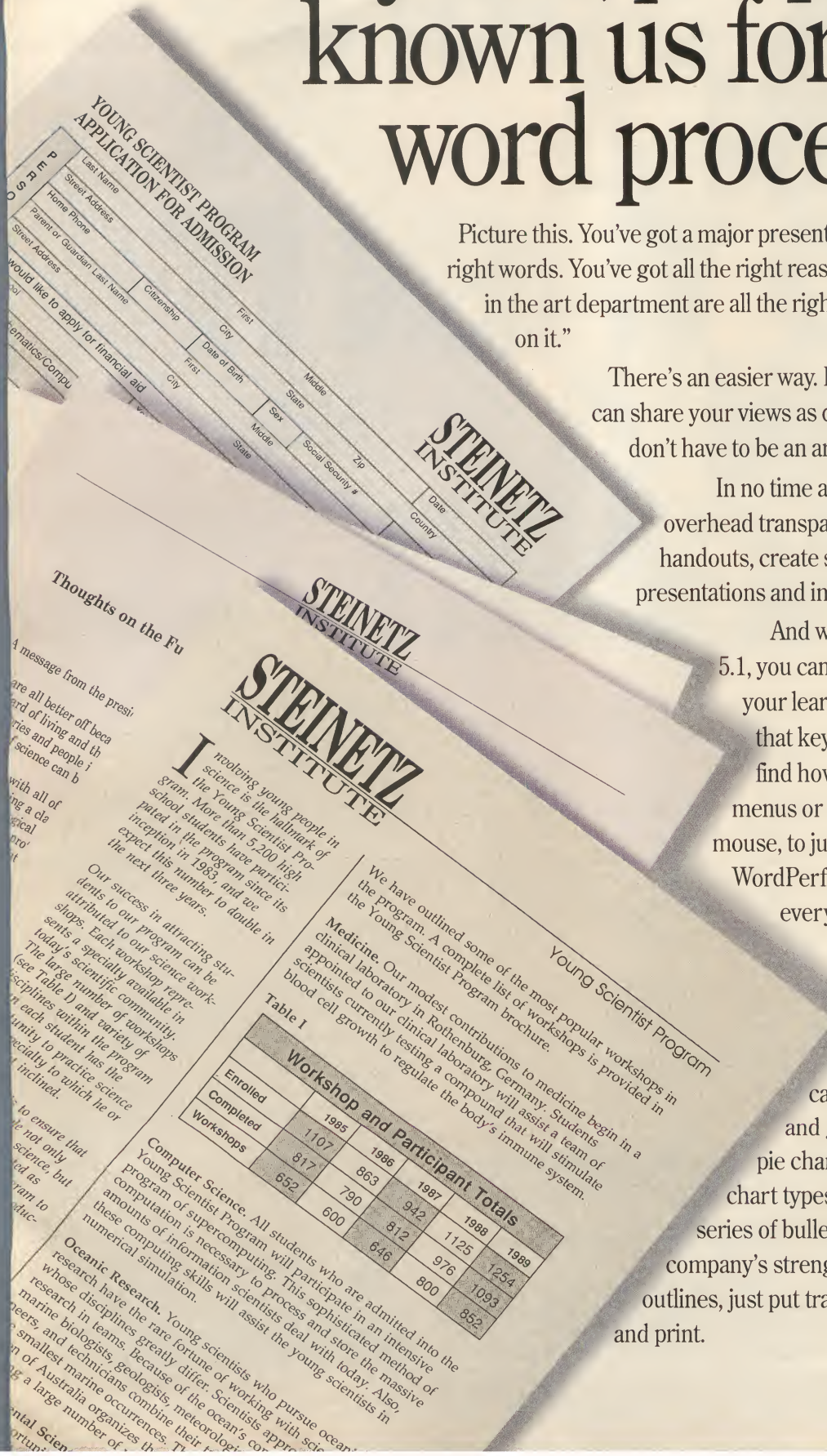

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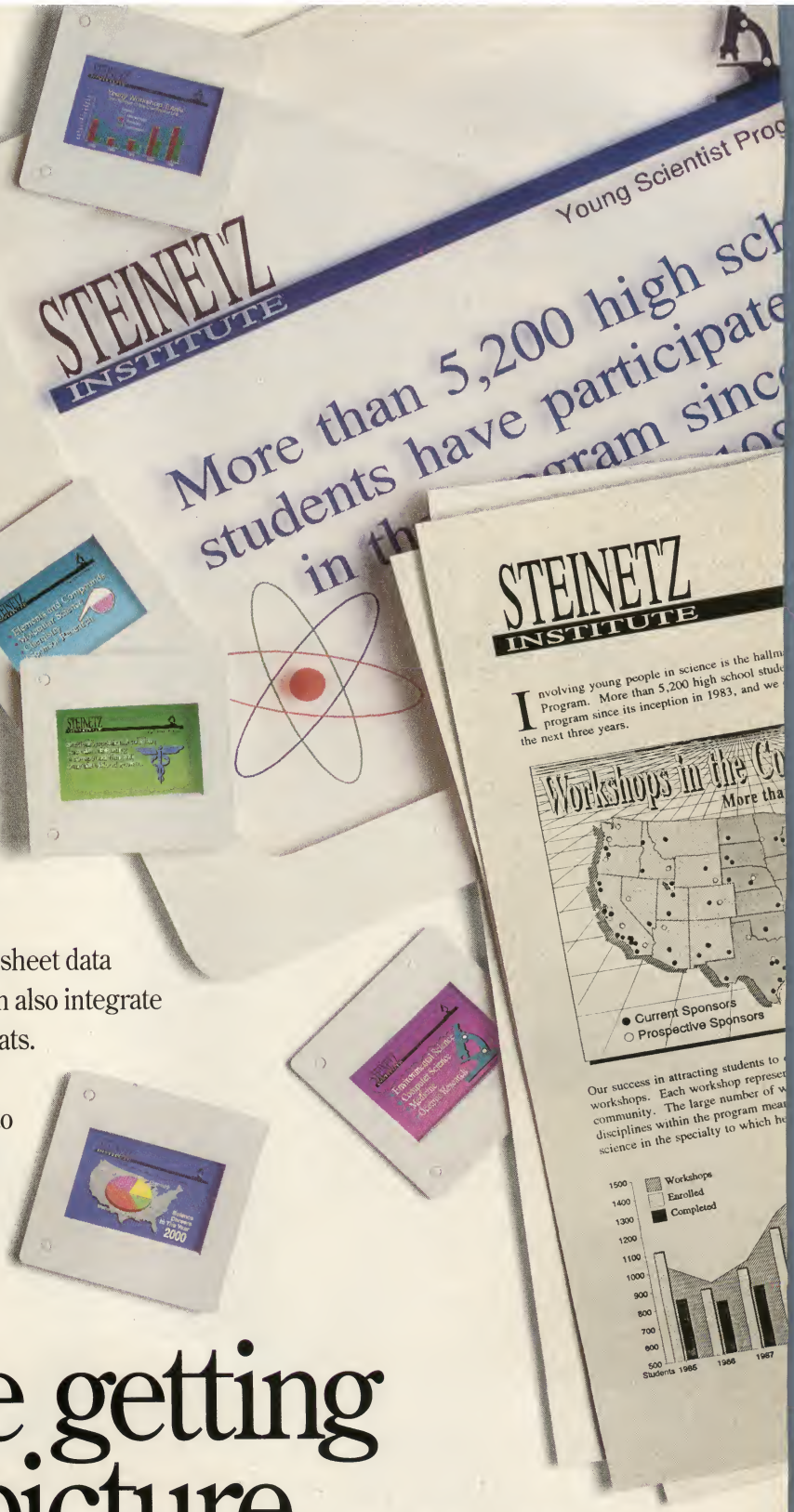

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Why didn't someone do this before?

Actually, a lot of people tried. But what they ended with were a bunch of fancy software "environments" that eat up memory, change the way you work, and boggle the mind with complexity.

Plus, a lot of them make you buy new "compatible" software applications. Some even make you buy a bigger computer.

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CIRCLE 724 ON READER SERVICE CARD

#6

Letters

WORDSTAR-STRUCK

PC Magazine is always enjoyable, but I think you missed the boat in the issue concerning word processing ("Two Aces and a King: The Big Three Word Processors Raise the Ante," November 28, 1989). There was no mention of *WordStar,* not even in the "also ran" section.

I find it difficult (difficult, hell! I find it impossible) to discuss the leading word processing programs without mentioning *WordStar. WordStar* 5.5 has got to compare favorably with the "Two Aces and a King" as you reviewed them. It seems fashionable these days to forget *WordStar;* the reason why escapes me because it has many great features.

I am *not* implying that *WordStar* is the one and only word processor, I am simply suggesting a good hard look and a comparison of its features with those of the other packages. We all have our likes and dislikes and our own individual expectations of a word processor. I have tried darned near every word processor that has come along, and I keep coming back to *WordStar.* Oh, I know, some will say that I am mentally unbalanced because *WordStar* is so-o-o hard to learn. Baloney! I can teach the village idiot to become a productive *WordStar* user in one day! The basic Ctrl-key functions are still the best if one is even modestly accomplished on the keyboard.

Gary Retterbush
Major, USAF (Retired)
Apo, New York

Good grief! We already know that Edward Mendelson thinks that *WordPerfect* hung the moon ("Two Aces and a King: The Big Three Word Processors Raise the Ante"), so why did you ask this diehard *WordPerfect* user to review *WordStar* 5.5 ("*WordStar* 5.5: New Features for Old Loyalists," First Looks, *PC Magazine*, January 30, 1990)?

As a *WordStar* and *WordPerfect* user, I believe that *WordStar* 5.5 is, once again, at the top in terms of overall power, and I think it is superior to both *WordPerfect* and *Microsoft Word* in certain important features.

COVER STORY

Two Aces and a King

The Big Three Word Processors Raise the Ante

by Edward Mendelson

IBM DisplayWrite 5/2, Microsoft Word 5.0, and WordPerfect 5.0 sit at the top of the word processing heap—and justifiably so. Which one's right for you? In order to decide, you'll need to review their individual strengths and weaknesses carefully.

***WordStar* users cry foul over recent word processor coverage.**

Mendelson failed to mention that *WordStar* 5.5's Mailmerge (*WordStar* essentially invented PC mail merging) supports direct use of .DBF files, as well as automatic loading of *dBASE* field names. *WordPerfect* users can only hope that merging in *WordPerfect* 5.1 will prove to be less clumsy than in the earlier releases.

Anyone who employs touch-typists should be aware of the fact that *WordStar* is the only word processor that supports touch-typing. Neither *Microsoft Word* nor *WordPerfect* allows you to rest your hands on the home row of the keyboard. Corporate buyers for whom productivity is important need to know this, and you can bet that Mendelson isn't going to tell them.

Daryl Close
Sycamore, Ohio

THE CORPORATE STANDARD

I am writing with regard to your recent reviews of 31 386SX machines ("386SX: The New Corporate Standard," *PC Magazine*, January 30, 1990). How can you arrive at the Austin 386SX as an Editor's Choice and not the Gateway 2000? The Gateway beats the socks off the Austin in all the performance categories except the BIOS Disk Seek test. The winning margin for the Austin is so slim it's almost insignificant—1.89 milliseconds. The Gateway is $100 more, but it includes an extra megabyte of RAM and an extra floppy disk drive. Either of these features is worth the extra $100.

After a careful analysis of the benchmark tests and features summary provided in the article, it appears to me that the only logical Editor's Choices are the Zeos and the Gateway.

Bill Franklin
Evansville, Indiana

PC MAGAZINE Editor's Choices are awarded on more than just fast performance and low price tags. One such intangible is a small-footprint design, which *PC Magazine* favors for the entry-level SX. The Gateway 2000 Multiperformer is a solid computer, which is why it received an honorable mention. However, the Zeos 386SX-16 is our choice among SXs in a full desktop case, while the Austin 386SX offers six open slots in its small-footprint design.—*Ed.*

As I was reading your reviews of 386SX machines in the January 30, 1990, issue ("386SX: The New Corporate Standard"), the diagrams displaying the machines' interiors really caught my eye. I liked them very much and was disappointed that they did not appear in the next issue's review of 33-MHz 386 machines ("Speed to Burn: 22 of the Fastest 386s," *PC Magazine*, February 13, 1990). Do it again!

Mark Hollomon
Cary, North Carolina

GIVING BOOTS THE BOOT

I, like John Boots (Letters, *PC Magazine*, February 13, 1990), am somewhat of a purest in respect to PC operations. I prefer the ad hoc C:> prompt to mouse

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Letters

chasing all around the screen.

However, I am surprised that Mr. Boots' mega-buck company leaders are more concerned with appearances than with productivity. Simply put, the GUI cuts deeply into the learning curve and speeds up computer operations—employee training is centered around the application instead of DOS.

A manager, regardless of the enterprise, is supposed to make cost-versus-production decisions and get the voluntary compliance from subordinates.

Mr. Boots is certainly not doing his company any favors.

Michael Lodge
San Diego, California

I feel compelled to respond to John Boots' letter (Letters, *PC Magazine*, February 13, 1990). Mr. Boots' narrow-mindedness seems to be exceeded only by his ego at still holding the high school touch-typing speed record.

I too am a reasonably fast touch-typist who can bang out a letter or memo with the best of them. I have been working with computers since 1968 and find the graphical interface extremely appealing.

I work for a 30-million-dollar subsidiary of a 5-billion-dollar company. My company employs 15 people holding Ph.D.'s and another 25 or 30 with master's degrees. Virtually every employee uses a Macintosh, and I use *Windows* on my machine. You would have to be pretty high up on the IQ scale to call us illiterate, yet none of us become nauseated by the look-and-feel of our systems.

Yes, it is possible to design user-friendly command-driven programs, but every software developer will develop his or her own personal version of user friendliness. Each program will use different keys to execute different functions. Why reinvent the wheel with every program? Why not use the GUI tools that are already there in the development kits for *Windows*, OS/2 PM, and the Macintosh?

I found an interesting coincidence in the letter that Mr. Boots referred to (Diana G. Matthieson, Letters, *PC Magazine*, November 28, 1989). Ms. Matthieson is from Gainesville, Florida, and Mr. Boots is from Jacksonville. Maybe there is something in the water in northern Florida that causes this graphical intolerance.

Bill Christensen
Knoxville, Tennessee

Am I alone, or does John Boots sound a little maniacal to anyone else out there? GUIs do nothing for me either, but I'm a little less obsessed about it.

I wonder if his 80-million-dollar company would be an 800-million-dollar company if they hired more open-minded people?

Jeff Wurstner
Waterloo, New York

Yes, it is possible to design user-friendly command-driven programs, but each will use different keys to execute functions. Why reinvent the wheel with every program?

A DATE WITH DVORAK

In both "Inside Track" and his column (*PC Magazine*, February 13, 1990), John C. Dvorak laments the last Comdex crush. "Personally," he opines, "I find that the Editors' Days that *PC Magazine* puts on around the country to introduce our editors to local companies are far more valuable to me as far as new products are concerned."

Great, John. And just how do we go about getting invited to one of those? Next time you're in my neck of the woods, gimme a call. We'll do lunch.

Dennis Stacy
San Antonio, Texas

PROTECTION FROM COPY PROTECTION

Stephen Manes does not know when he is well off. In his column (*PC Magazine*, December 26, 1989), Manes complains about the inconveniences of the "block" used to protect some software against

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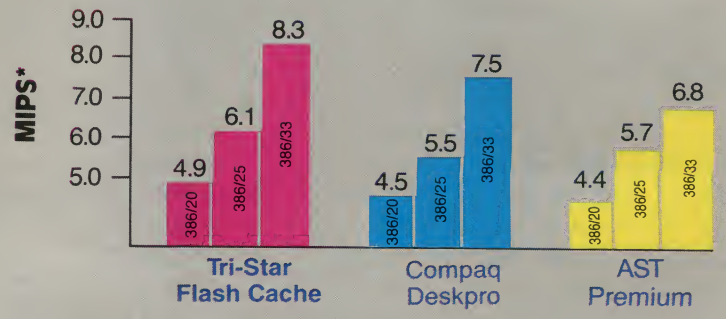
Benchmark Summary



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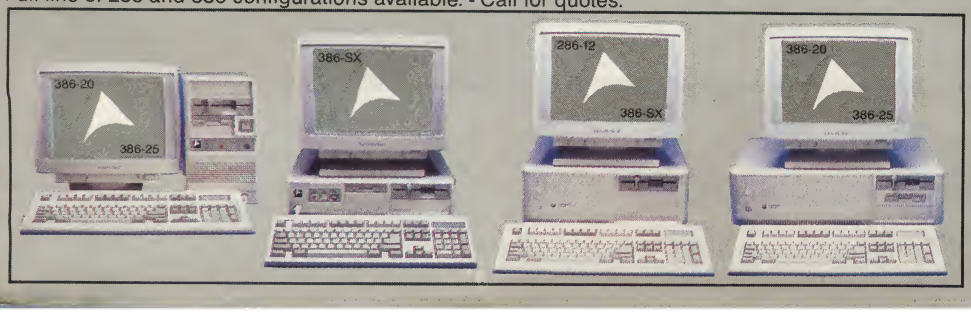

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PC MAGAZINE

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DATA 386-25A
January 16, 1990

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- PERFORMANCE

PC MAGAZINE EDITORS' CHOICE
Oct. 11, 1988 Dataworld Portacomp II

PC MAGAZINE EDITORS' CHOICE
Feb. 28, 1989 Dataworld 386-16

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Compaq Deskpro 386S	4.48	9.67	0.83

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- VGA gas plasma display, 640×480 resolution with 16 shades
- External VGA monitor port
- 1MB of base RAM, expandable to 4MB with memory daughterboard
- AMI BIOS with ROM setup and diagnostics
- Expansion slots: 1 half-length slot available
- 1.44MB diskette drive (external 1.2MB drive connector built-in)
- 40MB, 25mS hard drive (IDE interface)
- 1 parallel and 2 serial ports
- 87-key keyboard (external keyboard connector port built-in)
- 65W power supply
- Carrying case
- Weight: approx. 15lbs.

DATA 386SX
$1095

- Intel 80386SX 16MHz CPU (Norton SI ver 4.0: 18)
- 1MB RAM standard, expandable to 8MB on motherboard
- 80387SX coprocessor socket
- Expansion slots: 6 16-bit and 2 8-bit
- 1.2 or 1.44MB diskette drive
- 200W power supply
- Monochrome card and monitor
- Options include hard disks from 20MB to 700MB, tape backup, modem, mouse, Wordperfect key caps, DOS, extra floppy, monitors, game card, coprocessor and tower case

All systems comply with part 15 of FCC rules for a Class A or B computing device. As such, they are suitable for use in a business environment

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Marc Johnson
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- 200W power supply
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- NEC Multisync 3D monitor
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- AT compatible slots: 6 16-bits, 2 8-bit
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- 230W power supply
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- Phoenix BIOS
- Optional 40MB-700MB hard drives, support ESDI, SCSI, IDE, MFM and RLL controller
- 5 storage spaces for floppy and hard drives
- Optional TRW on-site service

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$1630

- Intel 80386 20MHz CPU with 1MB of RAM expandable to 16MB
- Supports 80387 and 80287 coprocessor
- 1.44MB or 1.2MB floppy drive
- Optional 40MB-700MB hard drives, support ESDI, SCSI, IDE, MFM, RLL controller
- Enhanced 101-key keyboard
- 1 parallel, 2 serial port
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- 230W power supply
- 5 storage spaces for floppy, hard drives and tape backup system

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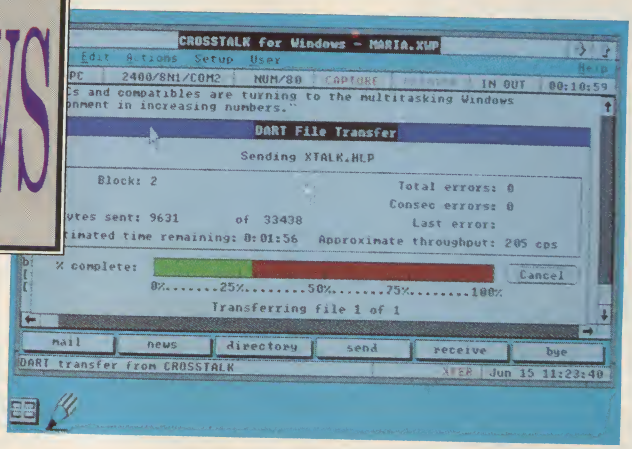

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CIRCLE 278 ON READER SERVICE CARD

unauthorized access, but he has clearly gotten off relatively unscathed.

In Mr. Manes's case, this device only prevented him from using the printer when

> **I'll be happy to buy copy-protected software if the vendor agrees in writing to pay for all damages caused by the protection scheme.**

he wanted to print something. This is not nearly as disconcerting as having it send trash to the printer without a by-your-leave.

Mr. Manes said nothing about his machine locking up, so I assume he missed that benefit as well.

I have had the dubious honor of testing *some Ada courseware* marketed by a well-known *firm, which* gave me the privilege of observing these phenomena firsthand. Since my firm had already paid for the thing, we called the vendor's support line. Their solution was to offer us a $100 replacement for a device whose sole function (from a user's perspective) was to get underfoot. Talk about adding insult to injury.

If you are brave enough to buy copy-protected software, block-protected software, or the like, you may not be as lucky as Mr. Manes. I'll be happy to buy copy-protected software if the vendor agrees *in writing* to pay for *all* damages caused by the protection scheme, including lost time and other indirect damages. If he doesn't trust his scheme enough to sign-off, why should I trust it enough to purchase the product?

Seymour J. Metz
Annandale, Virginia

THE MONEY OF COLOR

Your review of the Tektronix Phaser CP color printer ("Color Page Printers: Affordable at Last," *PC Magazine,* November 14, 1989) incorrectly referred to the cost per print as $1.50. This is the price of a print on *transparency film.* The cost per print on paper is about 38 cents. This was particularly disturbing because it was characterized as a negative by the reviewer.

Because this fact was misrepresented, your readers were given the impression that Tektronix's Phaser CP is considerably more expensive to operate. In fact, the opposite is true. The packaging and pricing of supplies make it one of the most affordable thermal color printers on the market to operate.

Roy Barker
General Manager
Tektronix Graphics Printing & Imaging Division
Wilsonville, Oregon

One of my biggest problems has been purchasing cheap printers that will print self-adhesive labels, such as Avery.

This morning I intended to utilize my November 14, 1989, copy of *PC Magazine* to find an affordable printer that would print Avery-type labels.

Needless for me to tell you, all your hoopla about printer testing apparently doesn't include the awareness that label printing is part of the real world.

Walter Mengel
Youngtown, Arizona

CORRECTIONS & AMPLIFICATIONS

The review of Mouse Systems *PC Paint* 3.1 ("Power Painting on a Budget," *PC Magazine,* December 26, 1989) contained three factual errors. The ALT-key/mouse-click combination allows users to pick up any color in a painting. The maximum number of colors that can be displayed in 800 by 600 mode is 16 not four. And although the program does not contain any internal print drivers, it does support a full range of standard printers via Inset Systems' *Inset,* a bundled screen-capture and printing utility.

HOW TO WRITE TO PC MAGAZINE

Send letters to *PC Magazine,* One Park Avenue, New York, NY 10016, or upload to PC MagNet (see the "By Modem" sidebar in Utilities for access information). All letters become the property of *PC Magazine* and are subject to editing. ■

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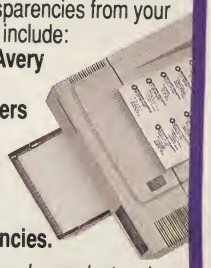

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Address • Shipping Labels			
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5161	1" x 4"	20	100
5162	1 1/3" x 4"	14	100
5163	2" x 4"	10	100
5164	3 1/3" x 4"	6	100
5165	8 1/2" x 11"	1	100
5267	1/2" x 1 3/4"	80	25
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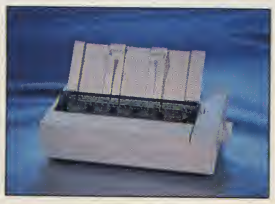

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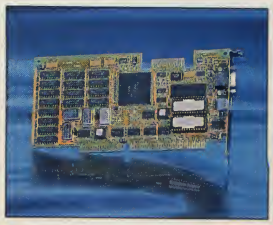

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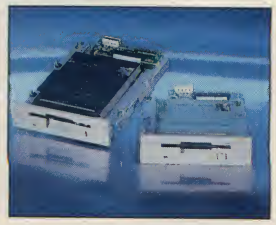

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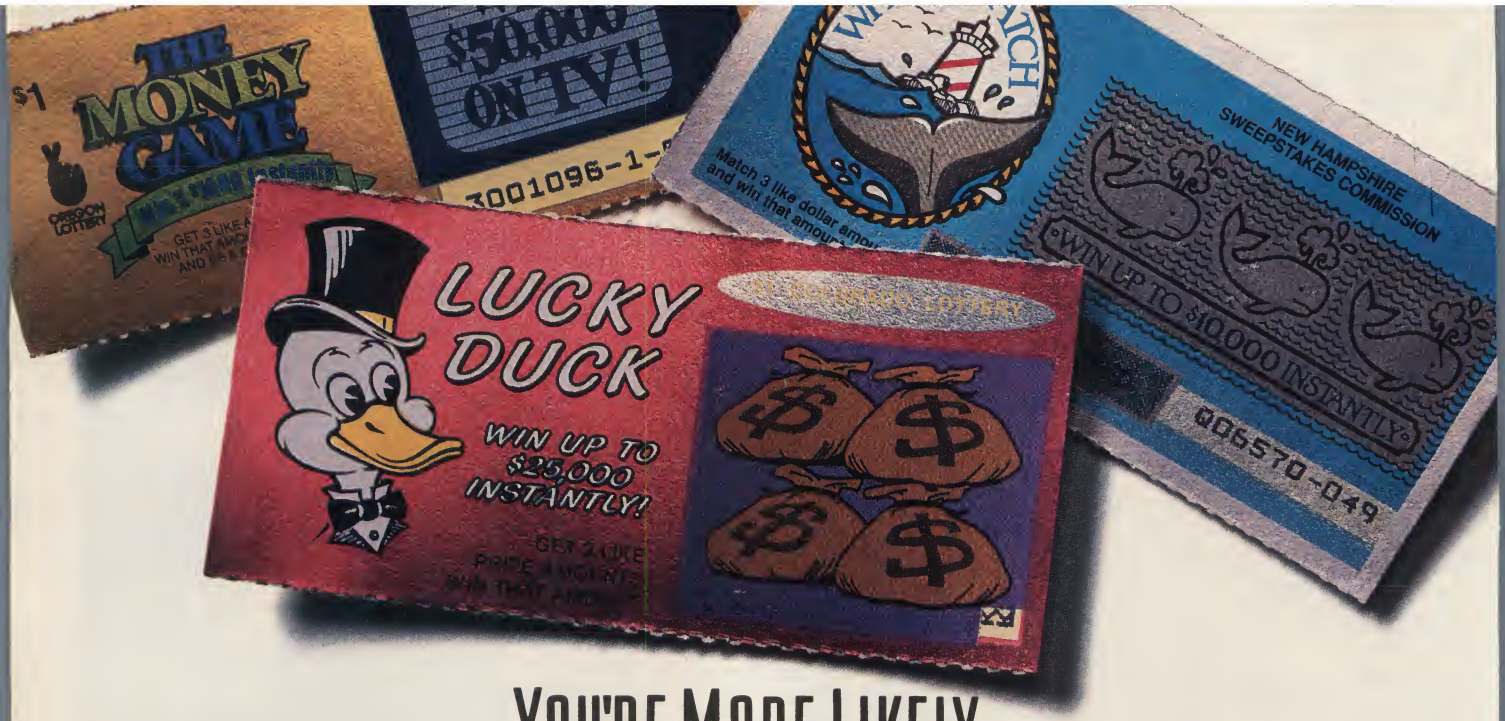

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Advisor

PS/2 BITS

I have an IBM PS/2 Model 80 computer with IBM's ESDI controller and a 70MB hard disk drive. I am looking for a second non-IBM hard disk drive to add to my system, preferably with a capacity of at least 120MB. What hard disks are available that meet these specifications?

Denis W. Repke
Milwaukee, Wisconsin

■ PS/2 BITS: Understanding the difference between PS/2 disk subsystems and finding bigger and better hard disk drives.

Your letter is representative of one of the most frequently asked questions: "Where can I get a bigger hard disk drive for my PS/2?" Although I answered a similar question about the PS/2 Model 50 (Advisor, *PC Magazine*, August 1989), I'll take this opportunity to answer the general question, discuss the drive-subsystem configurations of the PS/2 line, and offer additional sources for Model 50 drives.

Rather than keep you in suspense, I'll state up front that I found four companies that offer PS/2 mass storage solutions: CMS Enhancements (1372 Valencia Ave., Tustin, CA 92630; (714) 259-9555); Core International (7171 North Federal Hwy., Boca Raton, FL 33487; (407) 997-6055), Procom Technology (200 McCormick, Costa Mesa, CA 92626; (714) 549-9449), and Priam Corp. (20 W. Montague Expwy., San Jose, CA 95134; (408) 434-9300). And, of course, IBM (contact your nearest authorized IBM dealer; (800) IBM-2468) has some offerings of its own. I will stick to internal drives, although each of these companies has external models as well. The following products have not been tested—this is strictly a buyer's guide to point you in the right direction and (hopefully) help you make an informed decision.

The PS/2 Models 80 and 60 have the same drive subsystems and follow the same drive replacement/upgrade rules. Both machines have two drive bays (one beneath the floppy disk bays and one behind that) for half- or full-height 5.25-inch hard disks, although one controller can handle only two hard disks at a time. Similar to standard AT-type architecture, the hard disks in the Model 80 and the Model 60 connect to the hard disk controller card via a ribbon cable.

It gets slightly more complicated. The Model 60-041 and 80-041 (40MB disk drive models) use a different drive controller than the 60-071, 80-071, 80-111, and 80-311 (70MB, 115MB, and 314MB disk models, respectively); the 40MB models come with an ST506 controller, in contrast to the ESDI controller used by the more generously configured machines. Furthermore, all PS/2 drives use some variant of an edge-connector attachment, which differs from the pin connectors found in ISA-bus machines. In other words, you can't install just any old drive. Another problem is that ST506-controlled drives, or at least those offered for the PS/2, tend to be smaller than ESDI disks. Consequently, owners of -041 systems who wish to vastly increase capacity should realize that configuring an adequate amount of storage may mean replacing both the disk drive and the controller. (The Model 60 computer has since been discontinued.)

Your third-party ST506 options are CMS's 28-ms. F65M60-X (65MB, $1,379) and F120M60-X (120MB, $2,599); Core's 26-millisecond 44MB ($995) and 70MB ($1,295) disk drives, Procom's 28-ms. HiPer/II 65 drive (65MB, $1,195), and Priam's 20-ms. ID-130-PS041 drive (130MB, $2,295). IBM also offers a 40-ms. 44MB hard disk ($1,465; part number 72X8541). For the ESDI systems, Core offers 16-ms. 150MB ($2,245), 310MB ($3,295), and 650MB ($5,995) drives. Procom ships the 23-ms. HiPer/II 145 (147MB, $2,195) or the 18-ms. HiPer/II 330 (331MB, $3,495). Priam sells the 18-ms. ID160-PS071 (152MB, $2,295) and ID250-PS071 (250MB, $2,695) disk drives, as well as the 20-ms. ID330-PS071 hard disk (330MB, $3,150). CMS provides the 30-ms. F70ESDI-T (70MB, $1,379), F115ESDI-T (115MB, $1,899), and F320ESDI-T (320MB, $4,999). You can also get 30-ms. 70MB ($2,515; part number 62X8519), 115MB ($3,660; part number 90X7392), or 23-ms. 314MB ($6,495; part number 90X8745) hard disks from IBM.

On to the next group of drive-subsystem relatives—Model 55 SX, Model 50Z, Model 70 386, and the discontinued 50. The primary quirk of the 50 series lies in the drive-and-controller configuration. The hard disk is situated behind the floppy disk drive bays, with an edge connector plugging directly into the drive-controller adapter. The system is designed to hold only one hard disk drive and two floppy disk drives, severely limiting storage capacity. In addition, the Model 70 386, the 55 SX and the 50Z use ESDI controllers, while the Model 50 uses an ST506.

CMS sells drives specifically for the 70 386, 50Z, and 55 SX: the 27-ms. K60M50Z/70-P (60MB, $1,459) and the 23-ms.K120M50Z/70-P(120MB, $1,999). They also work in the PS/2 P-70 386.

Several types of third-party solutions have emerged for increased storage capacity in the Model 50. The first is to replace the disk entirely with another ST506 disk, such as Core's 21-ms. 44MB ($995) and 15-ms. 80MB ($1,695) hard disks, CMS's 24-ms. H40M50-P (40MB, $859) and 17-ms. H65M50-P (65MB, $1,299) or Procom's 25-ms. 45MB Ph.D5045 ($1,095). If you own a Model 30, 30 286, or 25, Procom also sells a kit (Plus kit, $195; for the hard disk and Plus kit together, $1,295) to adapt your old Model 50 drive to one of these machines,

as does CMS (M25 Kit, $159).

In addition to its ST506 hard disk drive, Procom offers the PIRA 50-100 (100MB, $1,895), which comes with an AT-type controller embedded in the disk drive and a board that replaces the existing controller. The PIRA-100 works in the 50Z models and the original 50 models—it provides a board that replaces the riser in a 50Z or replaces the entire controller in a 50. Also, IBM's 27-ms. 60MB hard disk ($1,495; part number 90X8627) comes with an ESDI adapter for the Model 50, which requires a slot. Otherwise, your old disk will make an interesting doorstop or paperweight.

If you'd prefer to keep your old disk and add another to your second floppy disk drive bay, you've got two options. Core (CNT-MCA, $495) makes an ESDI controller that coexists with the ST506. Although it takes up a slot, this method lets you use the higher-capacity ESDI hard disk drives. On the other hand, Core also offers a 21-ms. 44MB disk ($995) and a 15-ms. 80MB disk ($1,695) with a kit that splits the controller signal, allowing you to use two hard disk drives.

Lastly, we must consider the Models 25, 30, and 30 286. Although these systems do not, in fact, use the Micro Channel architecture like the other PS/2s, they do have drive-subsystem eccentricities; namely, they use an ST506 controller that's embedded either in the hard disk, as in the Model 30 286 and the Model 25, or in the motherboard, as in the Model 30. Furthermore, it should be noted that the only available expansion bay is the second floppy disk drive bay.

While many standard-bus architecture hard disks on a card and 3.5-inch disk drives will operate with these machines, you may end up losing at least one slot to a controller or the card. On the other hand, the only way to install a second hard disk is to add a hard disk on a card. Plus Development's (1778 McCarthy Blvd., Milpitas, CA 95035; (408) 434-6900) $795 HardCard 20 and $995 HardCard 40 are the only true single-slot hard disks on a card. Most other drives of this type take up one and a half slots because the drive bulges out at one end, obstructing part of a neighboring full-length slot.

Procom's 3.5-inch embedded-controller drives for the Model 30 286, the 25-ms. PIRA-40 (40MB, $695) and PIRA-100 (100MB, $1,895) won't use up a slot, but they do require you to replace the existing riser (the card with the expansion slots) with one provided by the company. CMS sells a series of drives that use the same replace-the-riser method but have a SCSI interface instead of the MCA ST506 variant that Procom's drives have: the 28-ms. K45M30286-Z (45MB, $999), and 24-ms. K60M30286-Z (60MB, $1,199) and K80M30286-Z (80MB, $1,499). In addition, IBM offers a 39-ms. 30MB drive ($800; part number 6128729). And finally, CMS's 29-ms. K40M25-ZS (40MB, $879) provides the same sort of zero-slot solution for Model 25 owners.

ASK THE ADVISOR

Send your questions to Advisor, PC Magazine, One Park Avenue, New York, NY 10016, or upload to PC MagNet (see the "By Modem" sidebar in the Utilities column for access information). Please specify your equipment. ■

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First Looks

Hands-On Reviews of the Latest Products

Micrografx Designer 3.0 Improves Text and Line Support, Adds Bezier Curve Editing

HANDS ON
by Gary Kaplow

You won't find T-squares, rulers, or even an expensive set of markers in my office. But you will find *Micrografx Designer,* a tool that I use for illustration tasks that I once did by hand. Version 3.0, Micrografx's most ambitious upgrade by far, extends the powerful *Microsoft Windows*-based program's reach by adding a host of new features, among them scalable outline fonts, symbol masking, improved text and line support, Bezier curve editing, and color bitmap tracing.

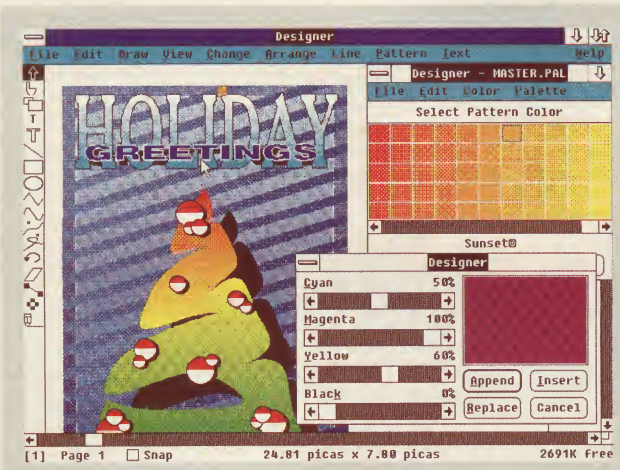
Whether you need a drawing package for text and logo design, illustrative graphics, technical drawing, or even basic architectural illustration, you'll find that the new *Designer* fits the bill. But fortunately for users of the old *Designer,* Micrografx hasn't changed the $695 program's interface very much. Its developers have removed the Square tool, the Rounded Rectangle tool, and several others from the default toolbox (and placed them in other menus) to make room for new ones: Bezier; Convert to Curves; Reshape Points; Reshape Beziers; and one of the most helpful, Slant, which lets you skew symbols horizontally or vertically.

As before, tools (like Rectangles and Ellipses, Arcs and Elliptical Arcs, Lines, Curves, Parabolas, Pies and Pie Sections, and Beziers) are dedicated to drawing symbols of particular shapes, making the program more flexible to work with than drawing packages that use multipurpose tools: although those programs seem easier to learn, they often end up being harder to use, since their tools are never task-specific. New users will find Version 3.0's more comprehensive online help, which covers almost everything in the Reference Guide, useful in bringing them up to speed.

Because Version 3.0's default toolbox has fewer tools, you'll have more room to add the tools you use most often by selecting the Tools command from the View menu—a feature that was introduced with Version 2.0 of the program. I found it very helpful to put the Pattern, Background, Line, and Text Color icons into my default toolbox. This enabled me to quickly identify which object was selected, based on the color the icon was currently displaying.

Designer 3.0's newly defined clipping path has made editing drawings just as easy as creating them. A new Reshape command lets you add, delete, or move designated points of an object as well as edit the control, anchor, cusp, and other associated points of Bezier curves, giving you greater control over the shape of your image. (For bitmapped images, the Reshape command is used for cropping; cropped pieces of the image are saved so that you can uncrop them later.)

You can also use Reshape to break a single object into two separate objects. Similarly, two completed objects can be merged into one, making the task of matching gradient or pattern fills between the two objects a snap. Or, you can cut out a portion of a symbol to simulate transparency.



Designer 3.0 lets you preset or change the color and background color of objects, lines, and text. You can create and name new colors and save your own palette sets.

Designer 3.0 increases your control over lines in several ways. The Line menu has been enhanced, allowing you to specify the cap styles (round, square, flat) of lines as well as their join methods (round, mitre, bevel) and width. Angle, Width, and Height options let you create customized lines, which lend a more calligraphic look to drawings comprised of curves. In addition, the program can now display lines using dithered colors, an option that is best used with thicker lines and darker values.

You'll see the biggest improvements in *Designer*'s text-handling capabilities. Version 3.0 offers you several classes of fonts (outline, vector, device, and screen); 41 scalable outline

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Industrial-strength PC thrives in hostile conditions 35

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Brings convenient access to PostScript to *Windows* users 36

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FACT FILE

***Micrografx Designer*, Version 3.0**
Micrografx Inc., 1303 Arapaho, Richardson, TX 75081; (214) 234-1769.
List Price: $695; upgrade for registered users, $99. Free upgrade for users who purchased *Designer* after October 1, 1989.
Requires: 1MB RAM, hard disk; EGA, VGA or other *Microsoft Windows*-compatible graphics adapter and display; *Windows* 2.0 or later; DOS 3.0 or later; mouse recommended.
In Short: The premier illustration program gets a slew of new features, including 41 scalable outline fonts, symbol masking, improved text and line support, Bezier curve editing, and color bitmap tracing.

CIRCLE 447 ON READER SERVICE CARD

CONTINUED FROM PAGE 33

fonts from Bitstream and URW come with the package, providing you with a true WYSIWYG display but stealing your time because of redrawing.

But because *Designer*'s outline fonts are created with a series of lines and Bezier curves, they are very versatile. Once you've entered and edited your text, you can convert it to curves (a process that translates the text instructions into drawing instructions) and edit it from a design standpoint, by filling it with a color or pattern, for example, or skewing it with the Slant tool.

Since *Designer* lets you enter and edit text right in the drawing area, you can see how it looks as your image takes shape. The program displays margin settings in the ruler area whenever text is entered or edited. Right and left margin and indentation settings can be altered via the mouse at any time.

The program's Import command lets you merge standard ASCII text into your drawing. As with previous versions, you can adjust the color, leading, and alignment of text, but now you can also attach different attributes to one string of text. Different styles (bold, italic, etc.) and different fonts can now appear in the same line of text.

Color, gradient, bitmap, and hatch patterns have not been changed with this release. Instead, Micrografx's developers have added two new features that set the competition back two steps. Symbol Fill and Mask Symbol now allow you to create your own patterns. (Packages like *Corel Draw!* allow you to use one of their predefined PostScript fills.) With Symbol Fill, you are no longer limited to patterns that the vendor has supplied—text, lines, or shapes can all be used as patterns. With Mask Symbol, you can create an illustration that is to be used as the background pattern for a larger illustration.

***Designer* 3.0 files can be moved to many other applications, including *AutoCAD* and those for *GEM* and even the Macintosh. This image was exported from *Designer* as an .EPS file and placed directly into *PageMaker* for composition. It was then output by a Linotronic 300 at a resolution of 1,270 dots per inch.**

Designer can now handle color bitmaps as either .PCX or .TIF formats; those images can be traced and converted to editable color vector images. When you import a bitmapped (color or black-and-white) image into *Designer*, a dialog box appears that prompts you to specify the input configuration needed. Thus, you can choose colors upon importing. If the Use Original Colors option is chosen, *Designer* will display the closest color available on the display driver you are using. Even though *Designer* may not be able to display the image in its true colors, it stores them within the bitmap so that they can be used for printing or exporting.

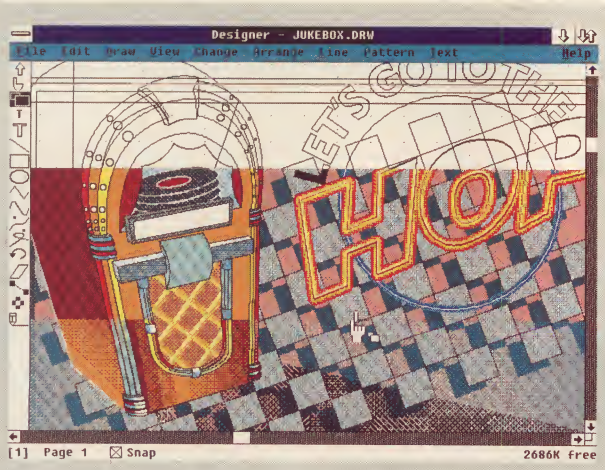
Micrografx has also spruced up the program's handling of clip art. Most Micrografx ClipArt entries have been given symbol identifiers, and you can now call up an image in a preview mode to see whether it is appropriate for your illustration. Over 1,700 images representing the broad spectrum of Micrografx's ClipArt library come with the program.

Also included are two new utilities. *Telegrafx*, a communications program, lets you transmit your images to two service bureaus for the purpose of creating high-quality slides or prints. And *SlideShow* lets you create on-screen presentations, replete with transition effects, using your designs.

As you might expect of a program that packs in this much new functionality, *Designer* 3.0 does have a few minor bugs. For example, when I used a gradient fill in conjunction with the Connect Close command, I lost control of the line weights. When I reported this to Micrografx, the company fixed the problem and sent a patch. Micrografx will do the same for any user who reports a problem. (You can also contact Micrografx to obtain a runtime version of *Microsoft Windows*, which the vendor is no longer supplying with the program as it did with previous versions.)

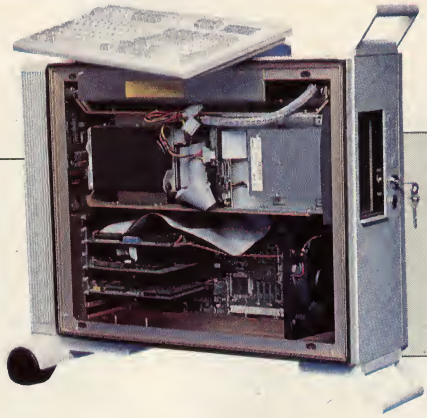
Problematic for LAN users is the fact that although a network version of the program is available, Micrografx did not build file-locking into the program, so multiple users can access the same files and save them over each other.

This limitation aside, *Designer* 3.0 has just about everything a professional designer could want. Once you spend some time using it for serious work, you'll wonder how you ever got along without it. ■



***Designer* 3.0 offers three viewing levels: preview off, which shows a wireframe; preview on, without complex fills; or complex view, which shows all gradients, colors, and patterns.**

PCQT 386-25 Cache: Industrial-strength PC is Built to Last



PCQT's 386-25 Cache has a 30-minute UPS and shock-mounted disk drives to ensure maximum protection for your data.

HANDS ON
by Matt Ross

Seeking to be the Volvo of the PC industry, PCQT of Kista, Sweden, is marketing an unusual concept: ultra-reliability. With the PCQT 386-25 Cache, Personal Computer Quality Technology has created a system that will safeguard your data against hostile elements.

PCQT built its computer with industrial settings in mind. Impervious to temperatures from 40 to 105 degrees Fahrenheit and electrostatically shock-resistant, the $8,650 machine is designed for use on the floor of a manufacturing plant or as an office server.

PCQT developed a system of few compromises. Dzus spring-release fasteners on the steel side panels enclose the sealed chassis. A rear panel of gasket-lined steel covers expansion cards and connecting cables to provide a dust-, splash-, and corrosive-proof shell and a shield to minimize emissions. The unit has six 16-bit slots and two 8-bit slots. (PCQT also announced a paper-white flat-screen VGA monitor that was unavailable at the time of this evaluation. According to the vendor, it will offer a dim feature that, unlike most monitor screen savers, reduces electromagnetic emissions by powering down the unit.)

A sliding panel seals access to two half-height removable-media drive bays, offering additional protection for your files. The internal carriage that houses these bays and one full-height drive bay for a hard disk is shock-mounted to the sides of the case with rubber shock-absorbing cushions. While this design cuts down on expansion possibilities, PCQT does offer either a 40MB or a 350MB SCSI hard disk in addition to its standard 100MB drive.

The case's heavy-gauge metal wheels and handles are both aesthetic and utilitarian touches. PCQT's form follows function: the 46-pound unit is easy to move around in an office and difficult to tip over.

A switchable power supply guards data against spikes and surges. This is backed up by a built-in uninterruptible power supply (UPS). The UPS, rated to give 30 minutes of extra computing time after a power outage, yielded 26 minutes of extra time in our informal test.

One pleasant surprise is the unit's silent operation. The internal fan couldn't be heard over the buzz of the fluorescent lighting of PC Labs.

The PCQT's performance is credible for a 25-MHz 386 system; most of the PC Labs benchmark test results fell within the normal range for this class. We did see slower conventional memory read times, primarily because the PCQT was manipulating the Intel cache controller at the BIOS level. This contributed additional system overhead, but will likely prove inconsequential in real-world applications. Like a Volvo, the PCQT 386-25 Cache may not be the fastest machine out there, but it will probably take you farther down the road. ■

FACT FILE

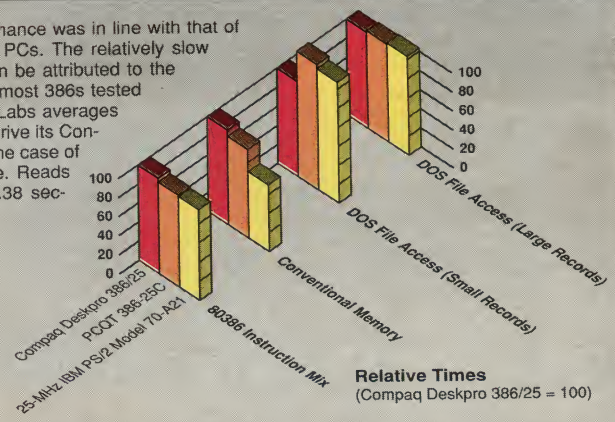
PCQT 386-25 Cache
PCQT North America, Inc., 12930 Saratoga Ave., Ste. B7, Saratoga, CA 95070; (408) 255-1131.
List Price: With 4MB RAM, 100MB SCSI hard disk, 1.2MB 5.2-inch and 3.5-inch floppy disk drives, serial and parallel port, DOS 4.01; $8,650.
In Short: PCQT combines solid 386 performance with durable construction designed to withstand the most hostile conditions. With attention to detail matched by few PC vendors, this Swedish import may be the safest PC your data will ever be housed in.

CIRCLE 448 ON READER SERVICE CARD

BENCHMARK TESTS: PCQT 386-25C

PC LABS

The PCQT 386-25C's performance was in line with that of standard 25-MHz 386-based PCs. The relatively slow small-record Dos File Access time can be attributed to the 40MB Conner Peripherals SCSI drive; most 386s tested have larger and faster hard disks. PC Labs averages conventional read and write times to derive its Conventional Memory score—although in the case of the PCQT, these times were not close. Reads took 0.50 seconds, and writes took 0.38 seconds.



The **80386 Instruction Mix** benchmark test times a series of tasks specific to the 80386 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at slower access speeds.

The **DOS File Access (Small Records)** benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. The test is performed without software disk caching. Fast times are advantageous for programs that work with many short segments of data.

The **DOS File Access (Large Records)** benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. This test minimizes the effect of small hardware caches on disk subsystem performance. It is performed without software disk caching. Fast times are advantageous when large files are loaded.

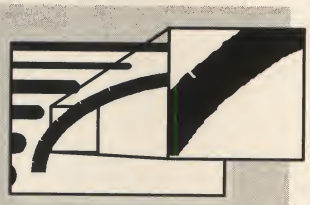
Performance Times (Times given in seconds)	80386 Instruction Mix	Conventional Memory	DOS File Access (Small Records)	DOS File Access (Large Records)
Compaq Deskpro 386/25	2.31	0.47	56.83	6.50
PCQT 386-25C	2.22	0.44	74.82	6.62
25-MHz IBM PS/2 Model 70-A21	2.19	0.33	72.34	6.71

PreScript: PostScript Interpreter is Long on Convenience, Short on True Compatibility

HANDS ON
by Luisa Simone

In an attempt to distinguish itself from the growing number of PostScript software interpreters, *PreScript*, from Pan Overseas Computer (POC), emphasizes convenience. Unlike its competitors, which require you to print from DOS or to create virtual ports, *PreScript* lets you print from within your applications. As a TSR, the program hides in the background, intercepts a PostScript file on its way to the parallel port, compiles the code, and transmits PCL-compatible information instead.

Conveniences increase for *Microsoft Windows* users. *PreScript* supplies a *Windows*-based utility, Preview, that automatically pops up when you print a file, and displays a bitmapped representation of the page. Use Preview for a few days and you'll discover the inadequacies of *Windows*'s WYSIWYG display. During testing, for example, Samna's *Windows*-based word processor *Ami* showed that line spacing for a headline in 32-point Helvetica was tight, but none of the letterforms touched. Preview accurately matched the paper output, showing where the ascenders and descenders of certain letters overlapped.



***PreScript* has trouble handling vector curves drawn in thick lines. As a result, the PC Labs test Bezier curve is broken, clipped, and jagged.**

Preview's simple menu lets you scroll through multiple page documents, view a page in one of three zoom modes, and easily disable *PreScript* in order to return to direct HP printer operation. Users of non-*Windows* programs must awkwardly shell out to DOS, and use a software switch to disable the memory resident portion of *PreScript*.

PreScript has a lot in common with other software interpreters. Like *GoScript* and *Freedom of Press*, it provides the original 13 Apple LaserWriter typefaces for $195, or the 35 typefaces of the LaserWriter IINTX for $395. And like its main competitor, *UltraScript*, *PreScript* is fast, beating the LaserWriter IINTX by a considerable margin. In part, this occurs because the program uses parallel, not serial, printer connections.

Pan Overseas Computer claims that I/O speeds can be further boosted by installing its $295 proprietary Laser Interface Cards. Although these two cards (one of which resides in an 8-bit slot in your PC, another in the HP LaserJet Series II expansion slot) use high-speed video transmission via an RJ-11-type phone wire to bypass the parallel port, the performance improvements will vary significantly depending on the nature of the image. With PostScript files containing mostly vector information, test images did print out two to three times faster with the cards than with the *PreScript* software alone. However, the PC Labs graphics test includes several high-resolution bitmaps, and revealed only a marginal 10 percent speed gain.

The POC Laser Interface Cards take direct control of the LaserJet's engine, making it possible to feed the printer one scan line at a time. Feeding the printer incrementally makes it unnecessary to upgrade your printer's memory. Users who install the card will be able to print a full page of 300-dot-per-inch graphics with only 512K of printer memory in their HP LaserJet Series II.

Convenience is no substitute for performance, however. Although our test PostScript files printed quickly, the images revealed that when heavy lines are used to draw vector curves, *PreScript* will produce broken or jagged output. Bitmapped photographs suffered from noticeable posterization making it impossible to reproduce the subtle gray tones in the PC-Lab test image. POC claims that the fix for this problem will be shipping by the time you read this article.

PreScript requires a minimum of 2MB of extended memory in order to operate, and supplies drivers only for the HP DeskJet or HP LaserJet family of printers (or compatibles). Again, the company is planning an upgrade that will reduce the memory requirements and support other laser printers. But for now, *PreScript*'s substantial hardware requirements and flawed output limit its usefulness for its already limited audience—*Windows* users looking for an easy way to preview PostScript pages. ■

BENCHMARK TESTS: PRESCRIPT

PC LABS

A parallel I/O connection (rather than the serial connection required by the Apple LaserWriter IINTX) partly accounts for *PreScript*'s significantly faster output times. The rather minimal performance difference between using the software alone and using it in conjunction with the POC Laser Interface Card contradicts the company's claims of 10- to 30-fold performance improvements. Note that these results specifically reflect the high proportion of bitmapped information in the PC Labs test file; files containing only vector information printed two to three times faster with the card installed.

The **PostScript Graphics Times** test clocks the processing speed of PostScript printers. It consists of a bitmap image, some shading patterns, and a group of filled-in curves.

	PostScript Graphics Times (Times given in minutes)
Apple LaserWriter IINTX	14.05
PreScript (software only)	6.12
PreScript (with POC Laser Interface Card)	5.73

FACT FILE

PC MAGAZINE

PreScript
Pan Overseas Computer, 333 W. El Camino Real, #320, Sunnyvale, CA 94087; (408) 737-8403.
List Price: 13-font version, $195; 35-font version, $395; optional LaserJet Series II Interface Cards, $295.
Requires: 2MB of extended memory, 2.5MB of free hard disk space; 80286- or 80386-based PC or compatible; graphics adapter; parallel port; and Hewlett-Packard LaserJet, LaserJet Series II, or Series IIP or a 100 percent compatible printer with 1MB of printer memory for full-page graphics. With the POC Laser Interface Card installed, the LaserJet Series II requires only 512K printer memory. DOS 3.1 or later.
In Short: *PreScript* is long on convenience, letting you print PostScript code on an HP LaserJet from within your applications, and even see an on-screen bitmapped preview in *Microsoft Windows*. Wait for the upgrade, however, which promises to reduce memory requirements and fix several interpreter errors.

CIRCLE 445 ON READER SERVICE CARD

Scalable LaserJet Fonts for WordPerfect

Manuscript Century Waldorf Script **Don Casual** Eterna
Prestige Corporate **Buckingham** Coronation Script PENWIN
Gibraltar Souvienne University Ornate Oxford Rockland
Letter Gothic **Copperfield** Garamand Corporate Condensed Carnegie
Baskerton Classic Typewriter Obelisk **Gettysburg** Futuri
Avant Guard **AERO** GREEK AB$∫ 01 Exchequer Script Katrina
Joulliard Zingbats ❝❶✆ Roman **New York Deco**
Garamand Condensed Padua Courier **Bongo Black**

Glyphix fonts install automatically in minutes and activate all of the font options in your WordPerfect (Ctrl-F8) font menu. Just select a font, a style and a point size from 3 to 120 point—you can even get effects like reverse, shadow and outline right from the menu. When you print, the Glyphix fonts you selected are generated automatically on-the-fly in just seconds.

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- No printer upgrade required
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- Standard LaserJet Plus, Series II, IID, IIP or compatible printers
- No additional printer memory required
- Fonts scalable from 3 to 120 pt.
- Portrait and landscape
- Regular, **bold**, *italic* and ***bold italic***
- Reverse, outline & 20 other effects
- International character set

GLYPHIX REVIEWS ■ "... unlike anything else on the market- except possibly PostScript... produces remarkably fine type at amazing speeds." PC Magazine, June 13, 1989 ■ "... offers a combination of features and performance that is unavailable elsewhere. Like PostScript, Glyphix generates fonts from outlines, on the fly, and sends them to the printer as they are needed.." Computer Buyers Guide and Handbook **AND USERS AGREE** ■ "Your approach to font generation is the right one--better than Bitstream, MoreFonts, Trionum, you name it." C. S. ■ "... I couldn't be happier with the quality, ease of use, and, most of all, printed output of this product." C. C. Massachusetts. ■

TECHNICAL REQUIREMENTS: IBM PC, AT, XT, PS/2 or compatible with a minimum of 512Kb RAM, a hard disk, MS-DOS 3.0 or later, a LaserJet Plus, Series II, IID, IIP or compatible printer with standard memory

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CIRCLE 299 ON READER SERVICE CARD

WordPerfect Users Can Now DrawPerfect, Too

HANDS ON
by Robin Raskin

WordPerfect users who have been hankering for the perfect path to presentation graphics can rejoice. *DrawPerfect* is not only a full-featured charting/drawing/presentation program that uses *WordPerfect*-like commands, but the integration between the two *Perfects* is—you guessed it—perfect.

Feature for feature, *DrawPerfect* can compete with the top-selling PC graphics packages. The $495 program lets you import data for charting, create drawings with graphics primitives that include curves, choose from a clip-art library of 500 images, or create text charts using any of its 25 built-in outline fonts. You can output the results to any device imaginable or link all of your individual images together for an on-screen presentation using the built-in Presentation module.

DrawPerfect's work area is similar to other presentation graphics programs designed to accommodate both mouse and keyboard users. Framing the drawing area is a row of pull-down menu options, each with a corresponding *WordPerfect*-related function key. A two-column toolbox (one column for drawing, the other for editing) facilitates mouse use. Rather than relying on direct manipulation, most of *DrawPerfect*'s options are selectable from pick lists.

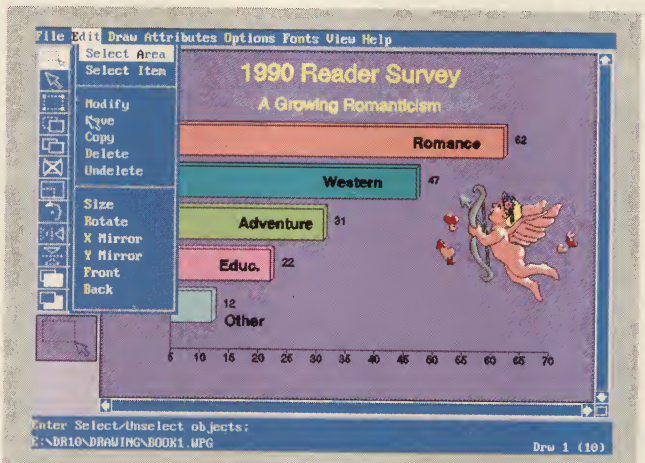
The tie that binds the word processor to the graphics program is the *WordPerfect Shell*, Version 3.0, shipped with every copy of *DrawPerfect*. The *Shell* allows both *Perfects* to remain open simultaneously; its built-in clipboard moves information between the two. You can toggle between programs to transfer images directly, store images in the clipboard, or transfer text-based *WordPerfect* tables and text into *DrawPerfect*.

The charting component of the program is its weakest link. Graphs and drawings are separate entities. Once a data graph is saved as a drawing to be mixed with clip art or annotated, it is no longer linked to its underlying data, and its components cannot be easily edited or updated.

The program reads .WKS, .WK1, .XLS, and *PlanPerfect* files, but does not read data labels—a serious limitation that WordPerfect Corp. promises to address in the next maintenance release. There's also no convenient way to graph noncontiguous ranges of data, although a menu option that asks you to specify the display type of a particular data set offers a clumsy workaround. In general, you have minimal control over the exactitude of a chart. For example, you can specify overlapped or 3-D bars, but you can't specify the percentage of the effect. The present version doesn't support hot links either.

You create charts using two simple fill-in-the-form screens. One asks you to supply the chart's title, legend, axis names, and data. The other asks you to fill in various color and font choices. The process is tedious, offering you no quick way to perform global changes. Nevertheless, the results look good. And you can hasten the process of creating charts by using the included templates. With three different text charts, bar, line, pie, area, stacked bar, hi-lo, scatter, and a variety of mixed charts, there's no shortage of chart types.

DrawPerfect's drawing feature is considerably more impressive. The program can handle lines, boxes, polygons, arrows, arcs, curves, circles, and ellipses. You can edit curved drawings by manipulating control points on a line, although you can only move existing points, not add points.



***DrawPerfect*'s drawing area has a row of pull-down menu options, each with a corresponding *WordPerfect*-related function key. A two-column toolbox facilitates mouse use.**

Each of the primitives has a variety of selectable attributes, among them line width, fill pattern, and color. Editing functions include copying, deleting, sizing, rotating, mirroring, and foreground/background. Noticeably absent are an Undo command and the ability to Group and Ungroup primitives. Both features are critical, especially when you work with the program's more intricately drawn clip art.

Taking the lead from its progenitor, *DrawPerfect* shines at handling text, which can be added as a single line or poured into a word-wrapping window. All *WordPerfect* extended characters and many text attributes are supported. Because you can select among three on-screen text modes (rough draft, medium, or high quality), and because you can redraw only on command, the program is fast and responsive.

You can select from 256 colors (there are no built-in color palettes) and 64 pattern fills. Handy features such as constrain, grids, graded fills, zoom, view in black and white, text-kerning, and macros help you create sophisticated-looking output.

The Presentation module has the same functionality as those of many graphics programs, but its image-at-a-time form isn't as easy to use as the matrix-like form of those others. You can add files to a presentation list, specify the on-screen duration, and pick from a handful of transitional effects.

One of the program's biggest strengths is the way it handles graphics import. It converts .TIF, .PCX and other popular graphics formats without asking you to coordinate the translation. You select the file by name, and the program determines how to convert it. When you come across a bizarre file type, you can capture it with an included screen capture utility. And if you want to handle conversions as a batch process, there's a standalone conversion program, too.

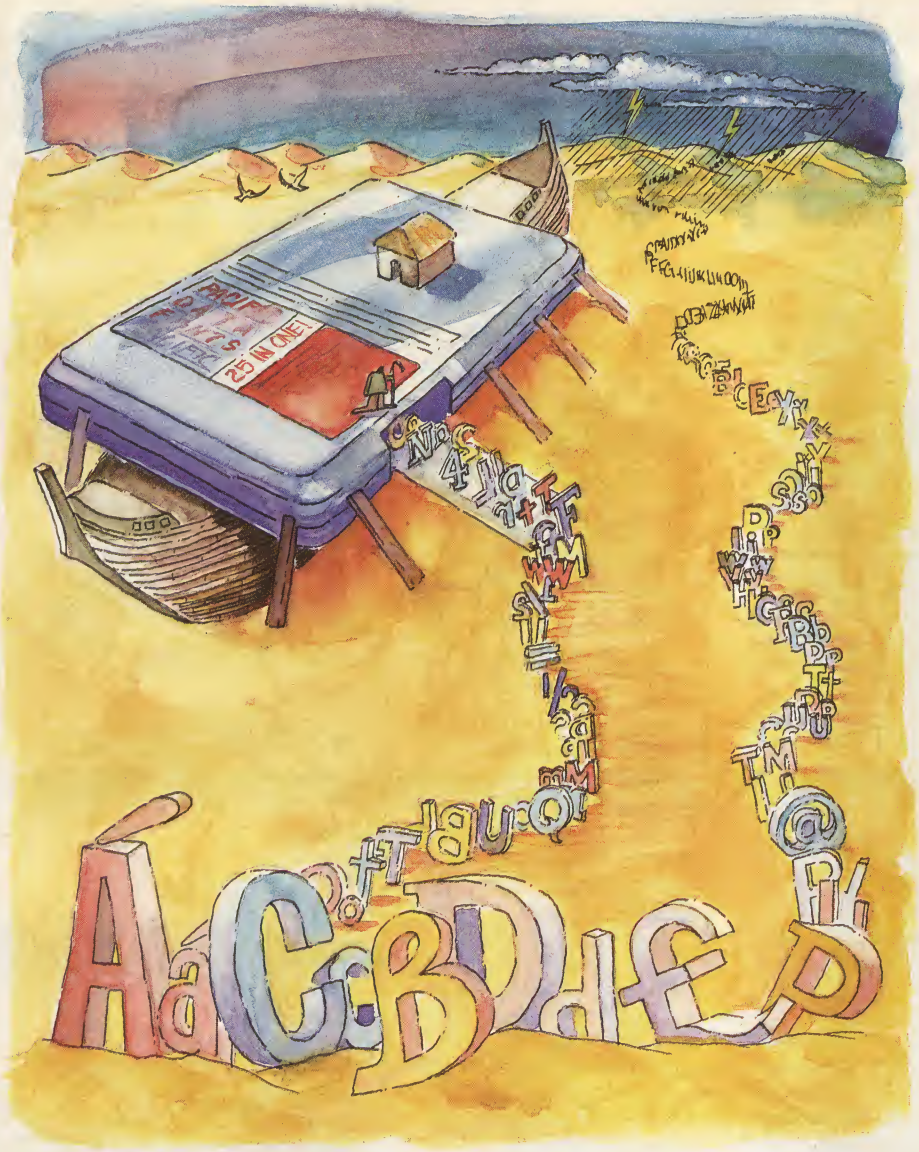
Those familiar with other graphics packages will not find much motivation for switching to *DrawPerfect* (unless they're shopping for a word processor, too). But, with *DrawPerfect*, WordPerfect Corp. demonstrates continued support for its installed base, regardless of whether you're typing or drawing. ■

FACT FILE

PC MAGAZINE

***DrawPerfect*, Version 1.0**
WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; (801) 225-5000.
List Price: $495.
Requires: 384K RAM (512K RAM recommended), two high-density floppy disk drives (hard disk recommended), graphics adapter.
In Short: It charts, draws, has clip art, does slideshows, and fits the *WordPerfect* environment like a glove.

CIRCLE 449 ON READER SERVICE CARD



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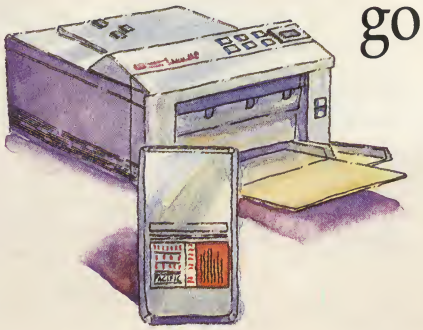

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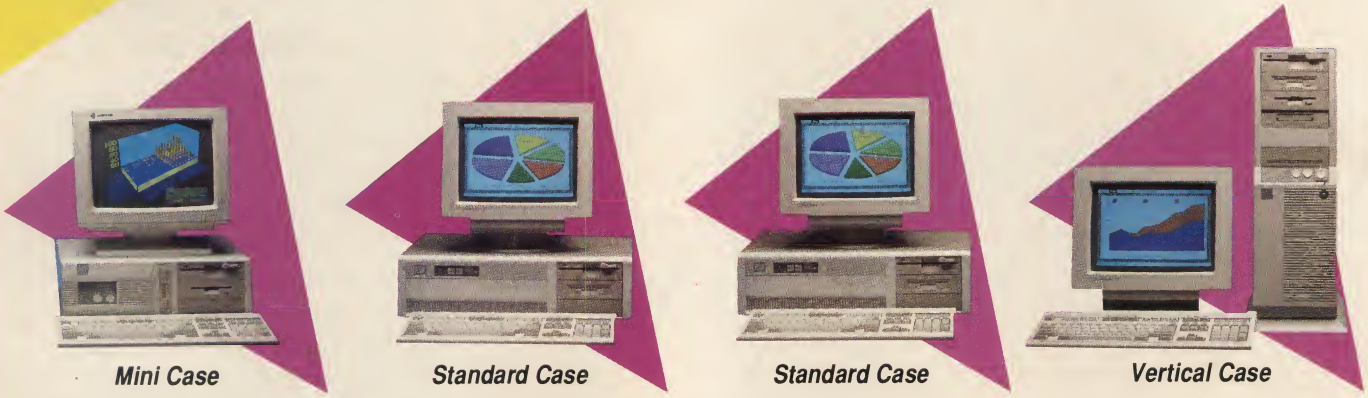
"Among PCs reviewed this issue, our favorite is the ACMA 386/25 Business System." PC Magazine November 28, 1989

Urgent News: Acma Slashes Prices



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- Supports EMS/LIM 4.0
- Supports 80287 math coprocessor
- 1.2MB or 1.44MB floppy drive
- 1:1 interleave dual hard/floppy disk controller
- Parallel, serial & game ports
- Enhanced 101-key keyboard
- User's Guide & "Easyview" stand
- MS-DOS & OS/2, Unix, Xenix and Novell compatible.
- Choice of Mini or Standard case

With Monitor & Video Board	Mono	EGA	VGA
40MB/28ms	$1,229	$1,529	$1,629
65MB/28ms	$1,369	$1,669	$1,769

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- Built-in ROM based setup
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- Parallel, serial & game ports
- Enhanced 101-key keyboard
- User's Guide & "Easyview" stand
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Now! $1,495

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- Shadow RAM
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- Supports 80287, 80387 & Weitek
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- 200W UL approved power supply
- Built-in ROM based setup
- 1.2MB or 1.44MB floppy drive
- 1:1 interleave dual hard/floppy drive controller
- Parallel, serial & game ports
- Enhanced 101-key keyboard
- User's Guide & "Easyview" stand
- MS-DOS & OS/2,Unix, Xenix and Novell compatible.
- Standard case

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120MB/28ms	$2,495	$2,795	$2,895

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- Phoenix BIOS
- 64KB Cache stand
- 1MB RAM, expandable to 24MB
- 0 wait state/interleaved memory
- Shadow RAM
- Supports EMS/LIM 4.0
- Supports 80387 math coprocessor
- Eight expansion slots
- 200W UL approved power supply
- Built-in setup and diagnostics
- 1.2MB or 1.44MB floppy drive
- 1:1 interleave dual hard/floppy drive controller
- Parallel, serial & game ports
- Enhanced 101-key keyboard
- User's Guide & "Easyview" stand
- MS-DOS & OS/2, Unix, Xenix and Novell compatible.
- Standard case (Vertical case $150)

Commercial leases start at $107/mth.*

With Monitor & Video Board	Mono	EGA	VGA
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"If you're looking to buy a computer by mail order but still want a company that will stand behind what it sells, the ACMA 386/25 is a good bet." "Among PCs reviewed this issue, our favorite is the ACMA 386/25 Business System." "...This is an impressive machine."

PC Magazine November 28, 1989

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PC Magazine December 26, 1989

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- Parallel, serial and game ports
- Enhanced 101-key keyboard
- User's Guide and "Easyview" stand
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Mahogany Brings OOP Techniques to Expert Systems Development

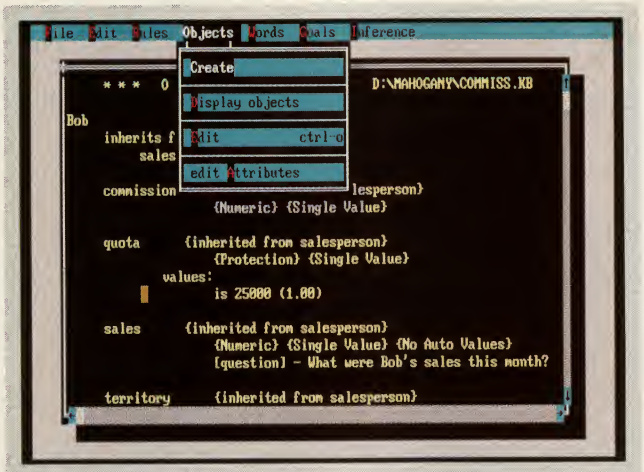
HANDS ON
by Richard Hale Shaw

No matter what subject an expert system deals with, it is easier to design if it incorporates object-oriented extensions. *Mahogany*, a $495 expert systems development tool from Emerald Intelligence, lets you create expert systems that manipulate objects (like aircraft parts or credit applicants) that have specific attributes (such as the dimensions of the parts or the income of the applicants).

Mahogany is a hybrid expert systems tool that combines rule-based technology with object-oriented extensions. You can define and describe object classes with their own attributes and rules, and you can also create new objects that inherit the attributes and rules of more than one parent class. Thus, while an individual object might have rules that are specifically its own, *Mahogany*'s inference engine will attempt to use the rules of the parent class when it fails to resolve a goal from an object's own rules.

For example, you might have a class called "employee." Each individual instance (i.e., each employee object) would inherit the tax and salary attributes of the class as well as the rules that describe the tax calculation. As a goal, you could instruct *Mahogany*'s inference engine to determine the increased tax liability of each employee who receives a 10 percent pay raise. The inference engine uses the attributes and rules of each object to reassess the employee's taxes. If you provide the employee information from a table, *Mahogany*'s inference engine can automatically create each new employee object for you.

Since *Mahogany* is above all an expert systems development tool, it proffers capabilities that even traditional object-oriented tools would be hard-pressed to offer. For instance, it not only has the ability to back-chain and resolve a specific goal (a typical expert system technique), but it can also back-chain to resolve all the goals or outcomes in the knowledge base—try doing that with a traditional, procedural application program. Or, you can forward-chain to use currently available data and see whether any goals are resolved.



***Mahogany*'s character-based SAA-compliant interface offers pull-down menus and a pop-up Object Editor for creating knowledge base objects.**

With *Mahogany*'s synergistic inference mode, you can combine back-chaining with forward-chaining to resolve a specific goal and see whether any other goals or conclusions are reached.

Mahogany's user interface has pull-down menus, edit boxes, and dialog boxes, all in a tightly integrated, mouseable, character-mode setting. Menu selections let you open or edit a knowledge base; manipulate rules, objects, and goals; and start the inference engine. The displays are all scrollable and printable, and the state of the system (with goal settings and object attribute values) can be saved at any time.

Mahogany's Rule Editor formats rules with if-then-else constructs and uses pop-up boxes to prompt you for the expressions needed to complete them. Object and Attribute Editors are also available for fine-tuning every aspect of a knowledge base. If a rule references an object that hasn't been created previously, *Mahogany* will create the object for you. In addition, you can write up the justification for any rule as a text file that will be displayed in a window whenever the user requests it. Rule commands like Show will switch the video to graphics mode and display a .PCX file; *Mahogany*'s Run command lets you operate external DOS programs.

A trace mode is available that lets you view an individual course of an inference pass. Additionally, with each inference pass Mahogany can generate statistics about the rules it has checked.

With *Mahogany*'s Externals Interface (an additional $150 purchase), you can write your own customized additions to a knowledge base in C, compile them with Microsoft C, and link them with a provided library. Externals can be called from a rule or from either of two functions provided with each of an object's attributes. These allow you to make additions to the user interface, add functionality to objects, or create hooks to external sources or services (like a SQL server). (Emerald Intelligence is currently preparing additional packages that use the Externals Interface.)

Mahogany's deficiencies are few. While its documentation is well written, it tends to be obscure: stronger analogies to traditional object-oriented programming techniques would make the object-orientation of the program much easier to grasp. And while its well-integrated SAA-compliant interface is admirable, it is surprising that *Mahogany* doesn't have a graphical user interface (GUI), particularly since its roots lie in Macintosh soil. Other expert systems tools are already moving toward using GUIs like *Microsoft Windows* and supporting full-scale applications on those platforms.

However, *Mahogany*'s consistent and deliberate integration of object-oriented software technology, its nearly *indefinite* extensibility via external functions, and its overall excellent quality make it one of the most exciting expert systems tools available. Both novices and experienced expert systems developers will find it easy and flexible to use. If you're at all interested in object-oriented software or expert systems, *Mahogany* is worth your consideration. ■

FACT FILE

Mahogany, Version 1.0.2b
Emerald Intelligence, 3915-A1 Research Park Dr., Ann Arbor, MI 48108; (313) 663-8757.
List Price: $495; External Function Development Guide, $250; other externals, $150 each; runtime versions, $100 each.
Requires: 640K RAM, hard drive, video adapter, DOS 3.*x* or later.
In Short: A rule-based expert systems development tool with well-integrated object-oriented capabilities. Easily used by both novices and experienced expert systems developers.

CIRCLE 446 ON READER SERVICE CARD

PFS:First Publisher 3.0: Still Kludgy After All These Years

HANDS ON
by Luisa Simone

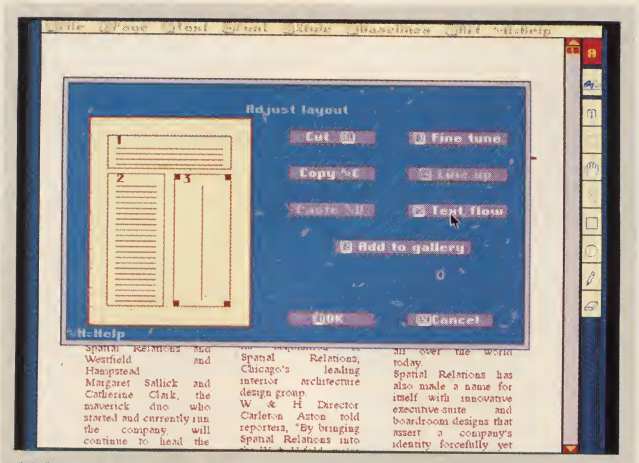
The newest version of *PFS: First Publisher*, from Software Publishing, can boast that it provides advanced DTP functions, such as easier access to 300-dot-per-inch fonts and graphics, while maintaining a flat learning curve for its installed base of loyal users. Unfortunately, to keep the program so easy to use, its designers kludged on these new features, limiting *First Publisher*'s effectiveness as a DTP tool.

For example, instead of abandoning its antiquated two-layered approach (one discrete layer for text, and the other for 72-dpi art), Version 3.0 accommodates 300-dpi .TIF and .PCX files by adding a third overlay. While you work on one layer, the other two appear as ghostly gray images.

Users can now compile high-resolution fonts from within *First Publisher*, both because the program supports Bitstream's new Speedo font technology, and because the Fontmove installation utility has been incorporated into the main body of the program. So in addition to *First Publisher*'s impressive array of bitmapped fonts, the program bundles two typefaces (Swiss and Dutch), which are scalable between 9 and 72 points.

However, you must still print snippets of type (like continued lines, or page numbers) at 72 dpi. The only way to position type outside of the program's absolutely rigid linear text flow is to treat it as a low-resolution graphic—and suffer with a visually inconsistent document.

First Publisher's new layout gallery allows you to choose or customize any 20 supplied page designs. Each thumbnail can contain up to 20 text columns, which in turn can be deleted, copied, resized, and resequenced. However, unlike other low-end programs, *First Publisher* doesn't actually link text frames, making it impossible to flow a story to noncontiguous pages. Recreating the PC Labs test newsletter, in which a story jumps from page 1 to page 3, is next to impossible.



***PFS:First Publisher*'s new layout gallery provides dialog boxes where you can modify the page design.**

Modifying layouts via the gallery is a vast improvement over the baseline technique, which remains as awkward as ever. And the page preview function is still a nonproportional mini-page that shows greeked type and unrecognizable graphics. Though Version 3.0 adds color screen displays, context-sensitive help, and landscape printing, it however continues to ignore the need for automatic hyphenation, kerning, and master pages. *First Publisher* continues to pretend that business people don't use paragraph indents or tabs.

A $45 upgrade will be offered only to users who purchased the older version of the program after February 1, 1990. Only the most loyal *PFS:First Publisher* users will consider the $149 list price a reasonable cost considering that the competition offers substantially more powerful features for only slightly more money. ■

List Price: *PFS:First Publisher*, Version 3.0, $149, upgrade $45. **Requires:** 512K RAM, graphics adapter, DOS 2.0 or later. Software Publishing Corp., 1901 Landings Dr., Mountain View, CA 94039-7210; (415) 962-8910.

CIRCLE 437 ON READER SERVICE CARD

WPTools and WPMD: Stethoscope and Doctor's Bag for WordPerfect Files

HANDS ON
by Edward Mendelson

Although *WordPerfect* includes more built-in conveniences than any other word processor, users often need more. Software by Seidman's $25 *WPTools* and $35 *WPMD* are utilities for exploring, managing, optimizing, and repairing *WordPerfect* 5.0 and 5.1 files. Users who don't stretch *WordPerfect* to its limits may not need these programs, but when you do require one of their time-saving functions, or when *WordPerfect* won't read its own files, nothing can take their place.

The *WPTools* package has 20 programs. One lets you browse through a batch of *WordPerfect* files more easily than in *WordPerfect* itself. Another copies document summaries (or the first 400 words of text) into a database file that you can consult in the *WordPerfect Library Notebook* program or use as a *WordPerfect* merge file. Another program checks *WordPerfect* files for cross-references that point to a missing target code, and ones that aren't pointed to by a reference.

Others do a better job than *WordPerfect* at performing formatting and conversion tasks. One converts ASCII text with columns separated by spaces into a *WordPerfect* file with columns separated by tabs.

Files created in early versions of *WordPerfect* 5.0 had the habit of growing in size whenever you changed printers or fonts, and some files wouldn't print after you changed printer drivers. One program in *WPTools* strips outdated information from these files, often reducing them to two-thirds their bloated size, while making it possible to print them again.

In rare instances, early versions of *WordPerfect* 5.0 misplaced format codes, rendering a file unusable. Software by Seidman's *WPMD* program fixes broken files by intelligently reconstructing misplaced codes. If you're using a recent version of 5.0, or any version of 5.1, you can manage without *WPMD*, but large offices should have a copy in their first-aid kit.

These programs run from the DOS command line without prompts or menus. Some are tricky if you don't know what "standard input" means, but you can puzzle out the syntax from the manual. Both packages are available as shareware from the WordPerfect Support Group on CompuServe, but registered users get six additional programs in *WPTools*. ■

List price: *WPTools*, $25 (plus $2 for shipping); *WPMD*, $35 (plus $2 for shipping). **Requires:** 256K RAM, *WordPerfect* 5.0 or later, DOS 2.0 or later. Software by Seidman, 2737 Devonshire Pl. NW, Washington, DC 20008. CompuServe ID: 70441,2414.

CIRCLE 436 ON READER SERVICE CARD

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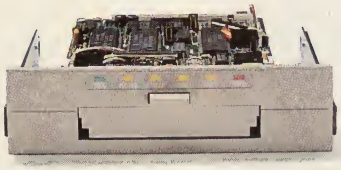
Soviets adopt multi-party system.

Berlin Wall falls.

Everex introduces quality tape backup for under $400.



PC MAGAZINE EDITORS' CHOICE December 26, 1989 Excel 40AT

Maybe you hoped in your heart of hearts, but you probably never thought you'd see it. Really good backup for under $400.

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Actually, it's more than just good. It's outstanding. The unique drive head is ceramic hard-coated for greater durability. And when your head lasts longer, so does your tape drive.

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It follows the popular QIC-40 standard to support interchangeability of QIC-40 tapes. It formats cartridges while running other applications. It offers flexible backup and restore methods—all with built-in ECC and Reed Solomon error correction. It's even Novell® compatible, with an optional driver.

And best of all, it's fast. So fast PC Magazine ranked it number one among QIC-40 machines and awarded it Editors' Choice.

Are you ready for an historic development in tape backup? Call 1-800-821-0806 for the name of your nearest Everex Reseller.

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EVER for EXcellence

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CIRCLE 216 ON READER SERVICE CARD

Hotline 2.2: Top Phone Dialer Adds Notetaker

HANDS ON
by Jonathan Matzkin

Many TSR utilities include a phone dialer somewhere in their plethora of features. But none of them handles your calls as well as the undisputed champion among phone-dialer software, *Hotline*, from General Information. *Hotline* does one thing, and does it comprehensively.

The most recent upgrade, Version 2.2, adds some important new capabilities, including hotkey access to six separate phone directories.

Version 2.2's notetaker, another welcome addition, associates an unlimited number of text notes with any directory entry. Notes can't exceed 500 characters in length, however; that's an unnecessary hindrance.

You can print notes by area code, listing, or any of several other sorting criteria, and can also print directories and mailing labels. The print utility runs separately from *Hotline* itself, and has a rather cumbersome interface that presents a blizzard of options. It takes some getting used to. The same could be said of *Hotline's* initial setup procedures.

The upgrade also lets you create customized subsets of *Hotline* databases. That should interest telemarketers and others who live and die by the phone. General Information reports that *dBASE III Plus* can be used to directly read and edit *Hotline* files. In the other direction, *Hotline* will directly read *dBASE* files that meet *Hotline*'s data structure requirements.

Hotline has supported expanded memory since Version 2.0. The current version consumes a dainty 4K of conventional memory, and about 98K of EMS RAM. The program is as tubby as ever (between 88K and 100K) when run in main memory, however, so users who lack EMS must decide between TSR convenience and the memory savings from running *Hotline* in nonresident mode.

Nearly as important as *Hotline*'s functionality is the data that General Information sells with it. Version 2.2 comes with completely updated listings for up to 10,000 U.S. businesses. Optional *Info Packs* offer listings in a variety of categories, including computer/high tech ($129), with 8,500 listings; and toll-free numbers ($99), with 14,000 listings.

Other *Info Packs* are slated to follow, including one that boasts all 132,000 listings in General Information's hard copy *National Directory of Addresses and Telephone Numbers*.

The computer rivals the telephone as the most important productivity tool in business history. *Hotline* creates a synergy between the two that makes its sometimes difficult-to-use interface well worth the effort. ■

List Price: *Hotline*, $99.
Requires: 88K RAM, DOS 2.0 or later, graphics adapter, autodial modem to use autodial feature.
General Information Inc., 401 Parkplace, Kirkland, WA 98033; (206) 828-4777.

CIRCLE 434 ON READER SERVICE CARD

PC-Kwik Power Disk Defragments, Analyzes, and Explores Hard Disks

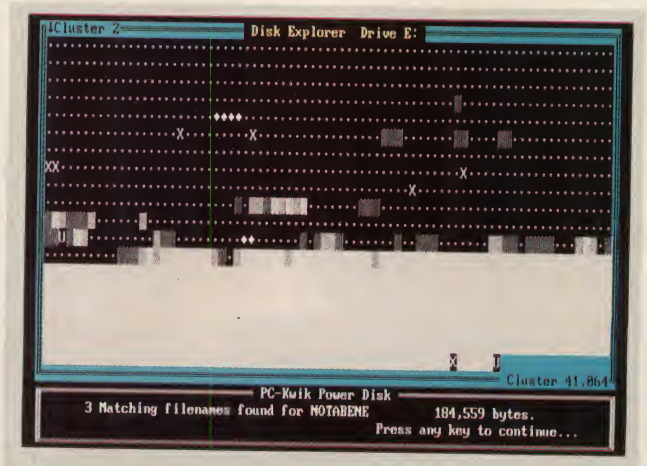
HANDS ON
by Edward Mendelson

In the 18 months since *PC Magazine* surveyed hard disk defragmenters (see "Order Out of Chaos: Boosting Performance with a Well-Ordered Disk," October 11, 1988), nothing appeared to challenge the undisputed Editor's Choice, Bridgeway Publishing Co.'s $49.95 *FastTrax*.

Nothing until now, that is. Multisoft Corp.'s $79.95 *PC-Kwik Power Disk* offers a combination of features that makes it the first plausible alternative to *FastTrax* for fast, thorough, and customized disk reorganization.

DOS degrades disk performance by dividing files into fragments and scattering them across your disk, so that the heads need more time to find them. Like other defragmenters, *Power Disk* speeds disk activity by reuniting fragmented files and by packing all files together at the front of the disk so that the heads can waste the least possible time moving from one file to the next.

Power Disk approaches or equals the high-speed defragmenting of *FastTrax*, with comparable safety features and a powerful set of options and disk-exploration tools. The menu lets you choose full disk packing, fast defragmenting, or a strategy that tries to leave files likely to be fragmented in an area of the disk where further fragmentation will have the least effect.



***PC-Kwik Power Disk*'s disk-explorer function reports the physical location of files, or identifies files associated with individual clusters. You can zoom in on the map for greater detail.**

Like *FastTrax*, *Power Disk* lets you create a command file that further refines disk organization and allows automatic operation. *Power Disk* doesn't offer the complete and elaborate control over file order and placement that you get with *FastTrax*, but it has some clever tricks of its own, including an option to organize directories in the order of your DOS path.

Power Disk won't let you reboot while it defragments, and won't let you pop up most memory-resident programs. Unless you choose the fastest defragmenting method, you won't lose data if someone pulls the plug while the program reorganizes the disk. (I tried it.)

The most intriguing part of the program is its Disk Explorer, a utility that lets you find the physical location of files or learn which file occupies a cluster. Packages like the *Norton Utilities* have similar functions, but without the interactive ease and flexible disk map that you get with *Power Disk*.

The most awkward part of the program is its name, but you can easily rename PCKPDISK.EXE to something that won't tangle your fingers while it disentangles your files. ■

List Price: *PC-Kwik Power Disk*, $79.95. **Requires:** 256K RAM (384K for disks over 32MB), DOS 2.0 or later.
Multisoft Corp., 15100 SW Koll Pkwy., Beaverton, OR 97006; (800) 274-KWIK; (503) 644-5644.

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Windows-based XPort Tackles Tough Vector Conversions

HANDS ON
by Robin Raskin

Graphics file conversion programs that work with bitmap graphics formats are plentiful, but only the bravest, like Micrografx's *XPort*, attempt conversions between vector formats.

The $395 *Microsoft Windows*-based program supports conversions to and from an important collection of vector file formats: .CGM, .PICT1 and .PICT2, .DXF, *GEM*, and .DRW and .GRF. Sorely missing is support for the .EPS format. But Micrografx intends to add support for Adobe's limited .EPS, TIFF and .PCX bitmaps, and IGES and GDDM vectors shortly.

XPort is built for expansion. The main program, a graphics translation engine, creates an intermediate format from which all bidirectional translations occur. Individual modules support each translation and can be installed separately. It even supplies development kits for customized translations. A runtime version of *Windows* comes with the program.

Once running, *XPort* splits your screen into two windows, one for selecting the input file and its specifications, the other for the output file. Each window has its own scrollable directory of files. Using a conventional *Windows* menu bar with pull-down selections, you specify input and output formats. Some formats have pop-up configuration boxes to customize a translation. For the nonstandard .CGM format, you can specify which of five major graphics programs created your .CGM file. Or, you can customize your own .CGM file specifications for output only.

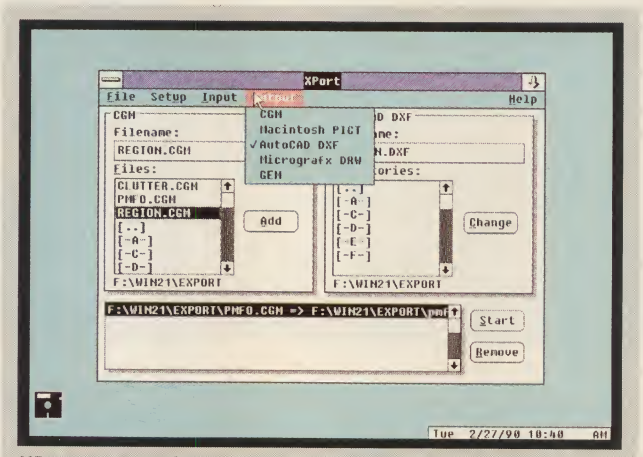
Files selected for translation appear in a list in a separate window at the bottom of the screen. Click on Start to use this list as a batch process. During translation you receive detailed progress reports and an extensive error report, a helpful feature given the quirky nature of file conversions.

XPort is most impressive when it substitutes a font in the input file with a closely matching font in the output file, or when it takes a *Designer* .DRW file with Bezier curves and outputs an *AutoCAD* file where polygons simulate Bezier curves (which *AutoCAD* doesn't support).

Still, the program is far from perfect, which means you'll have to know how to prepare your files for translation. For example, when *Windows*-based programs import .CGM files, they first convert them to .WMF format. .WMF images are saddled with *Windows*'s 64K size limit, which is too small to accommodate large *AutoCAD* files. You can streamline your .DXF files prior to translation using *AutoCAD*'s Purge command, but you can't take any .DXF file and run it directly through the *XPort* conversion process.

In addition, Macintosh PICT conversions lose bitmap information and require some minor preparation, such as file renaming. As I encountered problems that crashed the program, Micrografx came up with fixes and sent new disks to me; the company will do the same for any user who calls with a problem.

With *XPort*, Micrografx has created a strong graphics translation product. But for the same $395, you'd have to be crazy not to buy the company's *Designer*, which gives you all the same file translations (without the batch processing and error log) plus some of the most powerful drawing functions you're going to find. ■



***XPort* uses a split screen to specify input and output specifications for translation. The bottom of the screen provides detailed feedback during the translation process.**

List Price: *XPort*, $395.
Requires: 640K RAM (1MB recommended), hard disk, DOS 3.0 or later. *Microsoft Windows* 2.0 and mouse recommended. Micrografx Inc. 1303 Arapaho, Richardson, TX 75081; (214) 234-1769.

CIRCLE 432 ON READER SERVICE CARD

Impel Scripts Animations the Old-fashioned Way

HANDS ON
by Luisa Simone

Eastridge Technology's *Impel* is a desktop presentation program in search of a niche market. This $195 program produces animations via scripts.

Scripts are accessed through the Xam (Examine) menu and list the duration of each frame (1/60 to 4.25 seconds), transition effects such as Fizz or Weave, and screen coordinates of single objects. By tracking single objects (rather than entire frames) within an animation, *Impel* makes it easy to script movement. Simply choose an object's name and enter the number of times an incremental move should be repeated.

Scripts are lists of instructions that apply to the objects *Impel* stores in a library, an efficient method for handling frequently used images. Thus, multiple films can refer back to a single library, saving work and disk space.

Impel's direct manipulation mode, which lets you click and drag objects on an editing screen, seems novel at first. But without the proper tracking mechanisms, it produces less-than-satisfactory results.

Impel moves objects in only two dimensions: x and y. More complex effects are achieved by simultaneously stacking layers of moving objects in an imaginary z dimension.

The program sidesteps its inadequate painting and palette functions by importing *Deluxe Paint* .LBM, *PC Paintbrush* .PCX, *Color Rix* .SCL, and *Halo* .CUT file formats. Its skeletal black-and-white interface could use a major overhaul. An Undo command is needed on the editing screen.

Impel's 16 raster fonts will make short work of any text-intensive presentation. But only those users who are comfortable with the old-fashioned scripting process, and who can gain from its library orientation should attempt extensive image manipulation with *Impel*. ■

List Price: *Impel*, $195; IMPC Animation Compiler, $100.
Requires: 640K RAM, graphics adapter, DOS 2.0 or later (3.0 or later recommended). Eastridge Technology, 37 Murray St., New York, NY 10007; (212) 267-7980.

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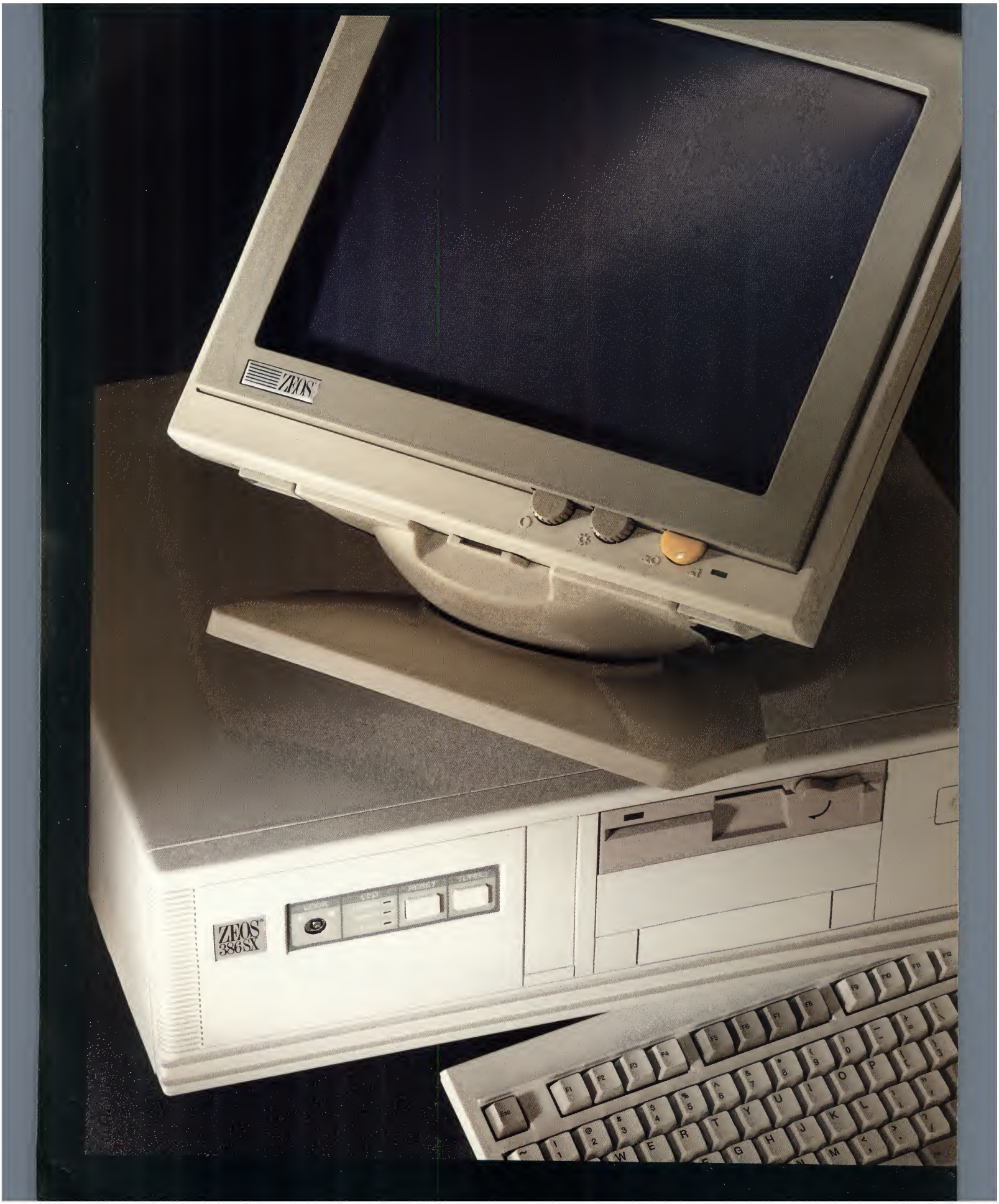
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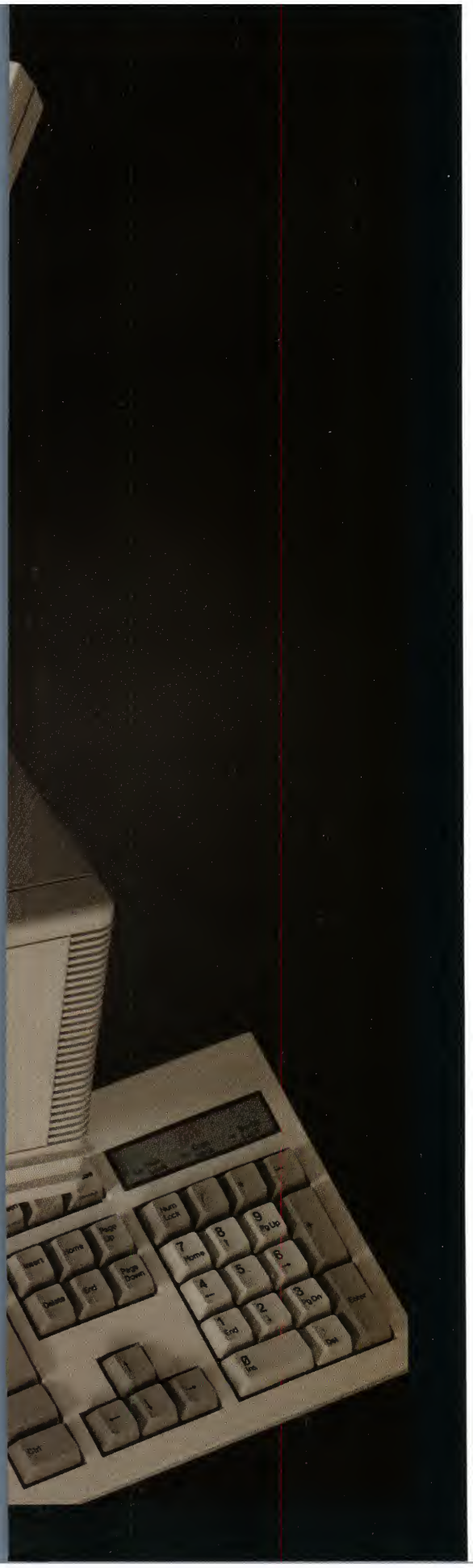

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Back & Forth Makes Nine Applications Look Like TSRs

HANDS ON
by Jonathan Matzkin

From what's been said so far, it seems that OS/2 2.0 will finally send DOS into well-deserved retirement. But the world's most popular operating system still has some life left in it, thanks in part to task-switching utilities like Progressive Solutions' *Back & Forth*. The shareware program lets DOS users jump between as many as nine open applications, without having to save files or formally close each application.

After *Back & Forth* is installed, its main application screen displays the names of any software packages that you have installed. You can launch a program from this screen by highlighting it and tapping Enter, or by simply pointing and clicking with a mouse.

Once launched, an application can be swapped into a full-screen window by tapping a user-configurable hotkey. The hotkey method lets you jump from one application to another without returning to the main screen, as if all of your applications were TSRs.

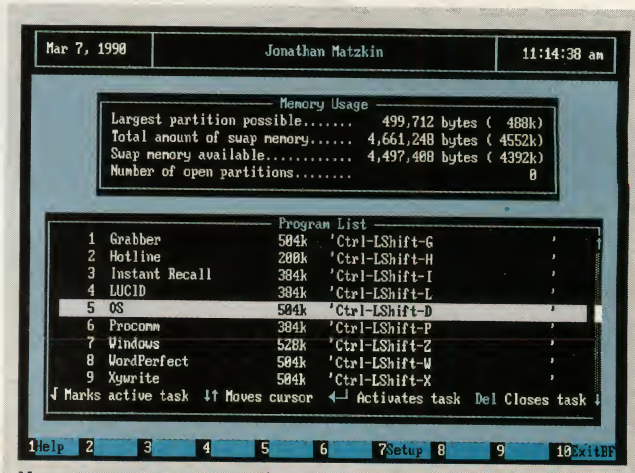
I loaded nine applications into *Back & Forth* and had no trouble accessing any of them via hotkey or through the main selection screen. *Back & Forth* easily swapped graphics screens, and returned to each of them with colors intact. I was unable to swap out of *Windows* once I hotkeyed into it, but that has more to do with *Windows*'s treatment of the keyboard than any deficiency in *Back & Forth*. When I exited from *Windows*, *Back & Forth* returned me to its main screen, so I could select another application.

Back & Forth does have some limitations, which are understandable given its modest price and try-before-you-buy shareware status. For example, it lacks a cut-and-paste feature, though the developer promises to deliver one in a forthcoming upgrade.

While the task-switcher remembers which software packages have been installed, it doesn't automatically open them for you at boot-up time. That's a minor inconvenience, but it would be nice to have your applications just a hotkey away rather than having to start each by manually selecting it from *Back & Forth's* main screen.

More serious is *Back & Forth*'s nine-program limit. That should be plenty for most users, but power users might find it a little confining.

For its reasonable $50 registration fee, *Back & Forth* delivers stable, easy context-switching. Given its low price, it is an outstanding value. ■



You can access any application from *Back & Forth*'s main screen by either highlighting the appropriate choice and tapping enter or by pointing and clicking with a mouse.

List Price: *Back & Forth*, $50. **Requires:** 256K RAM, DOS 3.0, and either EMS memory, a RAM disk, or a hard disk for storing swap files. Progressive Solutions, Inc., P.O. Box 276125, San Antonio, TX 78227-6125; (800) 833-4400.

CIRCLE 431 ON READER SERVICE CARD

Unicom Increases Communications Choices for Windows

HANDS ON
by Barry Simon

Shareware has a long tradition in PC communications, beginning with *PC Talk* and continuing with programs like *Boyan*, *ProComm*, *Qmodem*, and *Telix*. Now, there's a strong shareware contender to do your communicating in the *Microsoft Windows* graphical environment.

Data Graphics' *Unicom* supports VT52, TTY, and ANSI-BBS terminal emulations, but not VT100. Its protocol support includes Xmodem, Ymodem, and Zmodem, CompuServe B (CISB), and Kermit. Among its retail competitors, Crosstalk's *Crosstalk for Windows* also has Zmodem and CISB support, but Hi-Q International's *Ape* and Future Soft's *Dynacomm* do not. While *Unicom* supports the Quick B version of CISB, it is not able to resume an aborted download.

Unicom uses standard *Windows* elements: scroll bars allow you to look at your capture buffer, a graphical indicator reports the progress of downloads, and on-screen command buttons let you dial and hang up. Dialog boxes are plentiful.

Unicom's script language isn't as powerful as those of its more expensive competitors, but it should be adequate for most purposes. It supports variables, if-else statements, and case constructs. It can pause a script for an incoming string, but not branch depending on the outcome. It can run other programs, but lacks DDE support, which you'll find in the other three packages. You can use *Unicom*'s script language to create pop-up message boxes and areas for text input, but it won't allow you to build your own dialog boxes.

Like *Ape*, *Unicom* lets you do a clipboard-to-clipboard transfer between two computers running *Unicom*. But the program has a number of features that you won't find in *Ape* or the other *Windows* communications programs. For example, you can batch-dial, cycling through several numbers until you find one that isn't busy. You can program a scheduler to run scripts at a future time, much like you'd do with a VCR.

Speed is one of *Unicom*'s strong points. In our informal tests, it downloaded a 42K file in just over 3 minutes; *Crosstalk for Windows* took almost 5 minutes to complete the same task. Times for other transfer types should not differ as dramatically, however.

On the downside, *Unicom* did not properly inform CompuServe of an aborted transfer, so our only choice was to hang up without logging off.

Because of its modest price, batch dialing, and Zmodem and ANSI-BBS support, this program should be especially popular with BBS users. But all *Windows* users looking for a communications program for that environment should consider *Unicom*. ■

List Price: *Unicom*, Version 1.4, $45; with disk and printed manual, $65. Shareware available for trial download via PC MagNet. **Requires:** 640K RAM, *Microsoft Windows 2.x* or later, DOS 3.x or later. Data Graphics, 7735 46th Ave. SW, Seattle, WA 98136; (206) 932-8871.

CIRCLE 435 ON READER SERVICE CARD

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PC MAGAZINE *"Don't pass over the CPU 286 12MHz" —Sept 1989*

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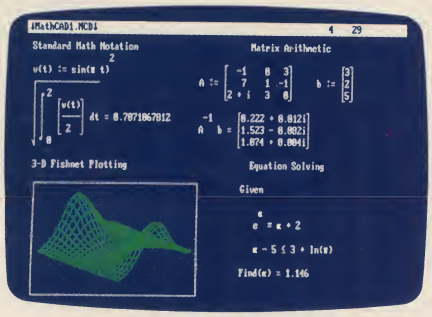

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by
Matthew J. Ross

New&Improved

News of Announced Products and Upgrades

Skipjack Creates dBASE Databases With Pascal

NEW

Max Software Consultants' *dBASE*-style function library for Pascal lets *dBASE* and Pascal developers turn *Turbo Pascal* or *Quick Pascal* compilers into a *dBASE*-compatible compiler. With the *Skipjack* Pascal add-in, developers can create Pascal-executable files that closely mirror *dBASE* functions. These functions include USE, SELECT, SAY, GET, SEEK, and INDEX. *Skipjack* also contains 25 *dBASE*-compatible command line utilities including CREATE, ZAP, BROWSE, COPY, APPEND, INDEX, SORT, and MODIFY STRUCTURE. *Skipjack* allows 255 workareas, 255 Say/Get areas, as well as unlimited indexes, fields, and relations per database.

Skipjack is fully networked, allowing developers to create multiuser databases. It runs on any network and uses the DOS file locking primitives to permit multiple workstations to access the same database.

List price: *Skipjack*, $299. **Requires:** 512K RAM (640K recommended), *Turbo Pascal* 4.0, 5.0, or 5.5 or *Quick Pascal*, hard disk, and DOS 3.0 or later. Max Software Consultants Inc., 4101 Greenmount Ave., Baltimore, MD 21218; (301) 828-5935.

CIRCLE 444 ON READER SERVICE CARD

Saber File Manager Organizes Network Files

NEW

Taking hard disk and file management one better, **Saber Software**'s *Saber File Manager* features an *XTree*-like interface with network functionality. *Saber File Manager* includes file tagging for file-group operation; support for all standard DOS applications; the ability to search for a string within a file or file volume; the ability to print files in raw or formatted form; file sorting by name, extension, date, or size; and directory management including hiding, showing, and renaming directories within a menu-driven mouse-supported environment which conforms with IBM's System Application Architecture.

Compatible with Saber's *LAN Administration Engine*, it has no memory overhead in the workstation, features password capability, network administrator-defined submenus, and customizable help. *Saber File Manager* allows flexible control over file viewers, editors, and execution options to the LAN administrator, providing maximum flexibility and network security.

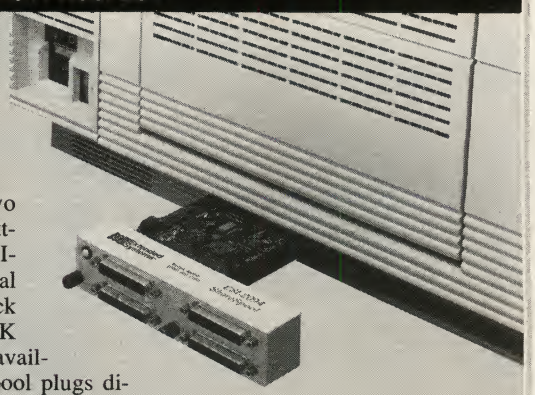
The *Saber File Manager* helps network managers manage files and security across LANs.

List price: *Saber File Manager*, $395 per server. **Requires:** 384K RAM, hard disk, DOS 3.1 or later. Saber Software Corp., P.O. Box 9088, Dallas, TX 75209; (800) 338-8754, (214) 361-8086.

CIRCLE 440 ON READER SERVICE CARD

HOT PROSPECT

EXTENDED SYSTEMS ALLOWS FOUR USERS TO SHARE A LASERJET III



Extended Systems expands its ShareSpool product line with two printer sharing devices for Hewlett-Packard's new LaserJet III. The ESI-2041C ShareSpool offers four serial inputs through RJ-45 modular jack connections. It features a 256K memory buffer with a 1MB option available, and the ESI-2041C ShareSpool plugs directly into the printer's backplane via the LaserJet III's optional I/O slot.

Extended System's ESI-2094A ShareSpool accepts four PC connections via parallel ports.

A parallel connection is also available with the new ESI-2094A ShareSpool. The ESI-2094A offers superior speed over the serial interface and high performance for graphics and desktop publishers through its 1MB memory buffer and dynamic memory allocation-assisted input channels. It also provides parallel access for as many as four users up to 100 feet from the printer.

Both the ESI-2041C and the ESI-2094A ShareSpools are transparent to the user, and all computers can send data simultaneously without affecting the data transmission from other computers. The ESI-2041C and the ESI-2094A are compatible with all Hewlett-Packard printers with the option slot, including the LaserJet Series II, IID, and III.

List Price: ESI-2041C ShareSpool with 256K memory buffer, $495, with 1MB, $690; ESI-2094A ShareSpool, $895. Extended Systems, P.O. Box 4937, Boise, ID 83711; (208) 322-7163.

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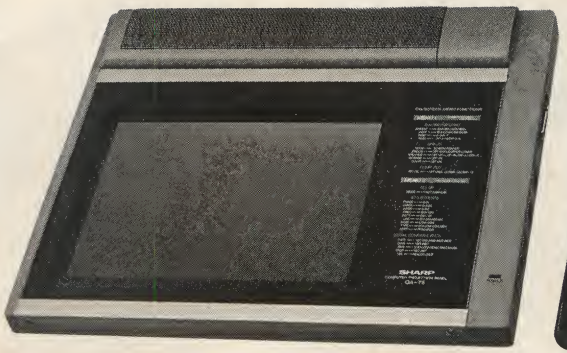
New & Improved

Sharp Panel Projects 16 Gray Shades at VGA Resolution



The Sharp QA-75 brings fine detail to overhead presentations with its 16-level gray-scale VGA.

NEW

At 640 by 480 resolution, a bright-to-dark contrast ratio of 17:1, and 16 true levels of gray via new liquid crystal, **Sharp Electronics Corp.**'s QA-75 high-contrast LCD data projection panel maximizes your overhead presentations.

In addition to VGA, the $1,795 panel supports MCGA, CGA, EGA, Hercules, and Mac II video standards. The QA-75's proprietary triple-supertwist nematic LCD technology produces black graphics or text on a white background for clear overhead presentations. User-selectable gray scaling and "hatching pattern" shading adjustments facilitate compatibility with desktop presentation graphics applications.

The QA-75 also features a 23-key wireless remote which allows direct access to any of the panel's display features, including screen freeze; zoom enlargement of any of the panel's four quadrants; on-screen menu control of shading, display, and PC functions; and a pointer for highlighting areas of the screen. The QA-75 LCD panel weighs 6.7 pounds and measures 14.3 by 12.4 by 2 inches.

List price: Sharp QA-75, $1,795. Sharp Electronics Corp., Professional Products Division, Sharp Plaza, Mahwah, NJ 07430; (201) 529-8731.

CIRCLE **439** ON READER SERVICE CARD

Datacom Technologies' MetroLAN Creates Serial Networks

NEW

Datacom Technologies expands its line of connectivity products with the release of MetroLAN. This serial networking system offers many of the functions of a full local area network (LAN) through its combination of hardware and the *MetroShare* operating system software. MetroLAN's Master Unit

controls the system, providing 256K of memory expandable to 4.5MB with field-installable SIMMs. In addition, four bidirectional serial ports and two parallel ports, configured as either input or output are included.

Through *MetroShare*, users can share data, transfer files in the background, send electronic messages, hold computer conferences, and share peripheral devices as printers and modems. It is memory resident at the workstation and uses 32K RAM or an additional 25K RAM with the optional hotkey access to *MetroShare*'s menu interface.

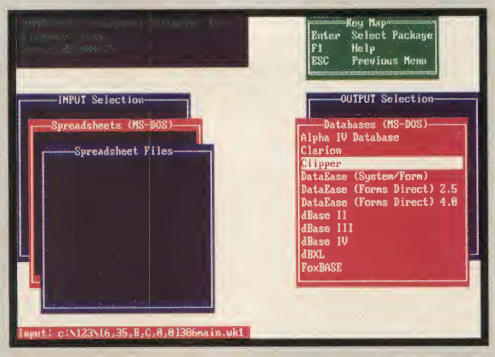
The MetroLAN serial network system is expandable up to 32 ports through remote units featuring one parallel and two serial ports; the *MetroConnect*-distributed architecture allows remote unit connections of up to 4,000 feet from the MetroLAN system unit at a transmission rate of 230K bits per second (bps) using the standardized high-level data link control protocol (HDLC) and four-wire telephone cable.

List price: MetroLAN Master Unit, $1,595, Remote Unit, $695. Datacom Technologies Inc., 11001 31st Pl. West, Everett, WA 98204; (206) 355-0590.

CIRCLE **443** ON READER SERVICE CARD

IMPROVED

***DBMS/Copy*, Version 2.0**—Conceptual Software's file conversion application now supports 65 software packages, up from the 26 packages in its previous release. *DBMS/Copy* has replaced its command-line interface with a series of pop-up windows. For *repetitive conversions*, a DOS command-line option accepts batch programs that can be created automatically with *DBMS/Copy*'s keystroke capture facility. *DBMS/Copy* reads and writes in each program's native file format. A tool for data analysts, *DBMS/Copy* supports 22 statistical packages, including *BMDP, SAS, SPSS,* and *Statgraphics* as well as *Oracle, Ingres, Informix* SQL databases and the current versions of the major spreadsheet and database applications. *DBMS/Copy,* Version 2.0, retails for $195. An upgrade from Version 1.2 is available for $49. Conceptual Software, Houston, Tex.; (713) 667-4222.



***DBMS/Copy* translates 65 different file types, including three SQL databases.**

***FontMaker*, Version 2.0**—The Font Factory has added direct support for Hewlett-Packard's LaserJet III and the IBM 4019 LaserPrinter. *FontMaker,* Version 2.0, has extended its AutoFont Support to include all LaserJet printers. It takes full advantage of PCL 5's font-scaling abilities, permitting users to create downloadable scalable type for the LaserJet III. With support of the IBM 4019 LaserPrinter's native mode, you can download fonts in point sizes from 4 to 155 with automatic rotation. *FontMaker*'s AutoFont Support uses Tagged Font Metric (TFM) technology; and according to the company, the package is device, resolution, and language independent. Version 2.0 of the *FontMaker* retails for $19.95 with individual typeface families selling for $94.95. The Font Factory, Dallas, Tex.; (800) 44-FONTS.

Font & Function—Adobe Systems has added 15 typeface software packages to its type catalog, *Font & Function.* This brings the total number of Adobe Type Library packages available to 134. Among the new packages are Trade Gothic, Raleigh, Syntax, Stempel Schneidler, Lithos, and Adobe Wood Type 1. The typeface packages range in price from $145 to $370. Adobe Systems Inc., Mountain View, Calif.; (800) 83-FONTS.

***PrintAPlot*, Version 2.0**—Insight Development's improved release of its device-management software has added several features, including faster printing of HPGL plot files on laser, inkjet, and dot matrix printers. With its new tiling feature, *PrintAPlot* 2.0 can print large drawings over multiple, contiguous pages that can be assembled

CONTINUES ON PAGE 56

640K Before Headroom®

640K After Headroom®

If you're up to your gills in TSRs (RAM resident programs), you've undoubtedly found out they can be quite a drain on your system's 640K.

Unless of course, you already know about Headroom.®

Simply put, Headroom breaks the 640K barrier by letting you run all your memory-resident programs from extended or expanded memory, or from hard disk. This means there'll always be enough room for even the most RAM ravenous "fish" to swim around in.

With Headroom you can hot-key between up to 32 application programs – so you can switch from your word-processor to your database to your spreadsheet with a touch of a key! *But unlike other* swapping and switching "merry-go-round" programs, all your TSRs are *always fully functional!*

Headroom is so fantastic that PC Magazine said *"Headroom performs more death-defying escapes from DOS's 640K straightjacket than any other program."*

And that's no fish story!

Features:	HEAD ROOM	Software Carousel	Pop Drop Plus	QRAM
Switch between programs	32	12	None	None
Menu of loaded programs	✔			
Easy on-screen setup	✔			
Includes cut and paste utility	✔			
Controls TSRs	32	12	50*	Limited*
Resolves TSR conflicts	✔		✔	
Frees all RAM occupied by TSRs	✔			
TSRs remain fully functional	✔		✔	✔
TSRs operate with each other	✔			
Load/unload TSRs as you go, in any order	✔			
Control/Free RAM used by device drvrs.	✔			✔
Use extnd. or expnd. memory or hard disk	✔	✔		
Load TSRs and device drvrs in high-DOS RAM	✔		TSRs only	✔
Requires LIM 4.0 hardware to operate	NO	NO	YES	YES

*Limited by amount of "high-DOS" memory available.

- Relocates memory resident programs to extended or expanded memory or hard disk
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- Helps TSRs operate with newer hardware (e.g. mouse, VGA, PS/2, etc.)
- Hot-key between 32 programs, even Windows™
- Works under all network environments
- Removable without rebooting
- Uses only 50K

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CIRCLE 167 ON READER SERVICE CARD

Computers, FCC Class A, Class B, and You — or When is it better to get a B than an A?

You need to know the difference between computers that meet the FCC class B radio frequency emissions standards and those that meet only the Class A standards.

Computers emit radio signals in their operation. Because these signals may cause interference to radio and television reception, the marketing and the use of computers is regulated by the Federal Communications Commission. Under federal rules, computer users are responsible for remedying interference, including interference in neighboring homes.

Computers certified by the FCC as meeting the Class B standard are less likely to cause interference to radio and TV reception than those that have been verified by the manufacturer or importer to the Class A standards. Only Class B certified computers may be advertised, sold, or leased for use in residences. A similar regulatory program applies in Canada.

Buyers seeking computers for use in homes (including offices at home) should shop for computers and peripherals which have been Class B certified. These devices carry a label with an FCC ID number. Both new and used Class A verified devices may be sold only for use in commercial and industrial locations. Signals from computers are more likely to be masked by electrical noise from other equipment in such an environment. These areas are also likely to have fewer radios and TVs. Accordingly, equipment marketed only for use in these locations may meet the less rigorous Class A standard. Class B certified equipment may be marketed for use in residences as well as commercial and industrial locations.

As you shop for a computer for use in your home, look for the FCC classification in the specifications or ask your vendor to recommend only machines that have been certified to the Class B limits. TV viewers and radio listeners in your home and in neighboring homes will be glad you did.

New & Improved

IMPROVED

CONTINUED FROM PAGE 54

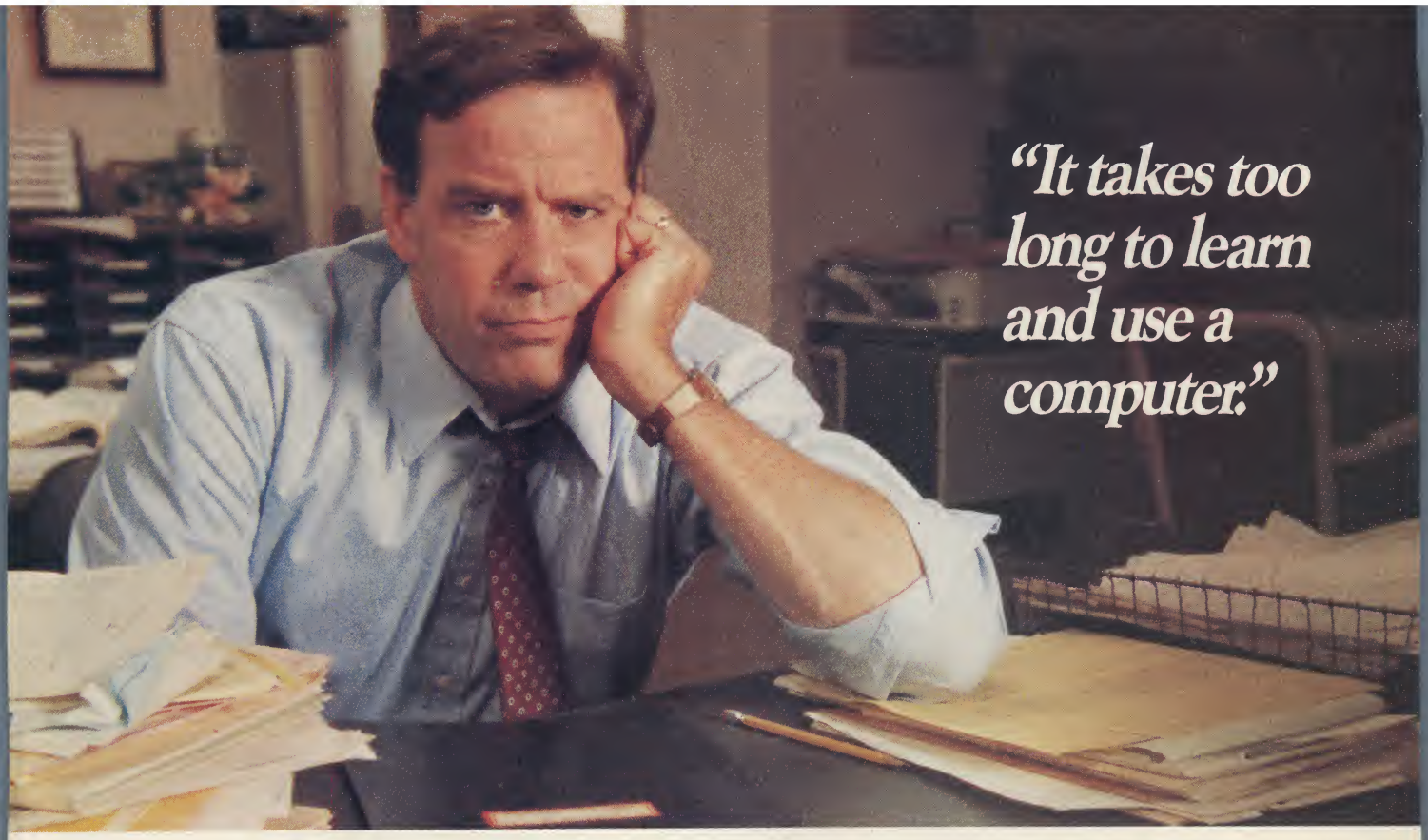
to create up to E-size plots. Expanded scaling capabilities produce A-size drawings scaled from one percent to 600 percent of the original image size. With independent *x, y* positioning, images can be placed anywhere on the page, while *PrintAPlot* 2.0's new rotation feature permits you to rotate the image either 90, 180, or 270 degrees. In addition, *PrintAPlot* 2.0 now attaches setting sheets containing specific style information to plot files for consistent output. The program offers multiple language support for user customization and works with a variety of printers, including Hewlett-Packard, Epson, Canon, QMS, Toshiba, and Kodak. *PrintAPlot* 2.0 has a list price of $299, with upgrades directly available from the manufacturer for $100. Insight Development Corp., Emeryville, Calif.; (800) 825-4115, (415) 652-4115.

***Workbench2*'s solid modeler can display 3-D representations of mechanical drawings to facilitate design.**

Workbench2—Iconnex has updated its *Mechanical Engineering Workbench* software to include three-dimensional construction and solid modeling. *Workbench2* is a standalone application that creates 3-D representations of 2-D models for conceptual design. It features 3-D construction techniques, hidden-line removal, optional shading, calculation of mass properties, and 2-D and 3-D file export in DXF to CAD packages. *Workbench2* integrates a geometry mechanism for creating design drawings with the corresponding logic, an equation mechanism for solving up to 25 simultaneous nonlinear equations, and worksheet and report mechanisms for report generation in a menu-driven interface. Other features include a scientific calculator and a mass properties calculator to determine mass, surface area, center of gravity, and volume. *Workbench2* retails for $995. A *Mechanical Engineering Workbench* conversion upgrade is available for $595. Iconnex, Pittsburgh, Pa.; (800) ICONNEX, (412) 321-8890.

Lotus 1-2-3/M—To provide a consistent platform across mixed hardware and operating system environments, Lotus Development Corp. and IBM have joined forces to provide a mainframe version of the popular spreadsheet for the IBM System/3270. *Lotus 1-2-3/M* supports *Lotus 1-2-3,* Release 3.0, features, including reading and writing files, executing macros, calculating formulas, drawing graphs, and printing. Since the internal file format for *Lotus 1-2-3/M* is interchangeable with *Lotus 1-2-3,* Release 3, worksheets created on either platform may be used without file translation. The Lotus Spreadsheet Connection supports IBM communications links, allowing users to transfer files with a menu-driven Lotus interface between PCs running OS/2 and the mainframe. *Lotus 1-2-3/M* was developed by Lotus Development Corp. As an IBM product, it is exclusively marketed, serviced, and supported by IBM, with prices starting at $15,360, plus monthly licensing fees. IBM Corp.; (800) IBM-2468.

AGA 1024—Desktop Computing has added the DGIS interface and drivers for several popular software packages to its Advanced Graphics Accelerator—the AGA 1024 video graphics adapter. The AGA 1024 already emulates IBM 8514/AI and the Texas Instruments TIGA standards. The Direct Graphics Interface Standard (DGIS) is a board-level software interface that resides in the local memory of intelligent graphics controllers. While it requires drivers for individual applications, the DGIS interface supports several applications not currently available through the 8514/A and TIGA video standards. Desktop Computing's DGIS drivers include support for *Microsoft Windows/286* and */386,* CGI, *GEM,* GKS, X Windows, as well as *AutoCAD, WordPerfect, Harvard Graphics,* and *Ventura Publisher.* The AGA 1024 has a suggested retail price of $1,495 with all 8514/A, TIGA, and DGIS interface software or $995 with either the 8514/A or TIGA software. Desktop Computing Inc., San Jose, Calif.; (408) 943-9409.



Discover the DeskMate™ Difference... the Friendly Face in the PC crowd.

If you've shied away from PCs because you thought they were too intimidating, now there's good news!

Say hello to DeskMate, the Graphical User Interface that replaces confusing commands with simple, plain English. Leading software publishers are adopting DeskMate to give their programs a friendly look and feel. The proven DeskMate format guides you through each program with simple "point-and-click" convenience.

Your key to "software ease." Popular programs with the DeskMate User Interface include *PFS:First Publisher, The Lotus Spreadsheet for DeskMate, Q&A Write* and *Quicken*. Use one, and you've essentially learned how to use them all. Choose titles from Activision, Broderbund, Electronic Arts, Intuit, SPC, Sierra and many other software publishers.

Take the Tandy "five-second test." DeskMate works with any PC compatible. But since the most popular Tandy PCs have DeskMate built in, you can be up and running in less than five seconds!

You'll be greeted by the friendly face of DeskMate, complete with a neat, organized listing of *all* of your programs. There's simply no comparison in ease of use. Come see for yourself!

Discover the DeskMate Difference for yourself . . . now at Radio Shack, GRiD and participating dealers.

DeskMate™
User Interface by Tandy

CIRCLE 289 ON READER SERVICE CARD

If it starts here, fax it from here.

It was recently estimated that 80% of all faxes start on a computer. A telling statistic indeed. And what it may be telling you is that it's much more convenient to fax directly from your PC.

The Intel Connection CoProcessor (CCP) enables you to do just that, simply by snapping this add-in card into your PC. The transformation is phenomenal.

With the CCP, you can send and receive faxes without leaving your computer or the application you're working on. Thus you can share data, text and graphics with PC and non-PC users alike. Send faxes at one time to one person or one hundred. Best of all, the CCP works in the background so you can keep using your PC while transmitting faxes.

That's just the beginning of the benefits. Because your documents aren't sent from a fax machine, they arrive looking crisp and clear. They're also easier to keep confidential because they're not lying around in your fax basket. And you'll never have to wait in a fax line again.

Call Intel at (800)538-3373 and we'll tell you all about this award-winning product and its industry-leading five-year warranty. Or call our round-the-clock, automated FaxBack line (503)629-7576 and ask for document #9994. Please have your fax number handy.

Either way, do it today. It could be the start of something great.

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New & Improved

DecisionPower Expert System Aids Decision Making

NEW

To help reduce the difficulty of the decision-making process, **Syndetic Technology**'s *DecisionPower* provides a combination of statistical and subjective information in a knowledge matrix, allowing you to combine data and human expertise and experience within a mathematical framework.

Using a spreadsheet-style editor, *DecisionPower*'s knowledge-matrix format is designed to allow users to identify relationships between decision criteria and possible outcomes. Analysis of results is possible through user-selected supporting evidence, and graphical output identifies the interaction of the evidence within the decision process.

List price: *DecisionPower*, $349. **Requires:** 640K RAM, hard disk, DOS 3.0 or later. Syndetic Technology Corp., 7400 Center Ave., #210, Huntington Beach, CA 92647; (714) 894-8734.

CIRCLE **442** ON READER SERVICE CARD

DEST's Recognize! Shrinks the Cost of OCR

NEW

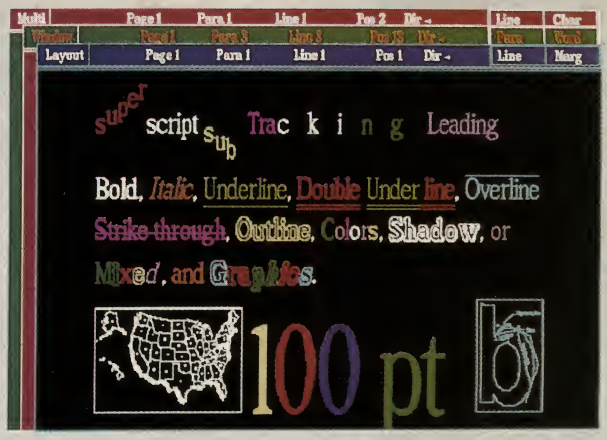
Offering omnifont recognition technology, full text formatting control, and accuracy across a number of type fonts, **DEST** has developed a low-cost optical character recognition package for its PC Scan series of scanners. *Recognize!* reads typewritten, typeset, laser, draft-quality dot matrix, and impact computer print. Documents can contain font sizes from 8 to 18 points, as well as monospaced, typeset, and proportional fonts. *Recognize!* also supports TIFF files allowing you to use third-party scanners.

Recognize! performs optical character recognition while scanning documents. Furthermore, text can be formatted specifically to a number of popular word processor packages, including *WordPerfect*, *Microsoft Word*, *WordStar*, *DisplayWrite 4*, *MultiMate*, *PFS:Write* and *Professional Write*, and *Samna Word IV* file formats.

List price: *Recognize!*, $595. **Requires:** 640K RAM, hard disk, scanner, DOS 3.1 or later. DEST Corp., 1015 E. Brokaw Rd., San Jose, CA 95131; (408) 436-2700.

CIRCLE **441** ON READER SERVICE CARD

You Still can't get WYSIWYG from any other word processor. Introducing Version 1.5 of The Universal Word®



Even graphical based word processors don't give you true WYSIWYG. Not Word for Windows.™ Not Ami Professional.® And WordPerfect® isn't even close.

With **The Universal Word,** the most advanced word processor ever, you get Macintosh® like technology in an IBM® PC and more. You don't have to imagine what will be on the printed page. What You See is **really** What You Get. That's something that isn't possible, even with programs that run under Microsoft Windows.®

True WYSIWYG means great display and printer support, and **The Universal Word** delivers it. Breakthroughs in font and printer driver technologies provide unequaled results on both dot matrix and laser printers. Users can now display and print font sizes from 2 to 100 points (from a rich variety of typefaces that come standard with the program). And **The Universal Word** makes the entire process easier, friendlier, and more productive thanks to an intuitive design, pull down menus, command option keys, and mouse support.

Experiment with multiple font typefaces, sizes, styles, colors, graphics, adjustable character and line spacing, and advanced page layout capabilities, directly on the screen. Also, you can open an unlimited number of windows and perform cut-and-paste operations with ease.

Looking for a foreign language word processor? **The Universal Word's Multi-Lingual version** can support every human language, living or dead, from Arabic to Zulu, making it the richest featured multi-lingual word processor available.

Special Introductory Offer: Order now and save 50% and receive a 15 day money back guarantee. Experience the difference. **The Universal Word** doesn't just say it's better, it guarantees it.

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Multi-Lingual version (right-to-left languages, ex. Arabic) now $297.50*

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the laptop with all the connectivity options you need.

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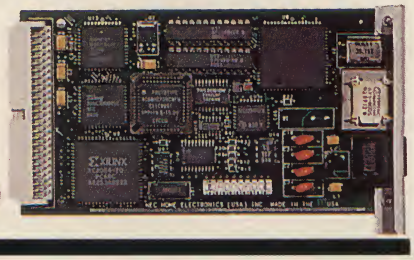

Remote 3270 and 5250 synchronous modems

3270 coaxial and Arcnet adapters

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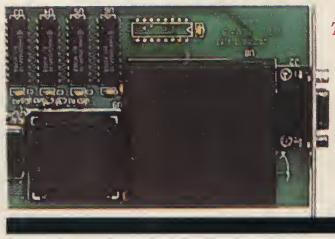

Token Ring adapter

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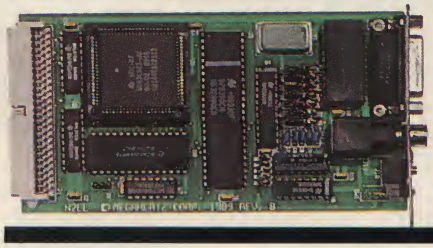
SCSI adapter supports CD-ROM drives

Starlan is a registered trademark of AT&T Corp.



Ethernet and Starlan adapters

C&C Computers and Communications

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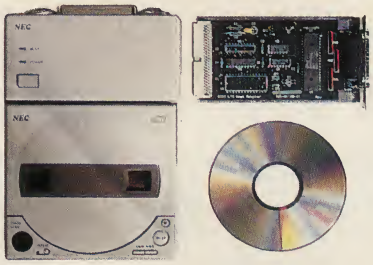
Here's the portable versatility you must have to maintain your corporate computing environment wherever you are. Because in the office or on the road, the ProSpeed™ 386SX offers you all the battery-operated connectivity and communications options you need.

A 16-bit general purpose laptop expansion (LTX) slot provides you with a vast array of connectivity capabilities... from sending and receiving faxes to mainframe communication to linking with a variety of local area networks. And the screen image? With its high-contrast black and white VGA display, clearly it's brighter, sharper and crisper. See for yourself, the new ProSpeed 386SX. When most people are putting all sorts of limitations on you, look at all the options you have.



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ProSpeed 386SX

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CIRCLE 335 ON READER SERVICE CARD

NEC

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Mega Drive modules are also ideal as a server to handle advanced LANs. Such as Novell Advanced NetWare. Or 3Com 3+.

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Mega Drive Systems products display superior performance, reliability and versatility over any other removable mass storage product.

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Access time per unit			
40Mb	**13ms**	sub 40ms	28ms
80/105Mb	**13ms**	N/A	N/A
120/170Mb	**10ms**	N/A	N/A
210/320Mb	**10/12ms**	N/A	N/A
MTBF (Hours)	**60,000**	<25,000	60,000
Compatibility	**PC,PS/2, Macintosh**	PC,PS/2, Macintosh	PC,PS/2 N/A
Capacity Range	**40-320 Mb**	21-44 Mb	21-42 Mb
# Drives on-line	**0-7**	0-2	0-2
Max on-line capacity	**2240Mb**	89Mb	85Mb

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** 10ms access time holds for 120 Mb, 170Mb and 210Mb Mega Drive modules. Other modules' access time is 12 to 13ms.*

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CIRCLE 317 ON READER SERVICE CARD

by Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Multimedia, in Many Forms, Nearly Ready for Prime Time

Take a fully loaded PC, mix with a disk full of video images, and stir with a handful of sound recordings. You've now got your hands on the hottest trend trying to burst out from research labs since PostScript met the laser printer and spawned desktop publishing. Call it multimedia and you're now hip to the busiest buzzword this side of Madison Avenue.

Intel staked its claim to a piece of the market over a year ago with its acquisition of DVI (digital video interactive) technology (see Pipeline, December 13, 1988). The technology's not yet perfected to the level it needs to be before a mainstream product can be released, but it's steadily enlisting support among developers. Most recently, IBM and AT&T discussed plans for DVI products.

IBM unleashed its own sound-and-fury-machine, called the Audio Visual Connection, late last year (see the review in this issue). It has stunning effects, but it uses a proprietary approach that will probably not inspire compatible products.

And now Microsoft has announced a strategy to bring animation and audio editing tools into future versions of *Windows* and OS/2.

Microsoft's first goal will be to integrate some of the video/audio authoring tools created by MacroMind, the pioneering Mac multimedia software developer.

MacroMind's current software provides tools to build interactive presentations, where video images and sound effects complement a show built around PC data. A whole slew of software publishers (from Autodesk to Z-Soft) responded to the Microsoft/MacroMind announcement with assurances that they'll be quick to unveil amazing multimedia programs for this environment in the near future.

It's now a safe bet to assume that most audiovisual shows running on PCs in coming years

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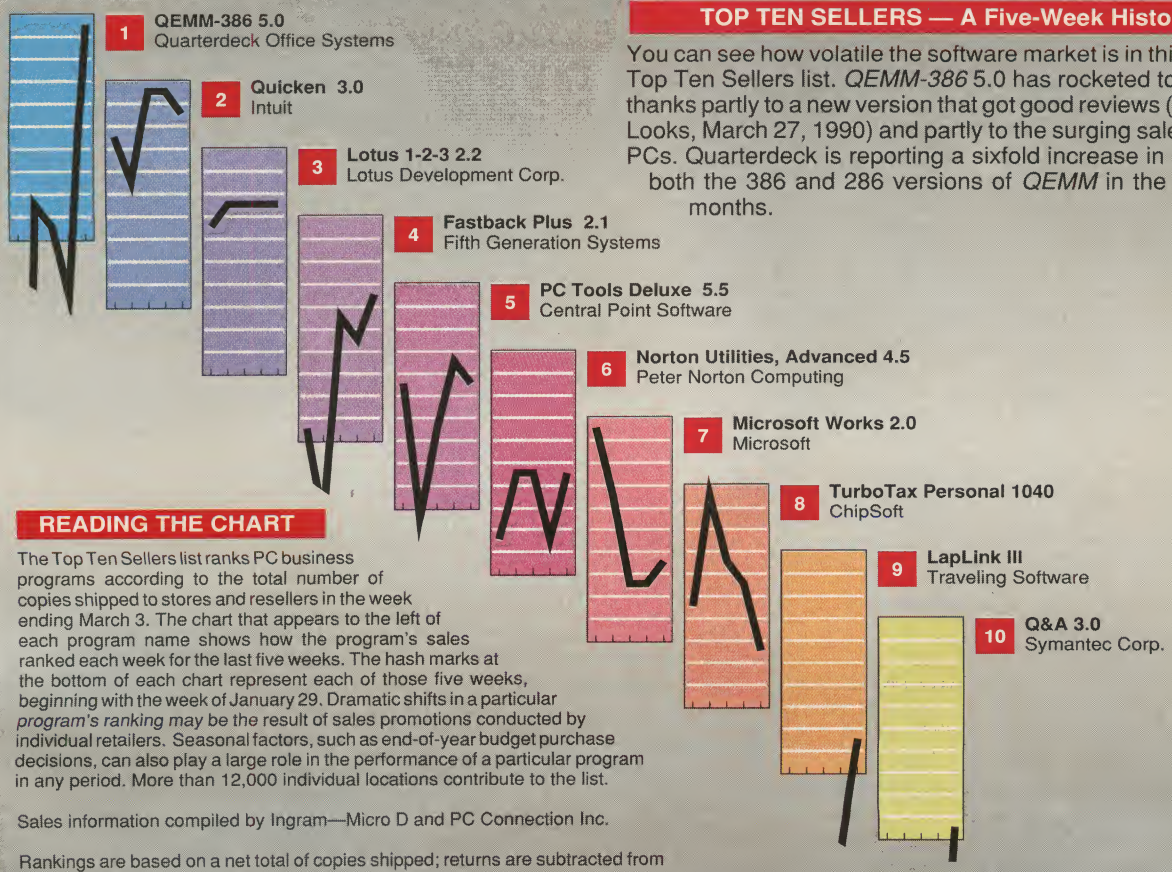


TOP TEN SELLERS — A Five-Week History

You can see how volatile the software market is in this week's Top Ten Sellers list. *QEMM-386* 5.0 has rocketed to the top, thanks partly to a new version that got good reviews (see First Looks, March 27, 1990) and partly to the surging sales of 386 PCs. Quarterdeck is reporting a sixfold increase in sales for both the 386 and 286 versions of *QEMM* in the last four months.

READING THE CHART

The Top Ten Sellers list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending March 3. The chart that appears to the left of each program name shows how the program's sales ranked each week for the last five weeks. The hash marks at the bottom of each chart represent each of those five weeks, beginning with the week of January 29. Dramatic shifts in a particular program's ranking may be the result of sales promotions conducted by individual retailers. Seasonal factors, such as end-of-year budget purchase decisions, can also play a large role in the performance of a particular program in any period. More than 12,000 individual locations contribute to the list.

Sales information compiled by Ingram—Micro D and PC Connection Inc.

Rankings are based on a net total of copies shipped; returns are subtracted from gross shipments.

Pipeline

CONTINUED FROM PAGE 63

will be running DVI hardware under OS/2 or *Windows*.

If you want to feel the impact of a multimedia PC today, you need look no farther than practical, unassuming Tandy. The sound chip built into its new 286 PC, the 2500 XL, enables it to run *Compton's MultiMedia Encyclopedia*—a CD-ROM containing the complete text of the 26-volume reference work including 15,000 photographs, plus a few extra treats.

The disk has over 60 minutes of sound recordings with historical events such as Martin L. King Jr.'s "I Have a Dream" speech, musical excerpts from Bach's Brandenburg Concertos, and samplings of bird calls.

Britannica Software of Chicago sells the *Encyclopedia* CD for $895, and the only special hardware you need on the VGA-equipped 2500 XL is an optional CD-ROM drive. It requires the *DeskMate* interface built into the PC's ROM, so you can't run it on any other PC.

It's becoming easier to see how multimedia presentations will revolutionize business meetings in the next few years. And it's only a matter of time before the right mix of hardware and software for the home makes the Nintendo system look like a Hula-Hoop.

ISDN Gets Tested in the Home

ISDN's slow, inexorable march across America has made its first foray into home-office computing.

IBM and U.S. West have set up a pilot project that connects a handful of private homes with host computers at the residents' offices using IBM's 7820 ISDN Terminal Adapter at both ends. The test will provide a 19,200-bit-per-second link at first, with plans to push the line up to a 64,000-bps connection.

Businesses are more likely candidates than homes for a digital phone connection that will provide faster data transfer rates and the ability to run several connections simultaneously (voice or data). A large office's centralized access to the phone system also makes the ISDN conversion more practical than large-scale residential rewiring.

To convert the bulk of the United States phone service to ISDN will mean equipment changes in the field, since repeaters and loading coils that enhance today's analog signals will need to be removed.

If you want to feel the impact of a multimedia PC today, you need look no farther than practical, unassuming Tandy.

E-Mail Bridges Under Study

The leading e-mail services are getting together on a plan to bridge the separate networks. This month a task force, which has been dubbed the Directory Services Consortium, is meeting to try and devise an interconnected directory that will be available from all of the participating networks. The group is comprised of representatives from AT&T, IBM, MCI, British Telecom/Tymnet, CNCP Canada, General Electric, Pacific Bell, Teleglobe, US Sprint, and Western Union.

The goal is to let a subscriber of any of the member networks communicate directly with members on other services. There are a few bridges already in place between some of these services, but they're cumbersome; most of the networks have no bridges at all.

New Tack for Wang

Wang's search for new markets is bringing it to the same channel that has launched a hundred entrepreneurs: mail order. The company that made word processing famous has started a new division in Taiwan to build a line of 286, 386SX, and 386 PCs with the name WLT Express PCs. Wang's innovative graphics tablet cum desktop environment *Freestyle* has been going nowhere since its introduction last year, and the company is undergoing a restructuring that is intended to make it a significant force in the personal computer market.

TrueType Claims Speed, PostScript Claims IBM

Heavy maneuvers took place in the battle to control PC font standards recently (see Pipeline, November 28, 1989).

Microsoft stepped up the timetable for delivery of its font technology in OS/2 to later this year and gave it a formal name, TrueType (it has gone by the code name "Royal" until now). Microsoft also promised to include TrueType in future versions of *Microsoft Windows* and said that it expected major software publishers to include the font manager in DOS character-based programs, too.

Microsoft is seeking to win over developers by providing results of its own testing that show TrueType to be far faster than PostScript. And Microsoft is trying to convince software developers that writing interfaces to the TrueType page description language will be easier and more efficient since TrueType's commands will be accessed from inside the operating system. It also maintains that despite Adobe's recent publication of "The PostScript specifications," programmers still cannot access PostScript's proprietary algorithm for font hinting.

Adobe, meanwhile, convinced IBM to build Display PostScript into the emerging family of graphical SAA interfaces, including AIX and OS/2 software. IBM also promised to support TrueType, but only on PS/2s.

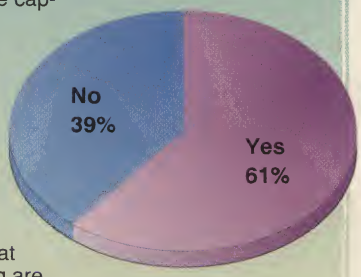
If you find this sorry state of affairs confusing, there's some consolation. Microsoft says that TrueType will have no problem printing out to PostScript printers. ■

SURVEY

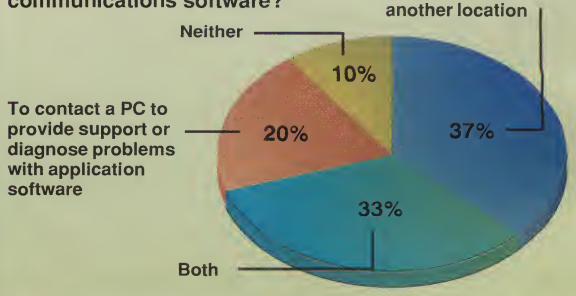
PC MAGNET

Is remote control software used at your organization?

Steady improvements in the capabilities of remote access communications programs have been rewarded with steady growth in their popularity. No longer are they used mainly to grab a few files off a distant system (most communications programs let you do that now). This survey of PC MagNet callers revealed that training and troubleshooting are now the main uses of the programs.



Which wording best describes your use of remote communications software?



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NEW ColorMAX 1280™
The High Performance Color Display
- 1280 x 1024 resolution
- 60 MHz TI 34010 coprocessor
- 256 colors out of 16.7 million
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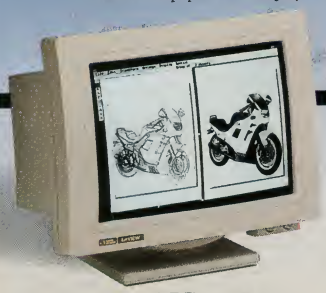

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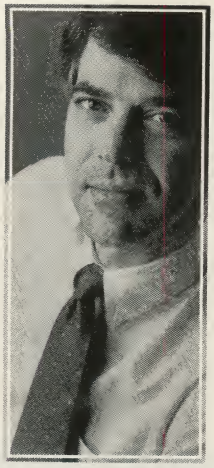
Bill Machrone



Laptop computers are everywhere. So is the confusion about how to categorize them.

I carry a notebook computer. So does a good friend of mine. Each of us regard the other's machine as totally unsuitable.

My computer is (as you are no doubt tired of hearing) a NEC UltraLite, and my friend is the proud owner of a Compaq LTE/286. We're at opposite ends of a continuum of machines that are all considered notebook portables. What they have in common is light weight (although we differ on whether the Compaq is actually light) and a form factor somewhere between a ream of copier paper and a full-size Day Timer. Where they differ is in style.

Compaq approaches the problem in its typically practical, levelheaded way. The result is a prosaic, rectilinear box with all the panache of the aforementioned ream of paper. NEC uses every stylist's trick to minimize the machine, which, of course, makes it irresistible to the eye. However, some of the minimization makes it quite resistible to users—its biggest stumbling block is the lack of a built-in hard disk drive. And this market has proven that it would rather wait for technology to catch up to its needs than to spend money on something that may not pan out.

On one hand, I'm impressed by the marketplace's faith in technology. On the other, I find it hard to believe that so many people who could materially benefit from a machine such as the UltraLite are so chickenhearted, simply because they must plug in a cable to move their files.

My friend travels with his LTE/286 and I travel with my UltraLite. When he's in the office, the LTE sits next to his desktop machine, and he uses the floppy disk drive to exchange files. When I'm in the office, my UltraLite sits next to my desktop machine and I connect them with *LapLink*. What's the difference? It's a couple of pounds of travel weight and an inch of briefcase space.

Compaq touts the LTE's 8.5- by 11-inch form factor—as if matching a piece of paper were somehow important. But it sounds good. So the machine has only one way to go: up. It's almost twice as thick as the UltraLite. What you can carry in your briefcase is limited by its thickness, since the other briefcase dimensions are relatively invariant.

GUILTY AS DISCHARGED

Another area of disagreement is battery life. My friend did consider the UltraLite—after all, he trusts many of my recommendations. "Heck," he said, "even *PC Magazine* claimed that the battery life stinks."

It's true. We did say it, but it ain't so. NEC allowed itself to get positioned by the press and, basically, did a terrible public relations job on the issue. First, NEC originally built the machine for nickel-cadmium batteries, which discharge quickly after a certain point. The warning light comes on just before the discharge and, for that reason, most battery rundown tests count up until that point. The UltraLite, however, was shipped with lithium batteries, which have a long, gradual discharge. I regularly use mine 35 or 40 minutes after the warning light is activated. Another 10 or 15 minutes will stop it cold, but I never take it that far.

NEC also changed the screen technology midway through the production run. The new

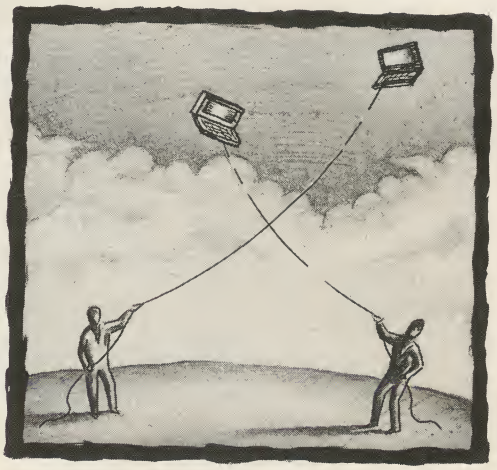


ILLUSTRATION: KURT RITTA

screen is so much brighter that you can use it on half-brightness under virtually all conditions. That, too, extends battery life. So I get about two and a half hours out of each battery pack.

My friend gloats as his Compaq chugs along for nearly three and a half hours. He can have it. His extra battery pack weighs about a third of my entire machine.

I maintain that the Compaq machines aren't even notebooks. For me, the essence of a

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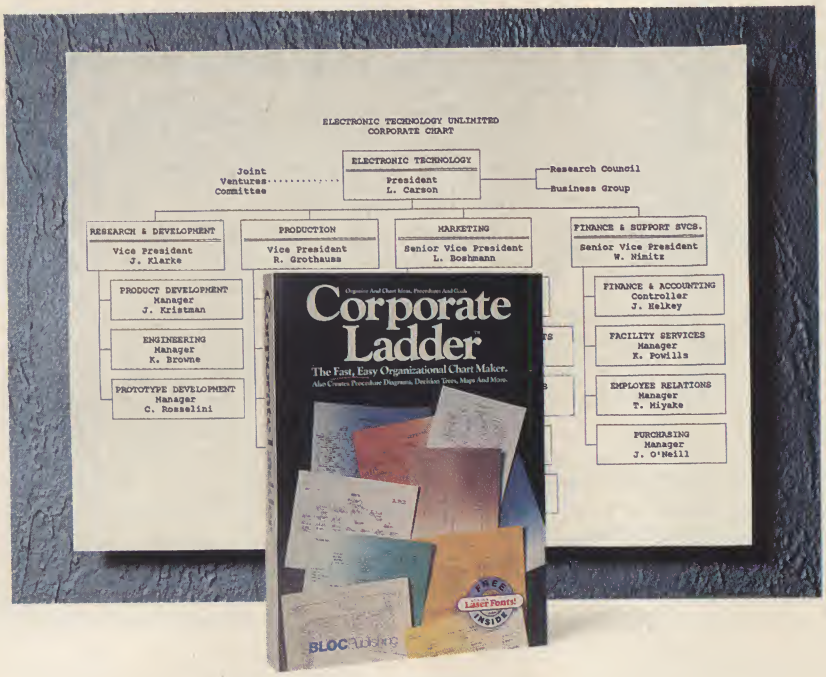

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Bill Machrone

notebook machine is that it functions like a, well, notebook. It has to be ready when you are. You flip the machine on, hit a key to bypass the memory test, and there's the DOS prompt. Total time: 2 or 3 seconds. When you flip on the LTE/286, it stolidly counts all 2.6MB of memory, with no way to bypass it. It resolutely checks the A: drive to see if you want to boot from there instead of the hard disk drive. It has to wait until the hard disk is up to speed. Total time: forget it. Any fleeting thought you might have wanted to record is history. Maybe Compaq's customers don't have inspirations. Or maybe they're satisfied jotting them on the back of business cards for batch updates to add to their personal information managers later.

We haven't seen the end of technological innovations in notebook computers.

Toshiba's new machines *even outdo* NEC in the "instantly on" department. You can shut one down in the middle of your favorite application and throw it into your briefcase. When you turn it on again, it picks up right where you left off. That's the state of the art, and a necessity for all new claimants to the notebook category.

Finally, there's the issue of the hard disk itself. My friend carries the *LTE/286* because he can carry all of his applications on it without shrinking or minimizing them. Not that he actually uses all the features in the overlay files, but it makes him feel good that they're there. I can't argue with that. Instead, I take issue with the ugly delays imposed by all laptops with hard disks. After the drive powers down, you have to wait for it to spin back up to speed before you can write to it. It's slower than a floppy disk drive.

The good news is that we haven't seen the end of technological innovations in notebook computers. There won't be one right answer for all users, but there'll be better answers for every user. ■

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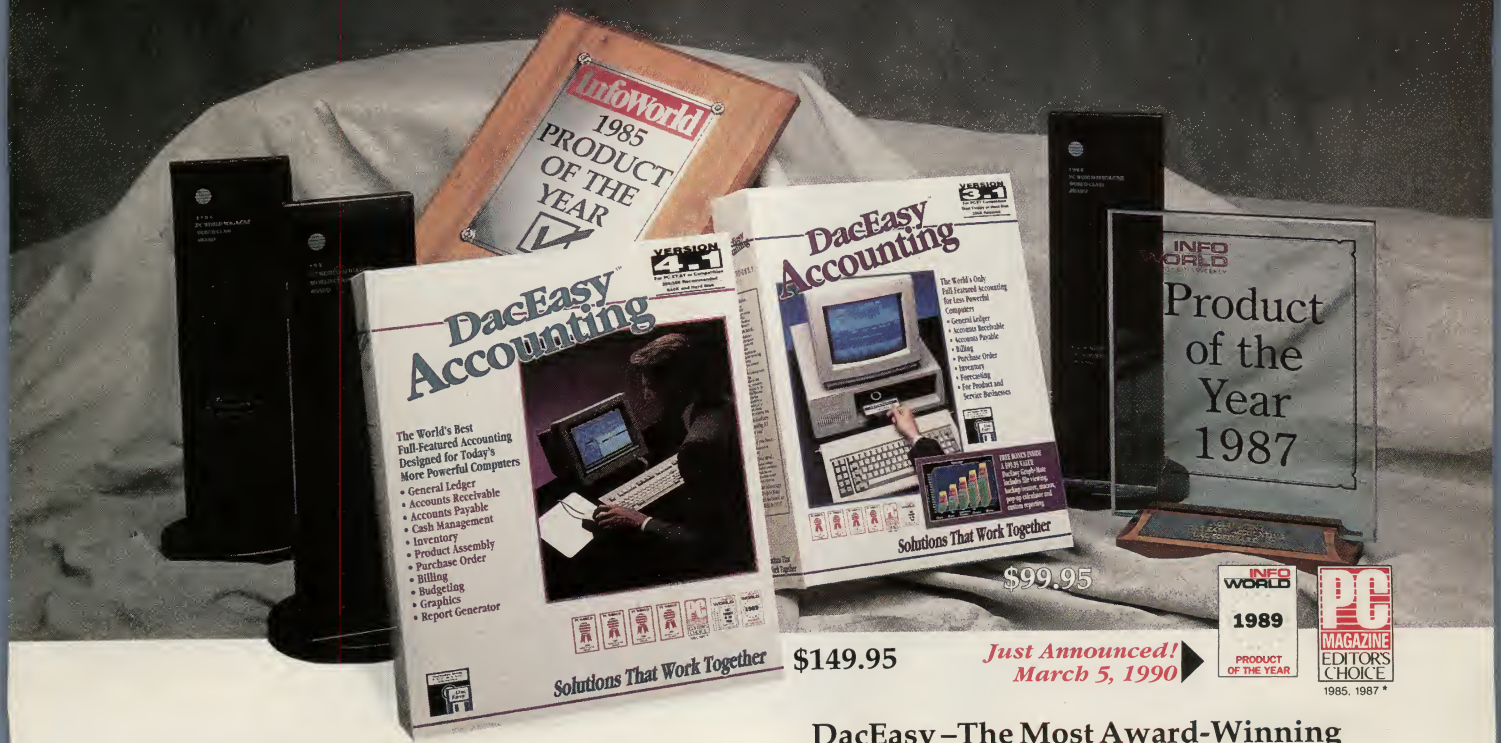

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Part of what makes microLaser a truly personal desktop laser printer that takes up so little room is its paper drawer, which slides *inside.* Because microLaser holds *250 sheets* standard (it holds 500 when you add an optional paper drawer), you spend less time refilling paper and more time creating superb-looking documents.

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John C. Dvorak

We may be about to enter a copy-protection nightmare. Now is the time to stop it.

Piracy 1990. Paranoia returns with a vengeance.

This means no backups. According to a new directive of the Council of European Communities, it will be an infringement of copyright to "make, import, possess or deal with articles intended to facilitate the removal or circumvention of any technical means which may have been applied to protect the program." This means that owning a copy of *Copy II PC*, for example, would be a violation. This means that owning a copy of an article in *PC Magazine* that tells you how to change a byte in some copy-protected software would be illegal.

Such a proposal typifies the stupidity that results when bureaucrats are cornered by vested interests. The folks behind this include the Software Publishing Association, the Business Software Association, and Apple. They've been soliciting support for this nonsense without mentioning the fact that the law they promote does not allow for making backup copies of software for personal use. The height of stupidity was reached in Britain, where a law was passed that forbids mere discussion of copy-protection bypass!

Obviously, the copy-protection fiends want to get international laws passed so that these laws can be cited as precedents and deviously incorporated into U.S. law. Ironically, publishers will be hurt most—users will simply refuse to buy their products because of copy protection.

Users do not trust disaster-prone copy-protected software. Every advance in technology is a new opportunity for it to stumble. Encumbered by copy protection, new BIOS revisions, floppy disk technology, disk optimizers, networks, caches, and even DOS upgrades are opportunities for your software to stop working—forever. Let's face it: copy protection doesn't work in the real world.

Copy protection is so counterproductive to marketing efforts that I'm always shocked when a company uses it. When *Paradox* was introduced years ago it was clearly the best database product on the market. But its publisher shackled it with a copy-protection scheme, giving everyone the shivers.

Paradox never got off the ground, and the company had to merge with Borland. Years passed before *Paradox* began to fly without copy protection, but it never did achieve the success it might have if it had not been copy protected in the first place.

So why is copy protection suddenly an issue again?

It's the proliferation of portable and laptop PCs. Few users buy a second copy of expensive software to run on their laptops. Instead, they download the needed programs from their desktop machines. Software packages are licensed for one CPU. Once they've been installed on your primary machine, that's where they're supposed to stay.

There has never been a provision in any software license agreement that allows for laptop use. But since the laptop is actually an extension of the desktop (despite its separate CPU), it should be given consideration in license agreements.

What about the poor user who has more than one laptop? Software companies that expect a single user to buy two, three, maybe

ILLUSTRATION: KURT RITTA

four copies of the same package are just plain greedy. They're living in a dream world if they expect popular support for such a notion.

Well, that is what they expect. Perhaps they should look back on Borland's visionary license agreement for *SideKick* that says, in essence, "Treat this package like a book. Only one person gets to use it at a time." So let's be fair about copy protection. It's time users protested this stupidity.

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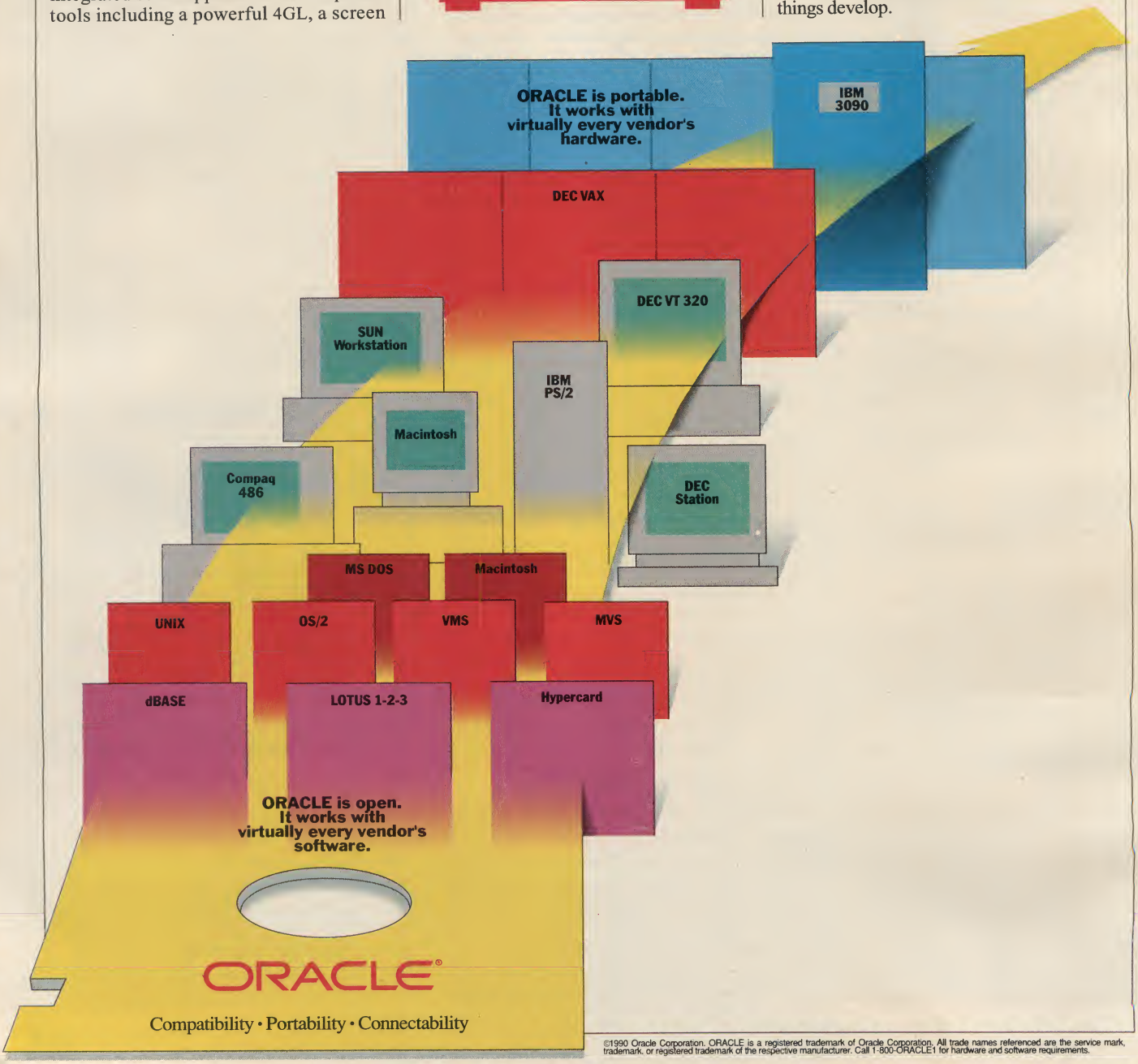

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John C.
Dvorak

Inside Track

Already Silicon Valley is talking about the 586. If you look at a 486 you discover that it's a 386 with a **hot cache,** a 387, and a little RISC thrown in for good measure. The 586 is supposed to be a 386, 387, with a newer, better cache, memory management unit, and a little RISC thrown in for good measure—a better 486 (which is a better 386 chip).

It looks like the next few generations of Intel CISC chips are just **better and better** 386 chips. Roger Ross (the inventor of the 88000 for Motorola and a RISC fanatic who now heads Ross Technologies and works with Cypress Semiconductor to produce a **killer SPARC** chip) admitted that the 486 is a phenomenal accomplishment, perhaps the **greatest CISC chip that will ever be.**

With that in mind I took the plunge and moved my workaday environment into a Silicon Valley Computer 25-MHz 486 Pylon I—and was **shocked** by the ease of transition. Because the 486 includes so much circuitry on-board the chip that the overall design requirements are less costly than those of a 25-MHz 386 and far cheaper than the **white elephant** 33-MHz 386 machines.

Right now the 486 is pricey. The chip alone costs $1,200 (if you can get it) compared with $400-500 **on the street** for the 386. But even with the pricey processor, Silicon Valley Computer is selling a 486 box without a hard disk for **under $4,000.** Call the company to find a source for this excellent machine. Silicon Valley Computer is in San Jose at (408) 453-8837.

I don't want to be the one that starts the **blood bath,** but for about the same price (or less!) than a 33-MHz 386 box you can get a 486 box.

Club American, from which you'll hear more, intends to ***lowball the world*** with a 486 box for even less than Silicon Valley Computer's. It won't be able to make them fast enough once people discover 486 performance. This may be the first time I've **violated Dvorak's** "wait a year for new technology" rule. Then again, this isn't new technology. It's the true upgrade to the 386 that we've been waiting for. I'm recommending that everyone who demands the best-performing DOS machines get a 486 as soon as possible. I suspect that numerous 486 bug reports and other scare tactics are designed only to keep the **386 cash cow** mooing. So now is the lull before a **storm** of 486 demand and consequent shortages. Once the 486 is popularized, Intel will never meet the demand for it. You won't regret this jump to light speed, believe me. **Do it!**

Now who says I'm an Intel basher?

Legal Dept.: While Silicon Valley Computer and others are working to push the performance envelope, NCR is sending **nasty** notes to everyone, threatening **legal action** over use of the word "tower" to describe the vertical PC configuration that's become so popular. NCR cites a trademark registration it obtained in 1983 that gives it the sole right to use that term. I recall seeing the first such configuration from DEC and remember seeing the word "tower" used to describe it prior to the NCR filing. I invite readers to show that this term is actually in the public domain. NCR, a company with tremendous engineering resources, should find **better ways to spend its time** than fighting 10,000 Taiwan clone-makers who have fallen in love with the term.

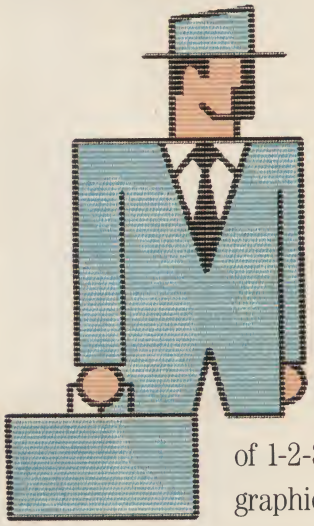
NCR cites a trademark registration that gives it the sole right to the term "tower." Taiwan, beware!

POWERstation Dept.: IBM avoided the use of the term "tower" when it rolled out its RISC-based line of Micro Channel workstations, dubbed RISC System/6000. Starting at $12,000, these little machines **outperform** nearly every workstation on the market by a **factor of 3**, without costing more cash. Some aspects of this machine were not covered well by the press, so what you heard about was only the **tip of the iceberg.** One issue is that a 386 emulator will run DOS at 20-MHz equivalent speed. Since I'm dubious about most emulator technology, I'm waiting to see this to believe it. The 6000 does have the horsepower, though, to do this.

As the details get distributed, we'll see that the 6000 was a bold move for IBM. While the company says it's as important as the introduction of the PC, it **misses the mark.** The PC with its cassette interface and BASIC in ROM was never taken seriously by IBM until it became a huge success. The 6000s are expected to be popular and are indeed a very big deal to the future of IBM in much the same way that the original 360 mainframe was. The obvious risk lies not in the chip but in the possibility that the 6000 will **impinge** on the sale of the high-margin heavy iron, which it obviously will do. There are tremendous price/performance advantages to these machines.

IBM figured that it had to do something because it was clear that RISC (a technology invented by IBM itself—the ROMP chip—developed for a "smart" typewriter) couldn't be stopped from encroaching upon the small mainframe world and, eventually, beyond. If someone was going to **steal business** away from the IBM mainframe, then it should be IBM itself. The pundits suggested that IBM's **inexperience** in selling to scientists and engineers—the initial marketing targets for these machines—would hinder sales. But, in fact, nobody sells to picky scientists and engineers. They make most of their buying decisions based on hard facts and won't need a lot of cajoling to jump on these systems. The IBM sales guys will look like **superstars** when the dust clears. ■

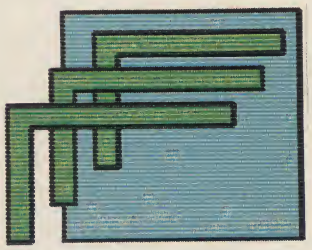
Introducing 1-2-3/G. The that doesn't have to



A dazzling screen is merely the beginning with new Lotus® 1-2-3/G.™

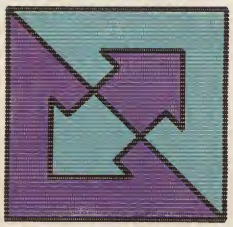
It's the only graphical spreadsheet that gives you the power and familiarity of 1-2-3.® Along with an advanced graphical interface that redefines the term "easy-to-use." Its impressive array of features will let you get your work done better, faster and easier. In ways that have *PC World* calling it "a new high in spreadsheet technology."

And if you're one of the ten million people who know how to use Lotus 1-2-3, you already know how to use 1-2-3/G. Because it works with the same keyboard commands you're using now. And your existing 1-2-3 data, macros and files are all compatible. Just retrieve them, and go to work.

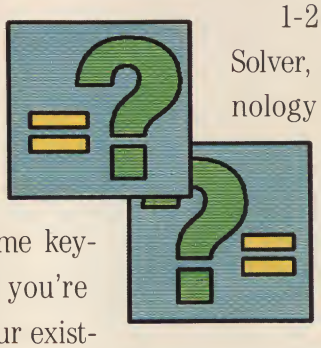


Once you do, you'll start working better almost immediately. To start with, 1-2-3/G gives you true 3D worksheets that make organization, navigation and formatting incredibly easy. And help you do complex analyses, so you can create models that more closely reflect the three-dimensional world you work in.

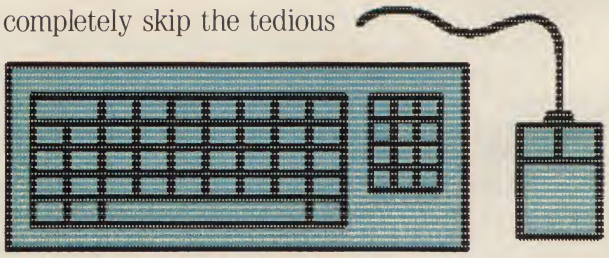
You can link your data across files. Making the integration of critical data from several files, even across networks, simpler than you've ever thought possible.



And 1-2-3/G can act as a powerful front-end to major databases. Because it lets you access data directly from outside sources without ever leaving your spreadsheet, to help increase your productivity.



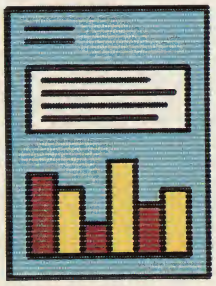
1-2-3/G also introduces you to Solver, an advanced goal-seeking technology that gives you an amazingly quick way to solve complex "what if" problems that have multiple variables. You define the parameters, and Solver will show you "how to" achieve the result you want. It presents you with a number of alternative solutions, even pointing out the best one. So, for example, you can find the right sales mix to optimize your profit margins, and completely skip the tedious



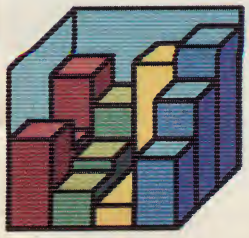
first graphical spreadsheet get by on looks alone.

trial and error process you'd normally go through.

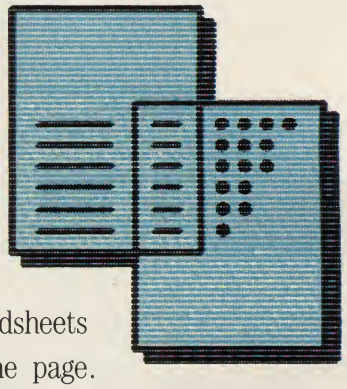
There's never been a graphical user interface as easy to use as the one you'll find in 1-2-3/G. It gives you the flexibility of working with the keyboard, the mouse, or both. Which makes the path from character-based computing to graphical computing a smooth one. While giving you the freedom to work in the way that's most comfortable and efficient for you.

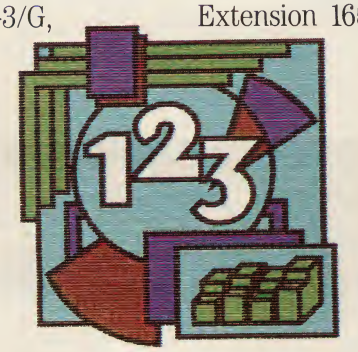


You can create collections that let you work with a number of ranges, simultaneously, as easily as you now work with a single range. Saving you both time and repetitive steps. And with unique palettes and previews in dialog boxes, 1-2-3/G goes beyond what-you-see-is-what-you-get. It gives you an upfront what-you-see-*before*-you-get-it look at options before you execute them.



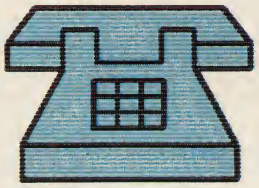
With Lotus 1-2-3/G, you'll be able to create more dramatic, more attention-getting graphs that communicate your information better. With the ability to move elements directly on the screen, customization is incredibly easy. And it's simple to get the graph you want, even 3D bar charts and mixed chart types, by choosing from the graph gallery's selection. For persuasive, presentation-quality reports, 1-2-3/G also lets you combine spreadsheets and graphs on the same page.





And because 1-2-3/G was specifically designed for OS/2,® it takes full advantage of that platform's speed, large memory and multi-tasking abilities. Along with its application integration ability, that lets you share data between Lotus 1-2-3/G and other OS/2 programs. So, all together, you'll be sure to get the most from your OS/2 investment.

But the best way to understand what 1-2-3/G can do is to experience it for yourself. Just call **1-800-TRADE UP,** Extension 165, and we'll send you a free auto-demo.* Or, if you're already convinced, ask for the Upgrade Order Pack instead. And start using the graphical spreadsheet that has a lot more going for it than just a pretty screen.



New Lotus 1-2-3/G

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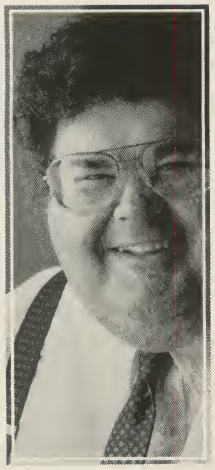

Modems, desktop laser printers, and the PC itself sounded pretty futuristic not so long ago. Why not a combination laser printer, scanner, and fax machine?

People in this business are always looking for the next hot software product: project managers, network e-mail, outliners, and so on. I want to go the other way for a minute: let's take a stab at the next hot hardware product.

My bet: scanners.

No, I don't think we'll have one sitting next to every PC. I said hot, not ubiquitous. But very, very hot, over the next decade. Until they become nearly commonplace, nearly as unremarkable—OK, nearly as ubiquitous—as modems are today.

In part, that's because I'm convinced business documents are increasingly going to include graphics components. I'm not talking about do-it-yourself letterheads with scanned-in logos, or letters to Mom decorated with pictures of little bunnies.

Rather, I think we're going to see a lot more businesspeople folding photos, sketches, diagrams, maps, and so on, into correspondence and reports. That's going to be a major part of the transition to the complex, multidimensional "smart document" many of us have been talking about for years. Voice annotation will be a part of the smart-document universe, too, but that will come later. For now, just let me stick a picture and a drawing in, thanks.

Which is just what the new generation of word processing programs are doing. Not only the heavyweight text-plus-graphics champ, *Microsoft Word for Windows,* and its challengers from the *Ami* camp, but also *WordPerfect, MultiMate, Microsoft Word* 5.0, and many more leading WP packages already make it fairly easy to fold a graphics image into the text of a report or proposal.

Most of the advertising for these products seems to assume that we'll sit around creating nice CAD-system sketches on our computers, or whizzy artwork from *PC Paintbrush*, *Corel Draw!,* or another graphics program, to fold into these documents.

Maybe, but I doubt it.

I think most of us will still draw diagrams on the backs of envelopes, rip ads out of airline magazines, clip cartoons from the morning paper—and then want some easy way to stick all these diverse things into our documents.

ENTER THE SCANNER

Scanned TIFF (and sometimes .EPS) files are so easy to drop into documents created with the kind of word processors most of us use today that once you try it, you get hooked.

At the high end, there are much more intricate answers, such as The Wang Freestyle System. But as impressive as Freestyle's expanded and annotated documents can be, they go way beyond what most of us want today—or will want for the next few years.

Hold on a second. Just let me scan this conference-room setup I drew a minute ago, and this Polaroid of the hotel, for that letter about our conference in Tucson. OK, all done.

It's about that easy.

One way I'm convinced scanners *won't* move onto our desks is in the form of hand scanners. I've worked with virtually all of the currently available hand scanners; on the surface, all work well enough. I think that Logitech's ScanMan (PC and Mac) and ThunderWare's

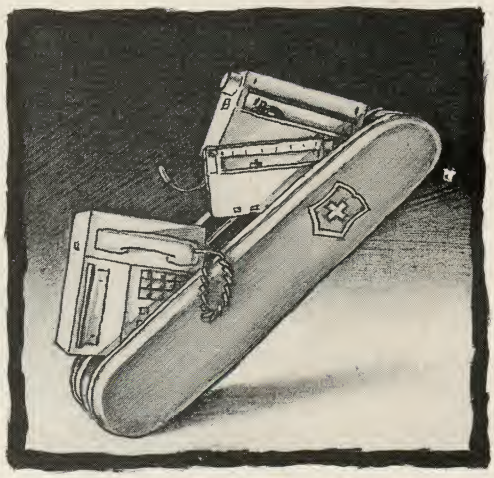

ILLUSTRATION: KURT RITTA

LightningScan (Mac only) are the best of the breed, but many of the others are OK, too.

Until you start to *use* them.

Some of the limitations are obvious. Scanning images wider than the head on a hand scanner is impossible. Don't believe those claims that it's easy to scan adjacent sections, then reassemble them on-screen: you'll go crazy.

Scanning narrower sections—logos, photos, signatures—is also an exercise in frustration:

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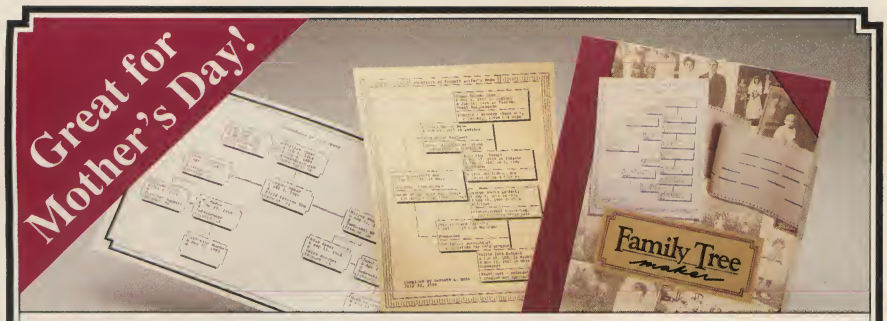

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CIRCLE 351 ON READER SERVICE CARD

Jim Seymour

No matter how steady you think your hand is, it's going to waver just enough during the scan to produce a distorted result. Not so distorted as to be grotesque—just unusable.

Flat-bed desktop scanners are the answer. I use both a Hewlett-Packard ScanJet and a Xerox/Datacopy 630. Both are superb, but HP has the critical edge: great software. The Complete PC's desktop unit is very good, too.

I know, finding the desktop real estate for them is a problem. DEST's scanners had a good if poorly executed idea: they sat atop your PC, beneath the monitor. A thinner version would work better.

But the way I think scanners will sneak into desktop computing for most of us will be as part of a new three-way tool: the compact combination laser printer, scanner, and fax machine.

It wouldn't cost much to put a 300- by 300-dot-per-inch scanner into an HP LaserJet Series IIP. And vendors are already working on controllers to let lasers in that range serve as fax machines.

WORKING IN UNISON

A tremendous synergy exists among those three components. Fax machines, after all, are simply scanners tied to printers. Use a fax machine, any fax machine, long enough and you'll long for a plain-paper printing mechanism—like a laser printer.

Once you've combined the scanning mechanism with that laser printing engine, and the fax card controller and telephone connections, it's an obvious—and easy—leap to let users access the scanning mechanism separately.

Bingo: a convenient *three-function,* no-compromises peripheral—for under $2,000 list, under $1,500 on the street. You could build that machine today.

Actually, you'd be happier if you waited a few months. Adobe and others are working on controllers for laser printers that let them send and receive PostScript-code faxes. For documents that originate wholly within your PC, you'll just tell the gizmo whether to print the page locally or at some distant fax machine, then send it the file.

I know, it all sounds pretty *futuristic.* But so did modems, desktop lasers, and the PC itself, not so long ago. Don't bet against it. ■

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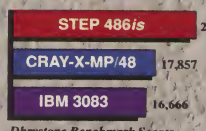

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William F. Zachmann

PR firms and vendors know that sending prerelease products to press members is a powerful way of influencing the influencers. But is there *more to this* practice than pure manipulation?

Thanks in large part to Regis McKenna, founder of the high-technology public relations firm that bears his name, ''influencing the infrastructure''—key analysts, consultants, leading-edge users, and influential members of the press—has become standard practice in the computer industry. Not all PR firms and hardware or software vendors go about this in exactly the same way, but nearly all attempt to do so in one way or another.

Many PR practitioners consistently display extraordinary common sense and sensitivity, and adhere to high ethical standards. They realize that the best way to serve their clients is by counseling them first to be sure they really have a worthwhile product and market strategy. With that established, the PR people are then able to use the existing industry infrastructure as a channel to tell their clients' stories effectively.

As is the way of people, there are always some who cut corners and try to influence the infrastructure in less desirable ways. And, as is the way of the world, sometimes even benign efforts can have their darker aspects.

''Beta'' or ''prerelease'' versions of hardware and software products, and the nondisclosure agreements that inevitably accompany them, are an example. While there is nothing inherently wrong with distributing beta releases, there is a potential for abuse that is not generally recognized.

Let's be clear from the start that there are plenty of valid reasons why companies may choose to make prerelease copies of software or hardware products available under nondisclosure agreements prior to their announcement and general availability.

First, beta releases can be a valid way to work out the bugs in products before they are shipped to users. Beta testers who really work with a product can provide vendors with valuable feedback on problems that can consequently be solved prior to formal release.

INTERESTED THIRD PARTIES

Second, particularly with hardware products and with software tools, utilities, and operating systems that affect the development of other software, beta releases provide an important and necessary means of enabling third parties to work on developing related products. Without beta releases, delays in third-party development could cripple acceptance of the underlying product and delay benefits to users.

Third, since many publications have long lead times for production and distribution, beta copies and nondisclosure agreements provide a way of making information about products available on a timely basis. The timing of nondisclosure agreements enables magazines with long lead times to cover products concurrently with their introduction.

Finally, sending out beta releases of products can help vendors inform the infrastructure about their products. As the old saying goes, ''one who tastes, knows.'' Giving key corporate customers, analysts, consultants, and members of the press a taste of things to come can be an important way of enabling them to form their own opinions of a product.

So, what's the dark side? In the first place,

ILLUSTRATION: KURT RITTA

seeking to inform can sometimes be hard to distinguish from an undue effort to influence. Since prior knowledge of industry trends can be a useful asset to those of us who are part of the infrastructure, giving or refusing access to beta versions of products can be a subtle means of influence.

The temptation is always there for vendors to provide beta versions of products to those who are likely to be well disposed toward them

and to withhold them from those who are not. Since access to beta versions can be an advantage, there can be subtle pressure to say nice things about a product or face exclusion from access to beta releases in the future.

Yet another downside to beta releases is in their use as a means of leaking information. While nearly all beta releases are provided under nondisclosure agreements, those agreements are often violated in practice. Vendors and the PR folks who advise them obviously know that.

The result is something like the official leak in Washington, D.C.—companies send out beta products knowing full well that information about them will be leaked. Since we all love to know secrets that others don't know, leaky beta releases can be used deliberately to stimulate interest in a product just prior to its formal introduction.

That creates the potential for more seriously abusive manipulation. Vendors can look the other way on nondisclosure violations that generate *favorable* publicity while threatening those who participate in *less* favorable violations with legal action.

Vendors and the PR firms that advise them ought not to abuse beta releases of products. A good step in the right direction would be for them simply to stop requiring nondisclosure agreements on beta releases provided to the infrastructure—except insofar as those are specific to publication lead times.

WHAT'S THE REAL POINT?

There is no reason a vendor cannot honestly and publicly say that such and such a list of users, analysts, consultants, and members of the press have been provided with prerelease copies of a product for early evaluation. *If the vendor really* wants to ensure that informed opinion about the product is readily available, there is no reason nondisclosure agreements should be necessary.

On the other hand, if the purpose of beta releases is *not* to influence the infrastructure, and the signing of nondisclosure agreements is genuinely required, say, to prevent competitors from learning product details, then vendors should not provide beta copies to the infrastructure at all. Instead, they should restrict distribution to their business partners or customers under strictly enforced nondisclosure conditions.

By so doing, vendors would squarely face the inherent contradiction between honestly disseminating product information and binding those who provide a channel for the dissemination with nondisclosure agreements (except as strictly related to the timing of publications). Straddling that contradiction does not very well serve the truth, and it opens the door to abuse.

For my part, as a sometime member of the infrastructure, recent experiences have convinced me that the best course is simply to *refuse* to accept prerelease products under formal nondisclosure agreements. I would rather learn about the details of a product with everyone else than gain inside information at the expense of my liberty to speak freely about it. ■

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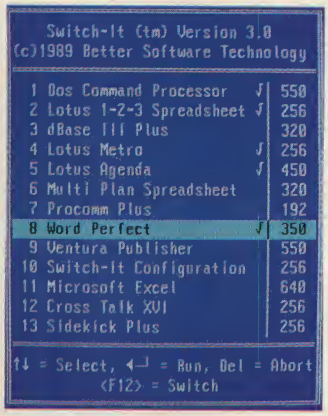

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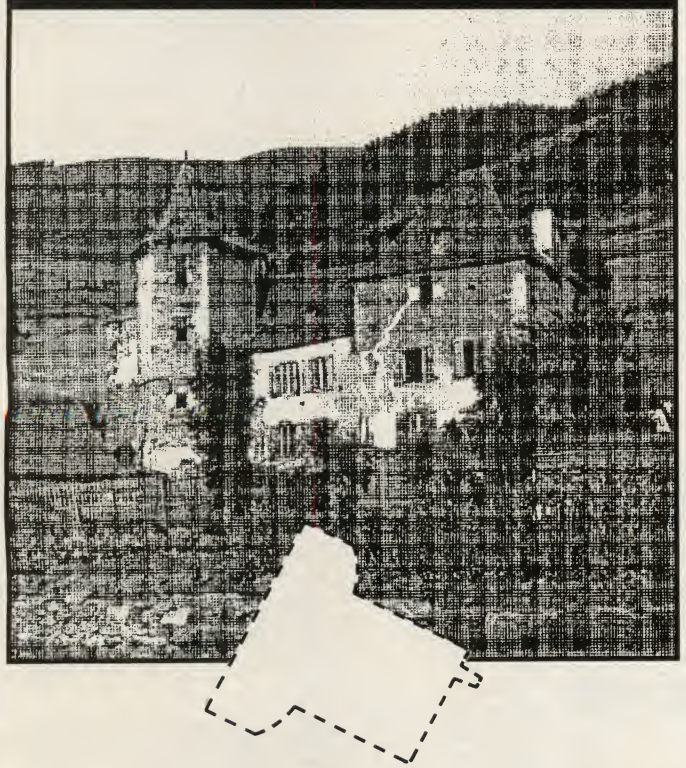

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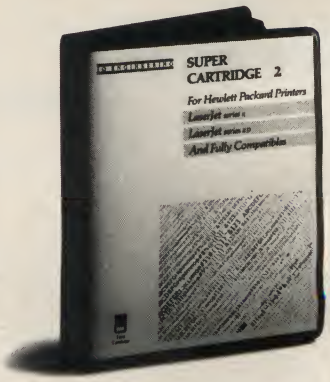

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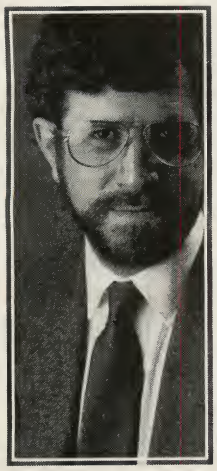
CIRCLE 325 ON READER SERVICE CARD

Stephen Manes



A recent breakthrough in telecommunications technology may be the latest wrinkle in computer service. Just dial 900-SUPPORT.

Welcome to the Stephen Manes Column Technical Support Hot Line. A technician will be with you shortly. The initial 60 seconds of your call, including this message, are entirely free. The following minute will cost a mere fifteen dollars. Each additional minute will be one dollar and fifty cents.

This fee includes the cost of your long-distance call; it will be billed to your phone, and there's no way you can get out of paying it even if we don't help you one bit. But this is your boss's money, so what do you care, as long as you can prove you weren't calling 900-SEXPOTS? One moment, please....

Well, why not? Major-league sluggers use it to broadcast tips on driving baseballs and cars. TV networks use it to collect the wisdom of America on a declaration of the rights of mink. Sleazeball merchandisers use it to hawk credit cards for which you can qualify even if your debt resembles Mexico's. Audio pornographers use it to suggest you come up and see them sometime.

Yet the computer industry, usually so quick to embrace new technology, has lagged badly in its use of this burgeoning communications technique, and even now, only a handful of bold firms have dared to try it. I refer, of course, to the 900 number.

Right: 900, the area code from hell, the one you've deprogrammed from your phone system to keep the hired hands from taking SportSpread bookie breaks. 900, the three digits that give the lie to the phrase "talk is cheap;" the prefix that makes regular long distance look like a fire sale.

But where others see ripoff, phone companies see opportunity. These are the guys who, in monopoly days, charged a dollar a month in perpetuity for an extension cord that cost a buck and a half at Radio Shack. Nowadays, sniffing a bonanza, they've been lobbying hardware and software firms to set up 900-number support lines. At least a few have been persuaded to join the 900 club.

A POLITE FICTION

But by no means all. The laissez-faire school, pioneered by IBM and imitated by Compaq, prefers the unlisted number and another tack entirely: Leave it to Dealer. This school, also known as the College of the Emperor's Apparel, promulgates the legend that the grant of an authorized dealership magically bestows knowledge, time, and savoir faire upon the dealer. The charm of this polite fiction, however, is often lost on those who require an answer about some arcane hardware or software anomaly, only to discover that their original dealer is busy applying for one of those anyone-can-get-it credit cards, the other authorized dealers in town have developed acute tinnitus that's badly exacerbated by the arrival of machines purchased elsewhere, and entreaties to higher authority are returned unopened.

At the other end—the high end—of the spectrum is the school that believes supporting users is in the vendor's interest and therefore is one of the corporate controller's least favorite animals: a "cost of doing business." Hardware vendors Northgate and Zeos, for example, tout 365-day, 24-hour, toll-free technical support

ILLUSTRATION: KURT RITTA

lines. WordPerfect, which has long offered toll-free support during business hours, almost begs you to use it: the toll-free support numbers pop up on the screen every time you press the help key.

Toll-free help doesn't come cheap. WordPerfect says it spends about a million dollars a month just for tech support phone expenses and salaries. But the company believes that picking up the tab for an average of more

than 12,000 calls a day, 8 minutes each, generates enough customer satisfaction to make the expense worthwhile.

Between these two poles lies a world of support schemes. Many companies offer free support provided you pick up the cost of the phone call—often a long-distance call featuring a long-duration hold. Some want to hear the color of your Visa card before offering aid. Others set up tiered service policies with priority numbers for those who pay in advance. Many provide in-house and CompuServe bulletin boards. The 900 number is simply the latest wrinkle in the concept of cough-up succor.

Companies that charge for support can and do make a case for the policy. They say 10 to 20 percent of support calls are frivolous or unrelated to the product—dopes who don't understand how to close the disk drive or copy a file or manage the network. Besides, most users somehow get things running without ever picking up the phone; why should they subsidize dim bulbs who refuse to pick up the manual or power junkies who push a program beyond its usual limits?

900-number service, these vendors claim, will help keep prices down and support lines unclogged. Which sounds sort of reasonable, except when you remember all the time you've wasted fighting with goofy products and brain-damaged manuals.

And ultimately there's something tacky about 900 numbers. If you're charged for each minute, you won't want to be put on hold for even a second—but if there's no hold queue, you may have to redial endlessly. If you're charged on a per-call basis and get stuck in an endless hold, you forfeit the cost of the call if you decide you've got better things to do.

With a credit card, you can dispute a charge. But, when the bill's linked to the threat of a disconnected phone, your leverage decreases drastically. And partly because the phone company rakes off its own substantial chunk of the fee, there's no way (short of offering some sort of discount coupon) to undo a charge or prevent it from appearing on a disgruntled caller's bill.

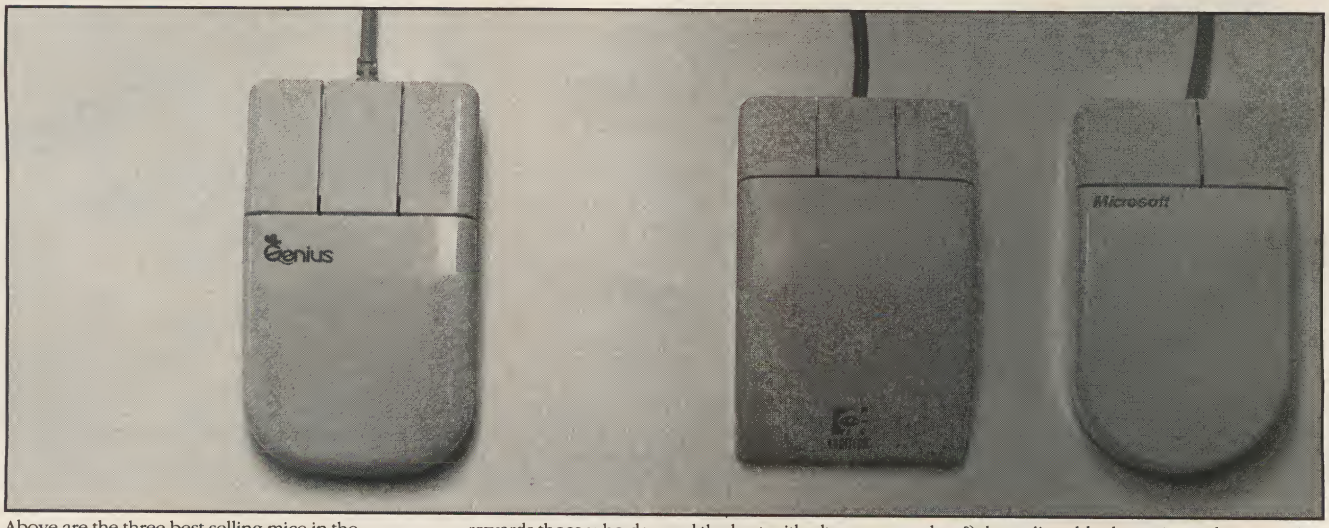
SHARP TEETH, BIG PROFITS

Worst of all may be the "opportunity" that 900 numbers offer the school of sharks, which believes support should become a profit center like your car dealer's repair shop—common practice in the mini and mainframe worlds, where machines are big, complex, and more or less monopolistic, and nobody expects them to work right without lots of help.

Cutthroat competition in the microcomputer industry helped change all that—for a while. But now, as our simple little computers take over the jobs of big complicated ones, support personnel actually gather at conferences to trade information about profit-oriented support. I'll bet seminars like "Hypertext: Your Biggest Ally in Making On-Line Help Help Less," "Slim Down That Manual! The Creative Omission of Essential Information," and "It's the Other Guy: How to Shift the Blame" draw big crowds.

So maybe the hottest new business in this industry won't be a hardware or a software company. Maybe it'll be a third-party outfit that can make everything work with everything else. Call it 900-SUPPORT. But don't call it cheap. ■

IT'S US VERSUS THEM



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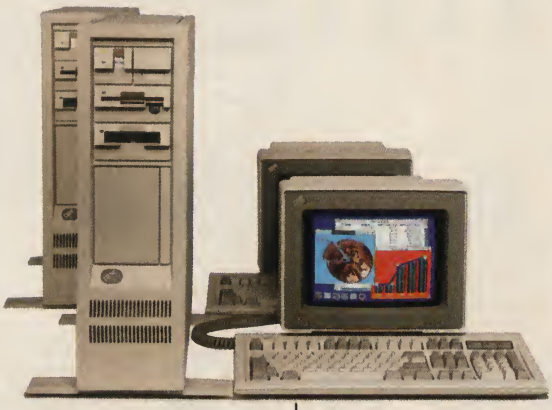

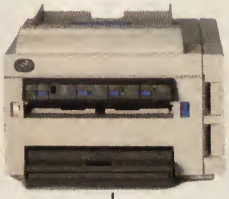

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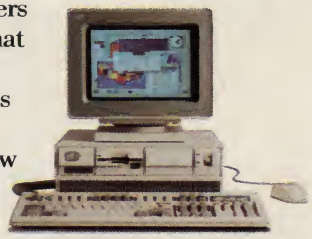
But more important, we've made these changes in our family so that one thing could stay the same: the IBM PS/2 family of personal computers is one that delivers solutions today, tomorrow and beyond.



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radius™

Monitors With More

Super VGA monitors offer the best solution for today's mainstream business applications. We've rounded up 24 color monitors that give you gorgeous VGA and Super VGA graphics.

by Winn L. Rosch

Sharper than MTV and less likely to make you feel the pangs of premature aging—in that alone the VGA display system has a lot to recommend it. But a VGA monitor can give you much more. Today's most popular display standard provides sharp graphics with 640 by 480 resolution, a palette of colors that puts a rainbow to shame—262,144 possibilities, to be exact—and fast screen updates (thanks to the advent of high-speed 16-bit graphics adapters).

PHOTOGRAPHY: WALTER CHRYNWSKI COMPUTE

What more could you want?

Just . . . more. More resolution. More versatility. More of everything. And less, too, at least when it comes to price. The current crop of VGA monitors gives you exactly that. They don't stop with 640 by 480 resolution but race ahead to 800 by 600, offering even sharper Super VGA images. They give you more versatility, too; many of these monitors can adapt to any IBM video standard and graphics adapter. Some will even accommodate Apple II and Macintosh computers. And they do it for less. Prices have never been better: as low as $495 list price (and an even lower street price) for the Mitsuba 710VH.

You can do even better than Super VGA, of course. If your applications, such as CAD and desktop publishing, demand even higher resolution and justify higher prices, check out the 1,024 by 768 noninterlaced monitors we reviewed in the April 10, 1990 issue of *PC Magazine*. But for mainstream applications—even those in graphical environments—Super VGA is an excellent choice.

MONITORS IN CAPTIVITY

Buy a new PC, and odds are you'll need a VGA monitor to match its video output. And if the computer you choose is a major brand, someone may try to make up your mind for you. All the big computer companies (such as IBM and Compaq) offer their own VGA displays. Buy one of those systems and you'll get what the manufacturer thinks you need. These "captive" monitors are painless to set up, a perfect match for the capabilities of the computer they come with, and only moderately overpriced. Since they're good enough, you might not even consider anything else.

But you have plenty of good reasons to examine a third-party alternative. The captive brands don't necessarily give the best pictures. And they're limited in abilities and versatility.

Most captive monitors work only with VGA signals. That's fine if you're easily satisfied and don't think display technology will improve soon. But the VGA-only design means you can't use a captive monitor for something else when the need arises (like plugging it into your old PC).

With an aftermarket VGA display, you can buy one monitor and reasonably expect it to work with any computer and graphics adapter that you have, from CGA to VGA. (All VGA monitors automatically work with the Memory Controller Gate Array [MCGA] standard used by low-end PS/2 computers.) If you've got only one computer, downward compatibility may not be much of an issue. But if you're charged with overseeing a flock of PCs, that versatility can eliminate the need to pry open each computer to see what kind of graphics adapter it contains whenever you want to plug in a monitor.

In addition, captive monitors limit you to a modest screen size. IBM gives you only two size choices for VGA screens: 12 or 14 inches; Compaq limits you to 14 inches. Worse yet, these captive monitors minimize on controls, limiting your ability to adjust the image. Typically, they let you make only two types of adjustments: brightness and contrast. You can forget about making the image bigger, getting the most picture out of a given tube size, or shrinking it down to get away from the quality vagaries in the far corners of the screen.

With dozens of third-party alternatives, you're not stuck with the system manufacturer's choice of monitor.

Fortunately, you're not stuck with the system manufacturer's choice. There are literally dozens of third-party alternatives: we rounded up 24 for this review. To be considered for this roundup, a monitor had to support both color VGA and Super VGA, and it had to work with a Paradise VGA 1024 Card graphics adapter. As always, a working unit had to arrive in time for testing. Monitors that support VGA but not Super VGA—such as units from Compaq, IBM, and Zenith—were excluded from this review.

PICK A FREQUENCY

All VGA monitors are divided into general classes depending on the way they react to the synchronizing signals generated by your PC's VGA circuitry. These signals are used by the monitor to lock the screen image in place so that it doesn't roll like a 1950s television on the fritz.

Fixed-frequency monitors, like the IBM and Compaq captive displays, are designed to lock onto a very narrow frequency range. These monitors demand that the signals from your VGA adapter be very close to its nominal value—31.5 kHz for horizontal sync signals and both 60 and 70 Hz for vertical sync signals.

Multiple-frequency (or multiple-fixed-frequency) monitors are designed to operate at two or more discrete frequency settings, each of which has a narrow band of acceptance like that of a fixed-frequency display. The best known of these monitors is IBM's 8514, a 16-inch monitor that accepts horizontal sync frequencies of either 31.5 (for MCGA and VGA signals) and 35.5 kHz (for IBM's proprietary 1,024 by 768 interlaced graphics standard). This horizontal frequency is also one of the standards proposed by the Video Electronics Standards Association (VESA) for 800 by 600 images. An alternate VESA proposal requires 60-Hz vertical and 37.8-kHz horizontal frequencies. Once the VESA operating frequencies are decided (a vote on these frequencies should have taken place by the time you read this), other manufacturers are expected to offer multiple-frequency monitors conforming to the new standard.

Variable-frequency (or multiscanning) monitors are simply more tolerant. They are able to adjust their circuits to handle sync signals over quite a wide range. For example, the Sony CPD-1302 accepts horizontal sync from 15 to 35.5 kHz and vertical sync from 50 to 100 Hz. Because of this wide-ranging frequency tolerance, multiscanning monitors can work under a variety of display standards.

VARIABLE VGA

Frequency is not the only variable faced by a VGA monitor. Within the confines of VGA synchronizing frequencies, IBM created three separate standards, each differing in the number of lines that make up the image. The basic VGA graphics mode makes images 480 lines high. In text mode and the VGA's double-scan CGA-compatible mode, images are built of 400 lines. EGA graphics on VGA monitors are drawn with 350 lines.

All else being equal, the greater the number of lines, the taller the image will be. If a VGA monitor doesn't have provisions for adjusting to the three different line counts, some images will be as short

and squashed as Roseanne Barr bulked up on steroids, or stretched out like Kareem Abdul-Jabbar on a torture rack.

To avoid such endomorphic and ectomorphic graphics, IBM added an autosizing system to the VGA standard. A VGA graphics adapter indicates the number of lines in an image by coding the polarity of its synchronizing signals. A truly VGA-compatible monitor detects the polarities of the two synchronizing signals and adjusts its internal electronics to maintain a constant height across all three VGA standards.

While this method works well for VGA signals, it doesn't help with Super VGA or other advanced non-IBM signals. No additional codings of sync signals are available, even if the industry decides on an acceptable standard. (The fourth possible sync signal coding is used by IBM to indicate interlaced 8514/A signals with 768 lines.) Consequently, monitor makers must develop some other autosizing method, stick with the VGA standard and only autosize for three image types, or just let the image vary with the signal standard. Various manufacturers have followed all of these approaches.

The best method is, of course, to autosize the on-screen image to match any standard; the worst, no autosizing at all. But even the latter case does not make a monitor impossible to use. If the monitor maker puts the image size controls where you can readily reach them, then you can manually adjust the picture.

If you often jump between operating modes, such as text and graphics, or leap back to EGA graphics, this method will be tedious and time consuming. But if you stick with a single standard, like running all your programs through a graphical operating environment such as *Microsoft Windows*, you'll just need to make the adjustment only once.

A CONTROL ISSUE

Some manufacturers make these important controls hard to adjust. Put the controls on the rear of a big-screen monitor and you'll need gorilla arms to make an adjustment while watching to see its effect. Other monitor makers don't bother making these controls accessible at all. They're locked inside the case, which inevitably bears a warning that there are no user-serviceable parts inside and you'll die if you try opening it.

Sometimes this simplification works out—when the manufacturer's eye and yours agree on what the proper image size and shape should be. If you disagree, you're condemned to suffer with a picture from purgatory for the duration of your ownership of the monitor. Look for a monitor that gives you ready access to its size and positioning controls.

Some manufacturers, notably NEC, have brought an innovative approach to size and positioning controls, using digital push buttons instead of conventional analog knobs or shafts. Pressing one button makes the image larger; another makes it smaller. Check the features table in order to find out whether the controls are digital or analog.

NEC's "D" monitors, such as the MultiSync 3D reviewed in this issue, can memorize the settings you make for each frequency range they operate in. So, as you shift between video standards, the monitor adjusts the image to your own personal degree of perfection. On the other hand, you may feel that digital monitor controls are like the programming buttons on a VCR: a counterintuitive riddle that's unsolvable by mortal minds, at least those more than ten years old.

DOWNWARD COMPATIBILITY

A wide frequency range for synchronizing signals is, by itself, insufficient to guarantee that a given multiscanning VGA display will work with earlier display standards. The older IBM display standards, MDA, CGA, and EGA, all used digital

EDITOR'S CHOICE

- **MAG Computronic PMV14VC Plus**
- **Mitsubishi FA3415ATK**
- **NEC MultiSync 3D**

Buy a color Super VGA monitor. For a few dollars more than you'd pay for a color VGA monitor, you'll get a maximum resolution of 800 by 600 pixels instead of 640 by 480. And a Super VGA monitor will support all your VGA software. If you need an even higher resolution for such applications as CAD and DPT, choose one of the 1,024 by 768 noninterlaced displays we reviewed in the April 10, 1990, issue. (Remember to buy a noninterlaced model.)

The 24 Super VGA monitors in this review all offer acceptable performance; we found none you'd be sorry to own. We picked three as Editor's Choice winners: the MAG Computronic PMV14VC Plus, the Mitsubishi FA3415ATK, and the NEC MultiSync 3D.

The $1,015 Mitsubishi FA3415ATK's 13.25-inch (diagonal) monitor offers the most attractive display in this roundup. Its flexibility (it can go back to CGA or up to 8514/A-compatible mode) and its available options made it an excellent general-purpose monitor.

For bargain hunters, the clear choice is the $635 MAG Computronic PMV14VC Plus, a 14-inch unit. One of the least expensive machines in this review, it performed better on PC Labs' performance tests than most, including the affordable $799 NEC MultiSync 2A. And its display quality is one of the best in this roundup, although your options for adjusting the image are limited.

The $1,049 13-inch NEC MultiSync 3D monitor, which was a finalist for our 1989 Technical Excellence Awards, stands out for its digital controls, stored settings, and all-around quality.

Of the two 19-inch units reviewed here, the $2,670 Mitsubishi Diamond Scan 20C has a more attractive display than the $2,395 Microvitec 1019/SP. Most 19-inch monitors support 1,024 by 768 resolution; turn to last month's review for more information on those. Although none of the monitors here have 16- or 17-inch displays, expect to see products that size come out later this year.

If you're absolutely determined to go no higher than VGA, the $999 Zenith Perfect Monitor, Model ZCM-1492—whose predecessor won an Award for Technical Excellence in 1987—offers the best image we've seen, though we have some long-term reliability concerns. The "captive" monitors that are sold with IBM and Compaq PCs—priced between $600 and $1,600—won't save you money and don't offer performance advantages.

signals, often termed TTL (for transistor-transistor logic, the family of electronic components used in their circuitry). VGA and later standards use analog signals. To accommodate the earlier display standards, a monitor must have both digital and analog inputs.

Analog signals can encode a virtually unlimited number of colors (the 262,144 possibilities in the VGA standard are set by the graphics adapter and not limited by the monitor), while digital signals have a definite color range demarcated by the number of wires conveying the video signal. The CGA and EGA standards use slightly different wiring schemes. The four signals used by the CGA standard can create only 16 colors; the six EGA signals can code up to 64 colors.

For a proper match with these two standards, most monitors with digital inputs incorporate color-mode switches that allow selection of 8-, 16-, or 64-color operation. (Eight-color mode is often included for compatibility with Apple II systems.)

The frequencies used by IBM's monochrome display, MDA, and the Hercules Graphics Adapter fall within the range of most multiscanning displays. However, connecting a monochrome system to your color display system usually results in an unpleasant white-on-black image. To adapt the aesthetics of these signals, many multiscanning monitors also include text-mode switches that allow you to turn white text green or amber, occasionally giving you the option of reversing it to black-on-white.

CONNECTION CONFUSION

Thinking about frequencies (horizontal and vertical), signal types, mode switches, and something that should be very simple—getting a monitor to work—seems complex if not unapproachable. Fortunately, things are hardly that bad. The VGA system is designed to be foolproof and makes all the important adjustments automatically. Stick with VGA (or start with it) and you'll find that any of these monitors is essentially plug-and-play. Just slide the connector at the end of the monitor cable into your graphics adapter, switch everything on, and you'll have great VGA graphics.

The biggest problem you'll face is the cable. Some manufacturers include a connecting cable with their displays. In fact, some permanently attach the cable to the back of the monitor. This is a great idea if you're afraid of losing the cable, but worrisome should you gouge the wire or break the connector on the end. If this happens, you'll have to take the whole monitor in for repairs. Other manufacturers make the connecting cable an option—one that could add $35 (in the case of the Mitsubishi FA3415ATK) to the monitor's price.

Nor are the connectors themselves straightforward. VGA adapters use a special high-density 15-pin D-shell connector. Monitors are known to use anything from 9-pin connectors, like those used by CGA and EGA adapters, to full 25-pin connectors that you can confuse with serial and parallel ports. And even VGA monitors with permanently attached cables may have retro-mode 9-pin connectors at the end.

Rule number one in buying a VGA monitor is to ensure that you get a cable with it. Beware before you buy. If the monitor cable requires a 9-to-15 pin adapter, make sure it accompanies your purchase, since some manufacturers make it an option. To find out what comes standard with each monitor, check the fact files and the features table accompanying the reviews.

THE LAND BEYOND VGA

With VGA relatively simple (or supposed to be) and higher resolutions so complex, you may wonder why anyone would want to venture into the unknown territory beyond the VGA standard. But there's much to be gained by purchasing a monitor that offers Super VGA capability. The best reason to capitalize on Super VGA is the simple one: the picture looks a lot better. Super VGA images are discernibly sharper than VGA.

Be warned: the usefulness of 800 by 600 displays is limited by the graphics adapter and software that you use. That means that Super VGA mode is presently limited in its application because few programs give this display mode explicit support. Although the proposed VESA Super VGA standard lends credibility to 800 by 600 resolution, some observers believe the industry will skip Super VGA and go directly to 1,024 by 768.

Although DOS is independent of the display system's resolution, most graphics adapters don't give you the option of booting and running DOS in 800 by 600 mode. (You may wonder why graphics adapter makers don't allow you to set their boards to boot up in high-resolution modes with a supersharp 15 by 10 text font. So do we.) Only a rare graphics adapter includes a driver for OS/2. This shortage of software support means you're essentially limited to operating environments like *Microsoft Windows* and *GEM* and a few CAD applications (most notably *AutoCAD,* which has widespread support from graphics adapters).

If you're committed to *Windows,* however, a monitor with 800 by 600 abilities is good news. *Windows* looks great in 800 by 600 mode. Compared with VGA, it's like spraying on Windex and wiping the dirty haze away.

DECISIONS, DECISIONS

Once you connect a new VGA monitor, you'll probably be delighted by the picture it gives you. At least, that's what PC Labs' test results showed. The bulk of the 24 monitors reviewed deliver quality high enough to please all but the most critical users. That's not to say that all performed the same: we noticed distinct visual differences when testing them.

We were surprised to find that the dot pitch of the cathode-ray tube used in a monitor didn't affect line width much. It did affect the quality of the image; a finer dot pitch made a less grainy, more pleasing image.

Compared with some previous monitor roundups, we found better quality overall; image geometry and convergence also showed improvement.

With overall quality on the upswing, convenience and features are more important than ever in making your purchase choice. The features table will prove an invaluable guide. Look for a full range of im-

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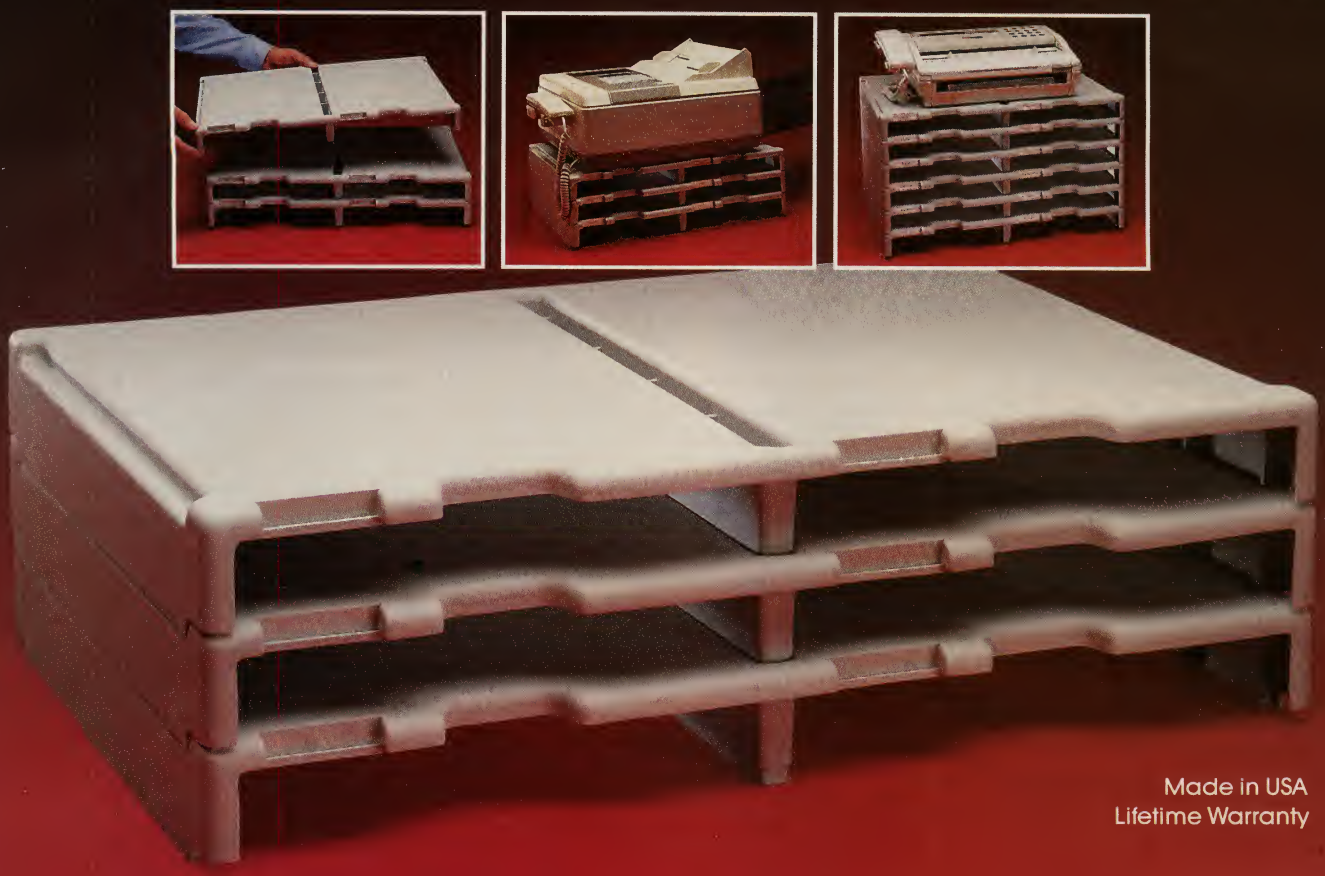

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age controls; you'll also want them where they're most useful—up front.

With all the recent media concern about radiation and magnetic fields, you may want to consider a VGA monitor designed to minimize these emissions—such as Hitachi's new CM1483M, which wasn't ready in time for this review. Not only does its low static field conform to the stringent Swedish safety standards, but it also minimizes the inevitable accumulation of dust on the face of the tube.

The excellent performance, high resolution, wide compatibility, and affordable prices of these aftermarket VGA monitors make them the best choice for your next PC. In fact, the only compelling reason to buy a captive display is that it's easy.

If you're looking for something more—more monitor for your money, a monitor that can stay with you as you upgrade your system, a monitor that can take advantage of all the power in your Super VGA graphics adapter—you'll want one of the Super VGA displays reviewed here.

ACER AMERICA CORP.

Acer 7015 Multiscanning Color Monitor

by Marghretta McBean

For $560, the Acer 7015 Multiscanning Color Monitor offers a 14-inch screen, 800 by 600 noninterlaced resolution, gray plastic housing with a darker gray contrasting bezel, an attached tilt/swivel stand, and two input cables: a 25- to 15-pin connector for analog mode and a 9- to 9-pin connector for TTL mode (there is an optional 25-pin to 9-pin cable available for PGA displays). Acer acquired the original design from Princeton Publishing Labs, which is the design end of Princeton Graphics Systems.

The controls are for the nimble fingered. The power switch, horizontal and vertical position knobs, vertical size knob, and color selector push button are located inconveniently on the back; the tube must be partially turned to access them. Color selection is available in TTL mode only; you can select green, amber, or white text color on a blue background merely by pressing the text-color switch repeatedly. Brightness is adjusted by moving a narrow thumbwheel on the right panel, and contrast by another thumbwheel almost hidden under the lower-right-front corner. The accompanying manual helps you locate their positions with useful diagrams. There is no horizontal-size control. A green LED power indicator is in the lower-right-front corner.

With a tested image size of 12.25 inches diagonally, the picture is not as full as it could be, but it's adequate nonetheless. At high resolution, the vertical lines were much fainter than the horizontal, even though the widths were similar. This is not of such great importance in VGA, although it gave a certain ghostliness to the picture at the top and bottom edges. The Acer 7015 placed high on the drift test; motion was indiscernible. Vertical size was not maintained while moving between modes. The high-resolution screen image had to be shrunk into the image area using that pesky back knob. The pincushioning results gave the 7015 good marks: it was the lowest in the Super VGA horizontal test and scored very respectably in the vertical and horizontal VGA tests as well.

There was no warranty information in the box, but a call yielded that the first four months have on-site service with TRW; during the remaining eight months you must drop the unit off at a service depot or an AASC (Acer Authorized Service Center). If your line of business doesn't require high-powered screen graphics and what you need is a decent no-frills color monitor for a good price, then the Acer 7015 offers a pretty good deal for you.

FACT FILE

Acer 7015 Multiscanning Color Monitor
Acer America Corp., 401 Charcot Ave., San Jose, CA 95131; (408) 922-0333.
List Price: $560 (tilt/swivel base and cable included).
Requires: CGA, EGA, Hercules, VGA, or Super VGA graphics adapter.
Visible Diagonal Screen Size (inches): 12.25.
In Short: Originally designed by Princeton Graphics Systems, the Acer 7015 is a middle-of-the-road Super VGA monitor with a middle-of-the-road features set and price.

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CORDATA TECHNOLOGIES INC.

Cordata CMC-141M Multiscanning Color Monitor

by Mitt Jones

If the broad gray face of the 14-inch Cordata CMC-141M doesn't remind you of one of IBM's newer monitors, the light-blue brightness and contrast knobs on the left side of the case may. And if that doesn't work, the bright orange power switch on the right side has got to do the trick. Fortunately, with a list price of $599, this 800 by 600 analog/TTL monitor, manufactured for Cordata Technologies by Daewoo, abandons its IBM act when it comes to value.

In order to get the Cordata up and running, your first step should be to discard the manual. The Cordata comes with one standard 9-pin signal connector and two signal cables: one for 9-pin TTL adapters and one for 15-pin analog. To install the monitor, you set the analog/TTL switch to match your graphics adapter and attach the appropriate cable. The manual somehow neglects to explain this in its two-part installation procedure.

To get the monitor to behave properly with a VGA or Super VGA adapter, you must also enable the "Text On / PS/2 On" switch, which simply activates automatic vertical sizing when the monitor is in analog mode. Other switches include a 16/64 color switch for TTL modes and an "H. Width" switch that gives you two choices for horizontal image size. Three back-panel knobs provide control of horizontal position, vertical position, and vertical size.

The CMC-141M performed well, if not perfectly, throughout PC Labs' tests. Line width, time variance, and pincushioning all measured within respectable limits. Objective comparisons showed that our evaluation unit's colors were true and sufficiently bright. If our evaluation unit had a problem, it was with convergence. Even with the naked eye and from a few feet away, I detected a slight red fringe to the left of the white, single-pixel text lines. This problem carried over into the white-

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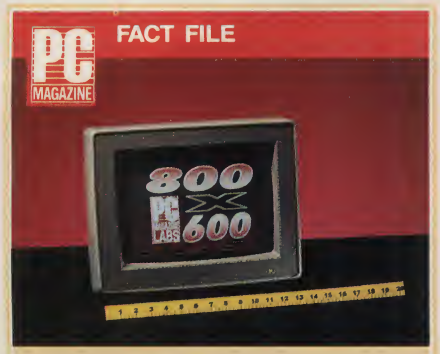


Cordata CMC-141M Multiscanning Color Monitor
Cordata Technologies Inc., 1055 W. Victoria St., Compton, CA 90220; (800) 233-3602 (outside CA), (800) 524-2671 (inside CA), (213) 603-2901.
List Price: $599 (tilt/swivel bas and cable included).
Requires:CGA, EGA, VGA, or Super VGA graphics adapter.
Visible Diagonal Screen Size (inches): 14.
In Short: With its low price and full range of TTL/analog capabilities, the CMC-141M offers an excellent value, although our test unit had some convergence problems.

CIRCLE **402** ON READER SERVICE CARD

on-black text screens, making the characters seem slightly fuzzy.

All in all, however, it's difficult to view the Cordata Color Monitor CMC-141M as anything but an excellent buy. Our evaluation worked well overall, and few monitors in this price range can boast such a wide range of features. At $599, this monitor is simply hard to beat.

DELL COMPUTER CORP.

Dell Super VGA Color Monitor

by Bruce Brown

Dell Computer Corp.'s 14-inch diagonal Super VGA Color Monitor gives good performance at a reasonable price. The 800 by 600 maximum resolution display lists for $599 including an integral tilt/swivel base.

The 28-plus pound Dell monitor has a 13.5-inch diagonal screen measurement and includes an attached 72-inch 15-pin analog cable. The long cable lets you position the display and computer system twice as far apart as regular cables. This could save you $25 to $30 for an extension cable if you put your system on the floor.

The Dell Super VGA Color Monitor works in both VGA and Super VGA modes. The Dell unit is a multiple-fixed-frequency monitor capable of working with horizontal 31.5- and 35-kHz and vertical 56-, 60-, and 70-Hz frequencies. The Dell ran just fine with the Paradise card used in our test system.

The Dell's numbers on the Microvision testing apparatus are fine, certainly within normal expectations for both VGA and 800 by 600 modes. There was a slight bowing on the left side in VGA mode; otherwise the Dell stood up well subjectively, with clear text, colors, and graphics.

If you find lots of switches and dials daunting, the Dell Super VGA may be just what you're looking for; it has a minimum of controls. The power switch and nondetented brightness and contrast dials are on the right side of the case. Three additional controls on the back let you adjust horizontal and vertical position and vertical size. There are center detents for horizontal position and vertical size but not for vertical position.

The Dell's documentation is excellent. There's plenty of technical information here for those who care, but there are also clear line drawings and explanations of how to hook up and adjust the monitor.

The Dell is sold by the company's mail-order operation and by its direct sales staff, often bundled with Dell computer systems. The standard one-year warranty comes along with Dell's usual 30-day money-back guarantee.

Despite the slight left-side bowing in VGA mode, the Dell Super VGA Color

FACT FILE

Dell Super VGA Color Monitor
Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759-7299; (800) 426-5150, (512) 338-4400.
List Price: $599 (tilt/swivel base and cable included).
Requires: VGA or Super VGA graphics adapter.
Visible Diagonal Screen Size (inches): 13.5.
In Short: A good buy, the Dell Super VGA Color Monitor is also a decent performer, except for some bowing in VGA. One potential drawback: a dearth of controls.

CIRCLE **403** ON READER SERVICE CARD

SUPER VGA: Good Enough for Today

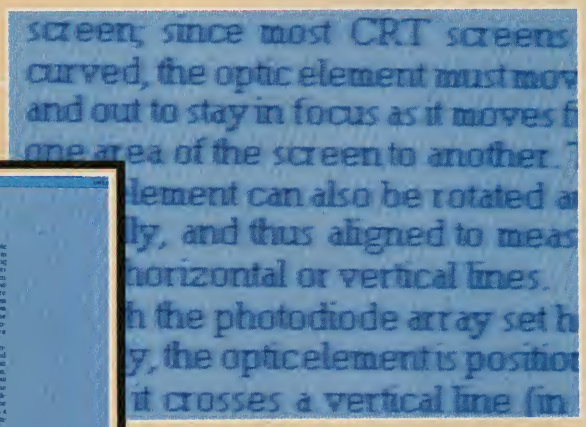
by Mary Kathleen Flynn

There's no doubt about it: if you're using software that supports 800 by 600 resolution, Super VGA looks a lot better than VGA. Although less spectacular than the 1,024 by 768 noninterlaced monitors we reviewed in the April 10, 1990, issue, Super VGA monitors are certainly good enough for most mainstream business applications—even those running in such graphical environments as *Microsoft Windows*. If you're not using Super VGA software today, buy a Super VGA monitor anyway; you may want that extra resolution tomorrow.

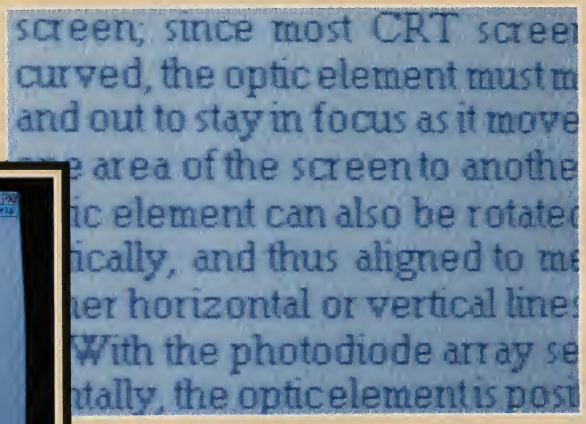
When we looked at the 24 Super VGA monitors side by side, we saw greater differences in image quality than we did when comparing the high-resolution monitors last month. Although all the Super VGA monitors produced acceptable images, some displayed brighter brights, whiter whites, and truer colors. Others looked like they hadn't gone through the wash—or like they'd gone through it a few times too many. As we tried to adjust the less attractive images, we learned just how frustrating a monitor without front controls can be. Alas, even after we played with those hard-to-reach controls, the whites on several monitors still looked dirty, and the colors faded.

Picking the three most attractive displays in this roundup proved easy. In the 13- to 14-inch (diagonal) class, the $635 MAG Computronic PMV14VC Plus and the $1,015 Mitsubishi FA3415ATK stole our hearts. These monitors produced true colors, crisp text, and clean backgrounds. The $1,049 NEC MultiSync 3D also looked quite good.

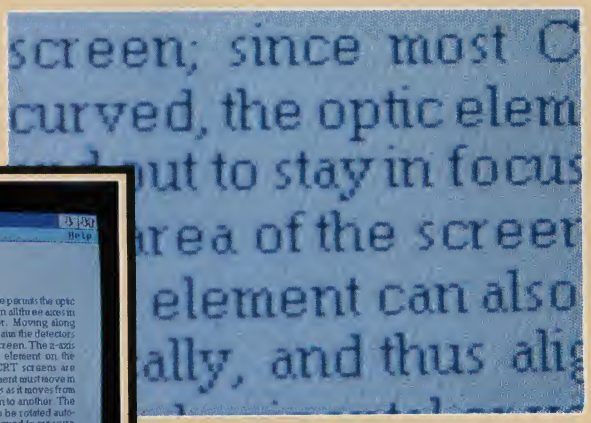
Deciding between the two 19-inch units was a cinch: the $2,670 Mitsubishi Diamond Scan 20C looked better than the $2,395 Microvitec 1019/SP. Interestingly, none of the monitors in this roundup offered a 16-inch display, an increasingly popular size for high resolution. We expect to see 16- to 17-inch VGA and Super VGA monitors come out later this year. ■

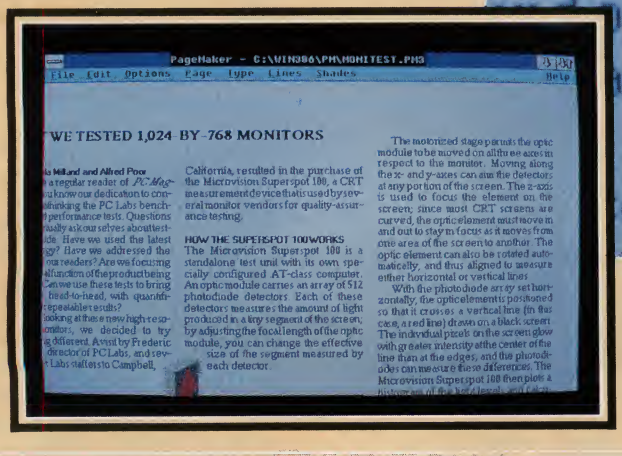


Sony's $1,095 Multiscan HG, reviewed in the April 10, 1990 issue, shows just how spectacular a 1,024 by 768 noninterlaced image can be.



The $1,015 Mitsubishi FA3415ATK, reviewed in this issue, proves that Super VGA is good enough for most of today's business applications.





The $1,049 NEC MultiSync 3D, reviewed in this issue, is shown here in VGA mode, proving that no matter how good the VGA, Super VGA is better.

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Monitor is a fine performer and a safe buy from a major U.S. computer vendor. With nice color differentiation, clear text, and full VGA and Super VGA compatibility, the Dell display is a good buy.

ELECTROHOME LTD.

Electrohome ECM 1310U

by Mitt Jones

When we first reviewed the Electrohome ECM 1310U in our May 31, 1988, issue, it carried a list price of $895. We awarded it an Editor's Choice for its superb colors and sharp picture. When we reviewed the 1310U in the May 16, 1989, issue, the price had risen to $1,198, and the competition had caught up: Taxan and NEC each garnered Editor's Choice awards. This year, the 1310U still has the same maximum resolution of 800 by 600, the same multiscanning capabilities, and the same .31-mm dot pitch. But the competition has advanced even more, and the price of the ECM 1310U has climbed to $1,259.

Why pay so much for a 13-inch monitor? Unless you find yourself needing to daisy-chain a few monitors together, you probably shouldn't. The only real advantage the 1310U can claim over the competition is its dual sets of BNC jacks: one set for the input signal and one for an output signal. Each set includes one jack each for the red, green, and blue signals, plus separate jacks for horizontal and vertical sync signals. Each input jack also has its own dedicated terminator switch, which allows the signal to be passed onto the corresponding output jack when open.

Despite its skimpy, three-page manual and abundance of connectors, the 1310U installs with little difficulty. Once you've found a BNC-5–to–DB-15 cable (Electrohome will sell you one for $99) attaching the monitor to a VGA adapter is quite straightforward. If you're connecting the monitor to a CGA, EGA, or PGA adapter, simply set the TTL/analog switch accordingly and plug the cable into the monitor's DB-9 TTL connector.

Our evaluation unit excelled in some respects during testing and suffered from serious limitations in others. On the upside, the 1310U generates a sharp, bright display that rivals the best .31-mm-dot-pitch models. Colors are true and vibrant.

The 1310U's most serious limitation has got to be its lack of automatic image sizing. In VGA modes, the vertical image size changed significantly, ranging in height from 6.5 to 8 inches. Of course, you can adjust the image size manually: the back panel of the monitor accommodates two sets of image-adjustment knobs—one for TTL modes, the other for analog. All of the analog controls, with the exception of the horizontal-size control, provided ample adjustment in VGA modes. However, that doesn't lessen the frustration of having to adjust them every time you jump from a 350-line mode to a 480-line mode.

The 1310U monitor comes with an etched, nonglare screen and uses a short-persistence phosphor—the best combination for most users. Electrohome sells two additional monitors, the 1311 and 1312, that are identical to the 1310U in every respect but phosphor and screen glass. The 1312, for example, with its clear, polished screen and long-persistence phosphor, is meant for applications that demand top picture sharpness, such as CAD.

If you need to daisy-chain monitors or if your specific application requires BNC-5 connectors, you'll undoubtedly be happy with the ECM 1310U. For the rest of us, however, this monitor just doesn't make sense. For what it takes to buy the 1310U, you could almost buy two monitors that would do the job as well and include autosizing in the bargain.

Electrohome ECM 1310U
Electrohome Ltd., 809 Wellington St. N., Kitchener, Ontario N2G 4J6, Canada; (519) 744-7111.
List Price: $1,259; tilt/swivel stand, $59; cable $99.
Requires: EGA, VGA, or Super VGA graphics adapter and cable.
Visible Diagonal Screen Size (inches): 13.5.
In Short: The ECM 1310U provides video outputs, an advantage for installations that require multiple displays. But for everyday installations, its features fail to justify its high price.

CIRCLE **404** ON READER SERVICE CARD

GOLDSTAR TECHNOLOGY INC.

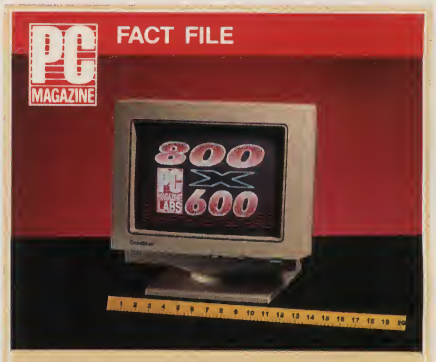
GoldStar 1450 Plus VGA

by M. David Stone

The 14-inch 1450 Plus VGA from GoldStar Technology is best thought of as a VGA monitor with an 800 by 600 Super VGA mode added—along with a Mac II mode for those who are interested. As with most analog-only monitors, setting up this $699 unit is trivial. Simply put the monitor on your desk, plug in the power cord and cable, and turn it on. The cable is permanently attached to the monitor, so you only have to plug the DB-15 connector into your video card.

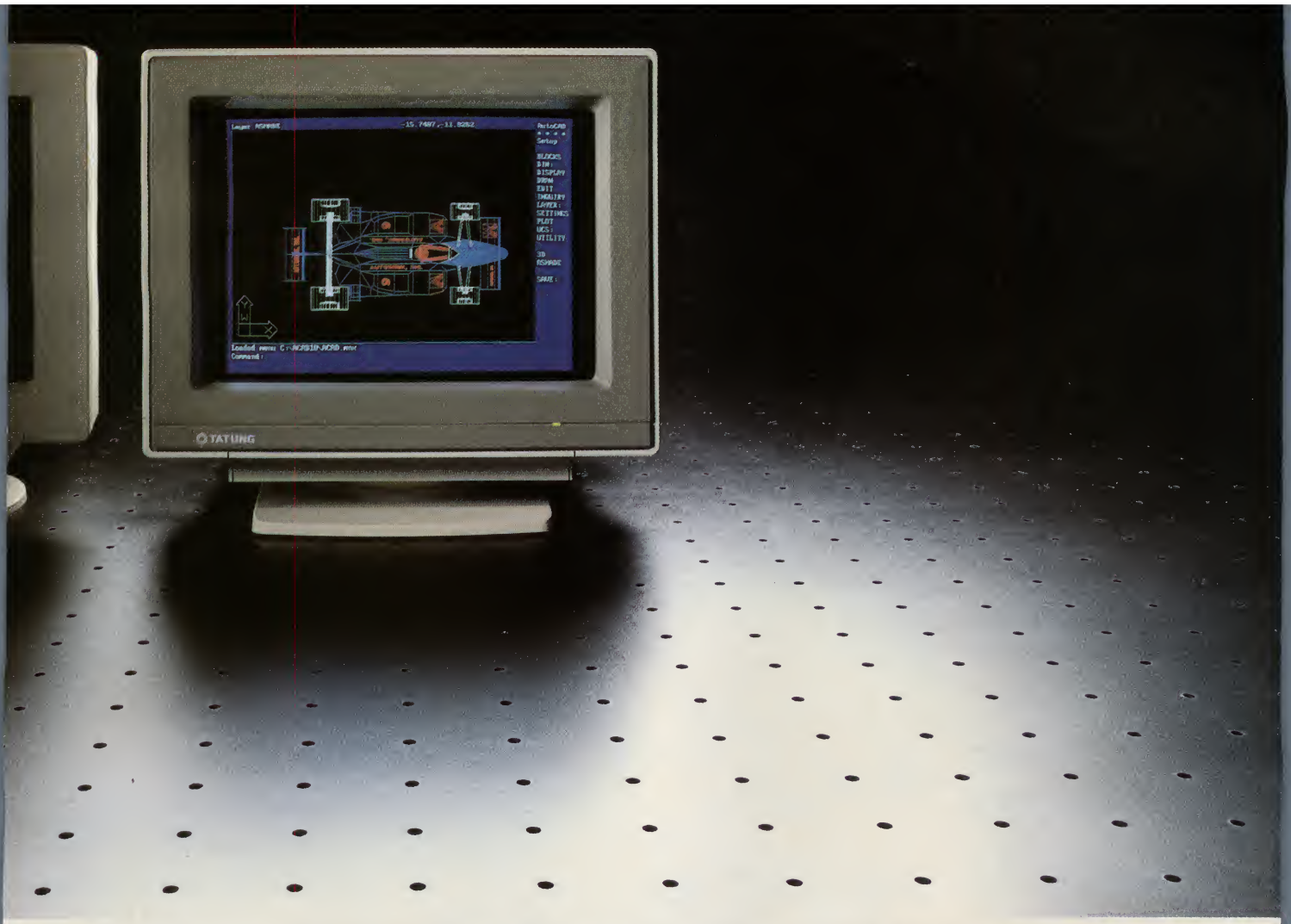
All image controls on the monitor are analog, and all are well labeled. The controls for horizontal and vertical size and position are on the back. You might argue about the placement, but in truth, you won't need to get at these very often. The monitor includes an autosizing feature for all modes. In PC Labs' tests, the autosizing worked well enough to eliminate the need to change settings when going from 800 by 600 to VGA resolution.

The only other controls are the power switch and the brightness and contrast slide controls. These are all on the front of the monitor, where they are easy enough to get at. Alas, the slide controls offer less control than a knob or thumbwheel, so it's easy to overshoot when you're trying to



GoldStar 1450 Plus VGA
GoldStar Technology Inc., 3003 N. First St., San Jose, CA 95134-2004; (408) 432-1331.
List Price: $699 (tilt/swivel base and cable included).
Requires: VGA or Super VGA graphics adapter.
Visible Diagonal Screen Size (inches): 14.
In Short: The Model 1450 Plus VGA is a fixed-frequency monitor that supports three modes: VGA, Super VGA, and Mac II. Before you buy, be sure it works with your graphics adapter.

CIRCLE **405** ON READER SERVICE CARD



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Or, you can compare the Tatung 98X with the premium NEC 3D.™

But the Tatung 98X costs $250 *less*.

	NEC Multisync 2A	NEC Multisync 3D	Tatung Omniscan CM-1496X	Tatung Omniscan CM-1498X
1024x768 Max Resolution 8514/A Compatible	No	Yes	Yes	Yes
Super VGA (800x600)	Yes	Yes	Yes	Yes
Dot Pitch	0.31mm	0.28mm	0.31mm	0.28mm
Price †	$799	$1,049	$749	$799

*Interlaced resolution available with the IBM 8514/A,™ ATI VGA Wonder,™ Genoa SuperVGA 6400,™ Paradise VGA1024™ and other leading graphics adaptors. † Suggested retail price February 1, 1990. All features effective February 1, 1990. All trademarks are the property of their respective owners.

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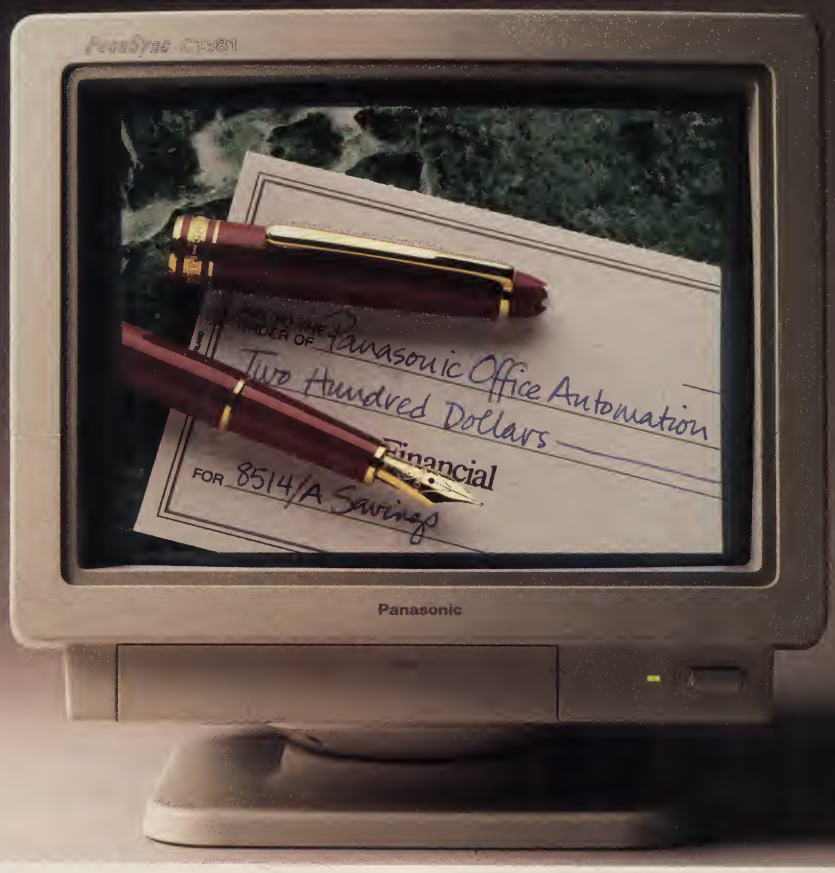

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The PanaSync C1381 gives you a sharp 1024 x 768 pixels, with 0.28 dot pitch. And virtually infinite color resolution.

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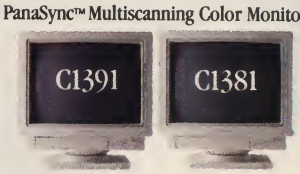

* *VGA, MCGA and 8514/A are trademarks of International Business Machines Corp.*

** *IBM XT, AT and PS/2 are registered trademarks of International Business Machines Corp. Macintosh is a registered trademark of Apple Computer Inc. An optional cable is required for Macintosh.*

M3-PCM

adjust brightness or contrast.

The preliminary manual provided with the review unit was skimpy and contained some minor mistakes, but the monitor is so easy to set up and use that it hardly matters.

As you might expect from the short list of video modes the unit supports, the 1450 Plus VGA is limited to a few specific frequencies. Horizontal frequencies are 31.5 kHz for VGA, 35 kHz for Mac II, and 35.2 kHz for Super VGA. Vertical frequencies are 50 Hz, 60 Hz, and 70 Hz for VGA modes; 56 Hz for Super VGA; and 66.7 Hz for Mac II.

Since most Super VGA cards use their own idiosyncratic schemes to get 800 by 600 resolution, there is no guarantee that the 1450 Plus VGA will work with any given card in Super VGA mode. However, GoldStar claims that the company has successfully tested the monitor with more than 20 cards.

In PC Labs' tests, the monitor worked with the Paradise 1024 VGA card. There was, however, a slight but noticeable flicker at 800 by 600 resolution in the white *Microsoft Windows* background.

If you are interested in this monitor, you'll want to make sure beforehand that it works well with your Super VGA card. Aside from the flicker in Super VGA mode, the 1450 Plus VGA performed up to par. At $699, it's a creditable performer at a reasonable price.

GOLDSTAR TECHNOLOGY INC.

GoldStar 1460 Plus VGA

by Alfred Poor

In recent years, the Korean manufacturers have started to make their presence known in the microcomputer market. One of the biggest names is GoldStar, which not only builds monitors for OEM clients, but also markets them under its own label. One of these is the 1460 Plus VGA, a 1,024 by 768 interlaced display with a $799 list price.

The 1460 Plus VGA looks modern and appealing. The tilt/swivel base is fairly typical for this class of device, but the monitor's face shows some unusual design. The power switch is a large button of aqua-colored plastic, giving the case a suitably trendy color scheme. Instead of the typical roller controls for brightness and contrast, the 1460 Plus VGA sports a pair of slide controls, a feature more commonly associated with a sound-studio mixing board.

The rest of the controls are on the back. There is a full set of four picture controls: size and position for both horizontal and vertical dimensions. All four are clearly labeled and have detents to mark the center position. Unfortunately, the back is hard to reach and it's difficult to figure which control you're touching while sitting in front of the monitor.

On the other hand, the video cable is permanently attached to the case. It has a standard 15-pin connector ready to plug into your favorite VGA board.

Instead of handling a range of frequencies, the 1460 Plus VGA is designed to sync to multiple horizontal frequencies. These include VGA, 800 by 600, and 8514/A 1,024 by 768 interlaced signals.

The monitor's display was adequate but not outstanding. Most of the benchmark-test measurements were generally in the middle range, but a few results are worth noting. The image was not as stable as most, though this may not be noticeable to most users. The VGA horizontal line widths, though, were 50 percent wider than the vertical lines—a difference that is clearly visible. One of the fundamental aspects of an 800 by 600 or 640 by 480 display is that theoretically the pixels are square, given the 4:3 aspect ratio of the display. As a result, the line widths should be of equal size; this is clearly not the case for the 1460 Plus VGA.

The 1460 did have some of the best pincushioning measures of the field, which speaks well for how the monitors are set up before leaving the factory. On the other hand, our test monitor had some obvious convergence problems in the upper-right corner, where the red and blue beams were visibly off in one direction.

The monitor carries an FCC Class B certification. GoldStar backs it with a one-year parts and labor warranty, plus an additional three-year coverage for the picture tube. In the event of required warranty repair, the owner pays for shipping to GoldStar, and the company covers the return freight.

The image produced by the 1460 Plus VGA is adequate. The placement of controls is a problem, though hardly fatal. The price is about in the middle, but since GoldStar sells through distributors to dealers to consumers, there are often significantly discounted prices available. As a result, the monitor represents a good value. While there may be others that offer better opportunities, you can't go far wrong with this one.

FACT FILE

GoldStar 1460 Plus VGA
GoldStar Technology Inc., 3003 N. First St., San Jose, CA 95134-2004; (408) 432-1331.
List Price: $799 (tilt/swivel base and cable included).
Requires: VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 13.
In Short: The Model 1460 Plus VGA doesn't stand out from the crowd, but it's a perfectly acceptable choice. Because of its two-stage distribution, you should be able to find attractive discounts.

CIRCLE **406** ON READER SERVICE CARD

MAG COMPUTRONIC INC.

MAG Computronic PMV14VC Plus

by Alfred Poor

One of the great advantages of *PC Magazine*'s reviews is that we go beyond just the few "big name" products and include every relevant contender. While this often produces just another thorough investigation that includes many "me-too" no-name machines or programs, we sometimes uncover some real finds, like the MAG Computronic PMV14VC Plus color monitor from the two-year old company.

This 14-inch monitor can display up to 1,024 by 768 resolution in an 8514/A-compatible interlaced mode. It also carries the impressively low list price of $635.

The price is only part of the monitor's attraction. The image it displays is quite smooth and crisp. Part of the quality may be a result of its fine dot pitch (0.28 mm), but that can only be part of the story.

The image on our test machine appeared to have no areas of serious misconvergence—the white lines of our test im-

SUPER VGA MONITORS: SUMMARY OF FEATURES

Products listed in ascending price order

	Mitsuba 710VH	Acer 7015 Multiscanning Color Monitor	Cordata CMC-141M Multiscanning Color Monitor	Dell Super VGA Color Monitor	PC MAG Computronic PMV14VC Plus	TW Casper 5156H	GoldStar 1450 Plus VGA
	$495	$560	$599	$599	$635	$680	$699
PHYSICAL SPECIFICATIONS							
Tilt/swivel base	■	■	■	■	■	■	■
Visible screen size (diagonal, in inches)	14	12.25	14	13.5	14	13.25	14
Case dimensions (HWD, in inches)	14 x 14 x 14.25	17.25 x 18 x 18	14.25 x 14.5 x 15.25	12.75 x 13.5 x 15	17.25 x 18 x 18	13.75 x 14.25 x 14.25	14 x 14 x 14.75
Weight (pounds)	37	28.5	32.5	28.75	30	25.25	28.5
Type of connector required	DB-15	DB-9 or DB-25	DB-9	DB-15	DB-15	DB-15	DB-15
Adapter cable supplied	■	■	■	■	■	■	■
FCC certification class	B	B	B	B	None	B	B
COMPATIBILITY							
1,024 x 768 (noninterlaced)	❑	❑	❑	❑	❑	■	❑
8514 (interlaced)	■	❑	❑	❑	■	■	❑
Super VGA (800 x 600)	■	■	■	■	■	■	■
VGA	■	■	■	■	■	■	■
EGA (TTL)	❑	■	■	❑	❑	❑	❑
CGA (TTL)	❑	■	■	❑	❑	❑	❑
Other	None	MDA, Hercules, MCGA	MDA	None	Mac II	None	Mac II
OPERATIONAL FEATURES							
Maximum resolution (pixels)	1,024 x 768	800 x 600	800 x 600	800 x 600	1,024 x 768	1,024 x 768	800 x 600
Video bandwidth (MHz)	45	35	35	38	45	30	45
Vertical scanning frequency range (Hz)	60–70	45–90	50–90	56–70	50–90	60–70	50–70
Horizontal scanning frequency range (kHz)	31.5–35.52	15–36	15.5–35	31.5–35	30–36	31.47–35.5	31.5–35.2
Phosphor persistence	Medium	Medium/short	Short	Medium/short	Medium	Short	Medium/short
Dot pitch (millimeters)	.28	.31	.31	.29	.28	.31	.31
Autosizing	■	❑	■	■	■	■	■
Inputs:							
Analog RGB	■	■	■	■	■	■	■
Digital/TTL	❑	■	■	❑	❑	❑	❑
Composite	❑	❑	■	❑	❑	❑	❑
RGB sync inputs:							
On green	❑	❑	❑	❑	❑	❑	■
External composite	❑	❑	❑	❑	❑	❑	❑
External separate	❑	❑	❑	❑	❑	❑	■
Outputs:							
Analog RGB	❑	■	❑	❑	❑	❑	❑
Digital/TTL	❑	■	❑	❑	❑	❑	❑
Composite	❑	❑	❑	❑	❑	❑	❑
RGB sync outputs:							
On green	❑	❑	❑	❑	❑	❑	❑
External composite	❑	❑	❑	❑	❑	❑	❑
External separate	❑	❑	❑	❑	❑	❑	❑
CONTROLS							
Brightness	Analog	Analog	Analog	Analog	Analog	Analog	Analog
Contrast	Analog	Analog	Analog	Analog	Analog	Analog	Analog
Color	None	Analog	Digital	None	None	None	*None*
Horizontal position	Analog	Analog	Analog	Analog	Analog	None	Analog
Vertical position	Analog	Analog	Analog	Analog	None	None	Analog
Horizontal size	None	None	Digital	None	None	None	Analog
Vertical size	Analog	Analog	Analog	Analog	Analog	Analog	Analog
Text-color switch	None	Analog	Digital	None	None	None	None
Color selector for text	None	Analog	None	None	None	None	None
120/240-volt switch	None	None	None	None	None	None	None
Degaussing	None	None	None	None	None	None	None
8/16/64-color switch	None	None	Digital	None	None	None	None
Pincushioning	None	None	None	None	None	None	None
Convergence	None	None	None	None	None	None	None

PC—Editor's Choice ■—Yes ❑—No

Tatung CM-1496X	TVM SuperSync	GoldStar 1460 3APlus VGA	NEC MultiSync 2A	Relisys RE-5155	Amdek AM/738 Smartscan	Panasonic PanaSync C1391	Princeton Ultra 14	Seiko CM-1440
$749	$795	$799	$799	$799	$835	$899	$899	$899
■	■	■	■	■	■	■	■	■
13	14	13	13	14	14	13	14	13
12.5 x 14.5 x 15.75	12 x 14.5 x 15.75	14 x 14 x 14.75	13 x 13.75 x 15.25	14.5 x 14.75 x 15.25	13.25 x 14 x 14.5	14.5 x 14 x 14.25	13 x 13.75 x 15.5	13 x 13.75 x 15.75
27.5	29.75	28.5	28.5	31	30	25.25	35	33
DB-9 or DB-15	DB-15	DB-15	BNC-5	DB-9 or DB-15	DB-15	DB-9 to DB-15	DB-9, or DB-15 to DB-25	DB-15
■	■	■	■	■	■	■	■	■
B	B	B	B	B	B	B	A	B
❑	❑	❑	❑	❑	❑	❑	❑	❑
■	■	■	❑	❑	■	■	■	■
■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■
❑	❑	❑	❑	■	❑	■	■	❑
❑	❑	❑	❑	■	❑	■	■	❑
None	Mac II	None	None	None	MDA, Hercules	MDA, Hercules	MDA, Hercules, MCGA	None
1,024 x 768	1,024 x 768	1,024 x 768	800 x 600	800 x 600	1,024 x 768	800 x 600	1,024 x 768	1,024 x 768
45	45	45	38	30	25	30	45	35
50–90	56–86.7	50–87	56–70	50–70	50–87	40–80	45–120	50–90
31.5–35.5	31–36	31.5–35.5	31.5–35	15.5–35	31.5–38	15.5–36	15–36	31–40
Short	Medium/short	Medium	Medium/short	Short	Medium	Short	Medium/short	Medium
.31	.28	.28	.31	.31	.31	.31	.28	.25
■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	❑
❑	❑	❑	❑	■	❑	■	■	❑
❑	■	❑	❑	❑	❑	■	❑	❑
❑	❑	❑	❑	❑	❑	■	■	❑
❑	❑	❑	❑	❑	❑	❑	■	❑
❑	❑	■	■	❑	■	❑	■	❑
❑	❑	❑	❑	❑	❑	❑	❑	❑
❑	❑	❑	❑	❑	❑	❑	❑	❑
❑	❑	❑	❑	❑	❑	❑	❑	❑
❑	❑	❑	❑	❑	❑	❑	❑	❑
❑	❑	❑	❑	❑	❑	❑	❑	❑
❑	❑	❑	❑	❑	❑	❑	❑	❑
Analog	Analog	Analog	Analog	Analog	Analog	Analog	Analog	Analog
Analog	Analog	Analog	Analog	Analog	Analog	Analog	Analog	Analog
None	None	None	None	None	None	Digital	None	None
Analog	Analog	Analog	Analog	Analog	Analog	Analog	Analog	Analog
Analog	None	Analog	Analog	Analog	Analog	Analog	Analog	Analog
Analog	None	Analog	None	None	Analog	Analog	Analog	Analog
Analog	Analog	Analog	Analog	Analog	Analog	Analog	Analog	Analog
None	None	None	None	Digital	None	Analog	Digital	None
None	None	None	None	Digital	None	Digital	Digital	None
Digital	Analog	None	None	None	Digital	None	Digital	None
None	None	None	None	None	None	None	None	None
None	None	None	None	Digital	None	Digital	Digital	None
None	None	None	None	None	None	None	None	None
None	None	None	None	None	None	None	None	None

CONTINUES

SUPER VGA MONITORS: SUMMARY OF FEATURES

Products listed in ascending price order

	Sony CPD-1302	Mitsubishi FA3415ATK	Idek Multiflat Digiana MF-5015	NEC MultiSync 3D	Nanao FlexScan 9060S	Electrohome ECM 1310U
	$995	$1,015	$1,045	$1,049	$1,053	$1,259
PHYSICAL SPECIFICATIONS						
Tilt/swivel base	❑	❑	■	■	■	❑
Visible screen size (diagonal, in inches)	13.25	13.25	15	13	13	13.5
Case dimensions (HWD, in inches)	11.75 x 14 x 15.5	14 x 13.75 x 15.25	14.75 x 14.5 x 15.75	13 x 13.75 x 15.25	14.25 x 16.25 x 14.5	13 x 14.25 x 15
Weight (pounds)	32	31	34.25	30.75	32	29.25
Type of connector required	DB-15 to DB-9	DB-15	DB-9 or DB-15	DB-15	DB-9	DB-9 or BNC-5
Adapter cable supplied	❑	■	■	■	■	❑
FCC certification class	B	B	B	B	B	B
COMPATIBILITY						
1,024 x 768 (noninterlaced)	❑	❑	❑	❑	❑	❑
8514 (interlaced)	■	■	■	■	■	❑
Super VGA (800 x 600)	■	■	■	■	■	■
VGA	■	■	■	■	■	■
EGA (TTL)	■	■	■	■	■	■
CGA (TTL)	■	■	■	■	■	■
Other	Mac II	Mac II, Apple II GS	MDA, Hercules, MCGA, Mac II	MDA, Hercules, Mac II	None	None
OPERATIONAL FEATURES						
Maximum resolution (pixels)	900 x 560	1,024 x 768	800 x 600	1,024 x 768	1,024 x 768	800 x 800
Video bandwidth (MHz)	25	40	30	45	30	30
Vertical scanning frequency range (Hz)	50–100	50–87	50–90	50–90	50–90	47–85
Horizontal scanning frequency range (kHz)	15.75–36	15.7–35.5	15.5–37	15.5–38	15.5–38.5	15–36
Phosphor persistence	Short	Short	Medium/short	Medium/short	Medium	Short
Dot pitch (millimeters)	.26	.28	.31	.28	.28	.31
Autosizing	■	■	■	■	❑	❑
Inputs:						
Analog RGB	■	■	■	■	■	■
Digital/TTL	■	■	■	■	■	■
Composite	❑	❑	❑	■	❑	❑
RGB sync inputs:						
On green	■	■	❑	■	■	■
External composite	■	■	■	■	❑	■
External separate	■	■	■	■	❑	■
Outputs:						
Analog RGB	❑	❑	❑	❑	❑	❑
Digital/TTL	❑	❑	❑	❑	❑	❑
Composite	❑	❑	❑	❑	❑	❑
RGB sync outputs:						
On green	❑	❑	❑	❑	❑	❑
External composite	❑	❑	❑	❑	❑	❑
External separate	❑	❑	❑	❑	❑	❑
CONTROLS						
Brightness	Analog	Analog	Analog	Analog	Analog	Analog
Contrast	Analog	Analog	Analog	Analog	Analog	Analog
Color	None	None	None	None	Analog	None
Horizontal position	Analog	Analog	Analog	Digital	Analog	Analog
Vertical position	Analog	Analog	Analog	Digital	Analog	Analog
Horizontal size	Analog	Analog	Analog	Digital	Analog	Analog
Vertical size	Analog	Analog	Analog	Digital	Analog	Analog
Text-color switch	None	Digital	Digital	None	None	None
Color selector for text	None	Digital	Digital	None	Analog	None
120/240-volt switch	None	None	None	None	None	None
Degaussing	None	None	None	None	None	None
8/16/64-color switch	Digital	Digital	Digital	Analog	Analog	None
Pincushioning	None	None	None	None	Analog	None
Convergence	None	None	None	None	Analog	None

☒—Editor's Choice ■—Yes ❑—No

Microvitec 1019/SP	Mitsubishi Diamond Scan 20C
$2,395	$2,670
■	❑
19 17.5 x 18.5 x 19.5	19 17.75 x 19.75 x 21
59 DB-15 to DB-9 ■ A	66 DB-15 or BNC-5 ❑ B
❑ ■ ■	❑ ■ ■
■ ■ ■ Mac II	■ ■ ■ Mac II
800 x 600 40 45–100 15–36.5	1,120 x 780 50 45–90 15.7–38
Short .31 ❑	Short .31 ■
■ ■ ❑	■ ■ ❑
❑ ❑ ❑	■ ■ ■
❑ ❑ ❑	❑ ❑ ❑
❑ ❑ ❑	■ ■ ■
Analog Analog None Analog Analog	Analog Analog None Analog Analog
Analog Analog None None	Analog Analog None None
None Digital Digital None None	None None Digital Analog None

ENDS

FACT FILE
EDITOR'S CHOICE

MAG Computronic PMV14VC Plus
MAG Computronic Inc., 17845-E Skypark Circle, Irvine, CA 92714; (714) 660-8899.
List Price: $635 (tilt/swivel base and cable included).
Requires: VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 14.
In Short: A bargain hunter's dream, the inexpensive PMV14VC Plus offers a superb image with true colors, crisp detail, and a picture that holds its size from mode to mode.

CIRCLE **407** ON READER SERVICE CARD

age were consistently white, without colored halos even in the corners. The pincushioning measurements were some of the lowest among all the monitors we tested. And the line widths were fairly thin and consistent between colors and between horizontal and vertical orientations. The time variance tests showed this to be one of the most stable displays in the group.

The PMV14VC Plus did an excellent job of maintaining the correct image size when switching between different resolutions. The monitor is a multiple-frequency design, capable of syncing on horizontal scan rates between 30 and 36 kHz.

If the MAG Computronic monitor has a problem, it is with its controls. The tilt/swivel base has the standard brightness and contrast controls mounted on the lower-right front corner. The power switch is located in the back and is rather small.

Even more significant is the fact that there are only two picture size and position controls instead of the more typical four. There is a horizontal position control (labeled "H-Phase") and a vertical size control. Instead of being located in the front where you can adjust them while you see their effect on the screen, these controls are in the back with the power switch, so you must struggle to find them when adjustments are necessary. The power-switch problem can be solved with a power strip, but the control issue is more difficult. Fortunately, the PMV14VC Plus holds its image size well between resolutions, so it's possible you won't need to fiddle with the picture controls frequently.

The MAG Computronic PMV14VC Plus has its flaws, but given its aggressive price and excellent image, it has to be one of the most attractive values in this group.

MICROVITEC INC.

Microvitec 1019/SP

by Winn L. Rosch

A metal monster of a monitor, the Microvitec 1019/SP gives you exactly what you need to make a big impression. Its 19-inch (diagonal) display tube yields a generous image with a maximum resolution of 800 by 600. It will also make a big impression on your budget, with its $2,395 list price; and on your desktop, with its overwhelming size and 59-pound weight. You can make it even taller by installing the tilt/swivel stand included with the unit.

Although the specifications and test results make the Microvitec sound mediocre even as a general-purpose analog/digital monitor, it makes an excellent on-screen presentation. The big screen just means all its numbers will be big. Take screen size into account and you'll see the 1019/SP's .31-mm dot pitch is the rough equivalent of .22 mm on a 14-inch display. Similarly, its seemingly thick line width is about right

FACT FILE

Microvitec 1019/SP
Microvitec Inc., 1943 Providence Ct., College Park, GA 30337; (404) 991-2246.
List Price: $2,395 (tilt/swivel base and cable included).
Requires: CGA, EGA, VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 19.
In Short: One of two 19-inch screens in this roundup, the Microvitec is less expensive than its Mitsubishi competitor but doesn't have as clean and crisp a *display*.

CIRCLE **408** ON READER SERVICE CARD

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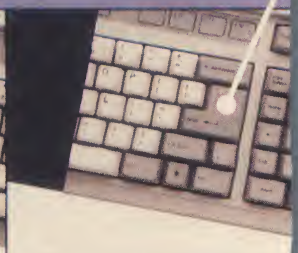

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eatures of OmniKey/PLUS.

PC MAGAZINE EDITORS' CHOICE

P.C. Machine Editor's Choice December 12, 1989

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Business Marketing Chicago

"We liked it a great deal especially its lively, bouncy feel, its audible click and the placement of the function keys."
New York Times Science

"Simply the best I have ever tried".
Ed Kahn MicroTimes

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for smooth images on its 19-inch screen.

The on-screen colors of the 1019/SP's P22 medium/short phosphors are bright against a dark gray background, though not as true as on Mitsubishi's 19-inch unit (also reviewed here). The image brightness is good and the glare protection effective. However, the screen bezel is out of place: a poor color match for IBM machines (brown) and too big. And since the bezel is larger than the tube, the on-screen image will bump into the screen border long before it fills the bezel.

The electronics of the 1019/SP are more than up to VGA and Super VGA signal standards. With a 40-MHz bandwidth, it can also handle 8514/A and Mac II outputs, as well as digital CGA and EGA signals. Its autosynchronizing range accommodates horizontal frequencies from 15 to 36.5 kHz and vertical frequencies in the range of 45 to 100 Hz. To connect with whatever graphics adapter you have, Microvitec includes two cables to match its 9-pin input connector to either 9-pin digital or 15-pin analog outputs.

Although the 1019/SP lacks true autosizing abilities, Micovitec puts the image size and position controls up front in a small control panel that includes an input selector and degausser as well as brightness and contrast controls. Only the power switch and digital color-mode switches are relegated to the rear panel.

Made in the United Kingdom, the 1019/SP is FCC Class A certified and is backed by a one-year warranty. Only its documentation is substandard: its thin pamphlet of instructions covers the entire Microvitec line, with little information specific to the 1019/SP.

Consider the 1019/SP if you need a big screen, have a big budget, and plan to stick to a single display standard.

MITSUBA CORP.

Mitsuba 710VH

by Alfred Poor

With a list price of just $495, the 710VH from Mitsuba Corp. is the least expensive 14-inch 8514/A-compatible monitor in this roundup. What can you get for this bargain-basement price?

The tilt/swivel base offers a fairly typical front to the world; it sports the familiar roller controls for brightness and contrast, and there is a large power switch shaped like the first two controls.

The video cable is permanently attached to the back of the monitor, so all you need to do is find a 15-pin socket on the back of your display adapter. The monitor accepts only analog signals, so you'll need a VGA, Super VGA, or 8514/A adapter.

The back of the case also houses the picture size and location controls. There is a horizontal-position control (called "horizontal phase"), and controls for vertical position and size. Unfortunately, there is no adjustment for horizontal size. More significant is that the three controls are tucked between the power and video cables, making them difficult to reach and adjust while you're looking at the image from the front.

These design flaws could be overlooked if the image were excellent, but it is not. Screens such as the *Windows MS-DOS Executive* were not as sharp as on some other monitors. A look at our test image revealed some significant convergence problems in the high-resolution mode. Along the left edge, the red beam was too far to the left and the green too far to the right, while along the bottom edge, the red beam was too high. There were similar problems in the VGA mode as well.

The test measurements revealed that the blue gun was set a little dimmer and wider than the red and green beams. The blue beam is hardest for the human eye to see

FACT FILE

Mitsuba 710VH
Mitsuba Corp., 650 Terrace Dr., San Dimas, CA 91773; (800) MITSUBA; (714) 592-2866.
List Price: $495 (tilt/swivel base and cable included).
Requires: VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 14.
In Short: The Mitsuba 710VH is the least expensive monitor in this roundup. Drawbacks include hard-to-reach controls, the lack of horizontal size control, and an image quality slightly lower than competitors.

CIRCLE **409** ON READER SERVICE CARD

SUPER VGA MONITORS: PERFORMANCE TESTS

On PC Labs' tests, all 24 Super VGA monitors in this roundup performed acceptably in both Super VGA and VGA modes. Although results from the drift and line-width tests show little variance among the monitors, pincushioning results show greater disparity—with the MAG Computronic PMV14VC Plus, the Amdek AM/738 Smartscan, and the Princeton Ultra 14 producing the most consistently straight lines.

For the **Drift** test, the Superspot 100 measures the time variance of an image—specifically, how far a fixed line moves in 1 minute, based on a 2.5-minute test.

The **Horizontal Line Width** test measures the average width of a line positioned half an inch below the top edge of the screen. Using a *Microsoft Windows* test-pattern image, we measured the widths of red, green, and blue lines, then averaged the results. Optimal line width is subjective; anything within a range of roughly 10 to 40 mils should be quite satisfactory.

The **Vertical Line Width** test measures the average width of a line positioned half an inch from the right edge of the screen. Using our *Windows* test-pattern image, we measured the widths of red, green, and blue lines, then averaged the results.

The **Horizontal Pincushioning** test measures how curved a horizontal line becomes when positioned at the edge of the display. This is reported in terms of the maximum deviation from a straight line. The Horizontal Pincushioning test was based on 21 sample points on a line half an inch below the top edge of the screen, starting half an inch from the left edge and ending half an inch from the right.

The **Vertical Pincushioning** test measures line curvature based on 21 sample points on a vertical line half an inch from the left edge of the screen, starting half an inch from the top and ending half an inch from the bottom.

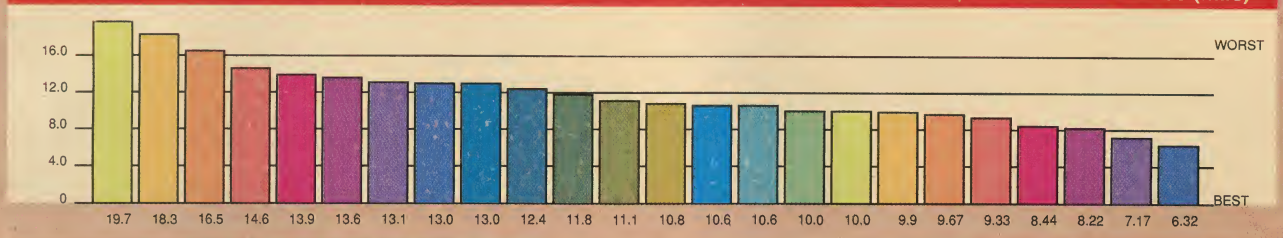
PC Labs' tests of Super VGA monitors were performed using a Microvision Superspot 100 CRT measurement device, an 8-MHz IBM PC AT, and a Paradise VGA 1024 Card graphics adapter. The test suite is the same one we used to measure the performance of 1,024 by 768 monitors in the April 10, 1990, issue of *PC Magazine*. For the current article, we tested the monitors in both VGA (640 by 480) and Super VGA (800 by 600) modes; results are reported for both. Measurements are in mils (1 mil = .001inch).

CONTINUES

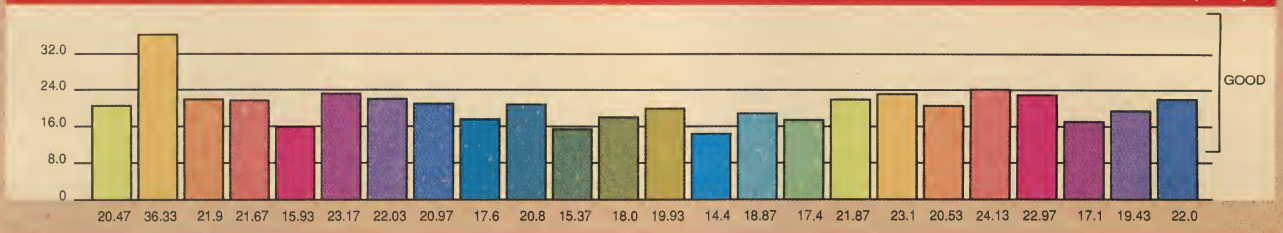
SUPER VGA MONITORS: PERFORMANCE TESTS

PC LABS

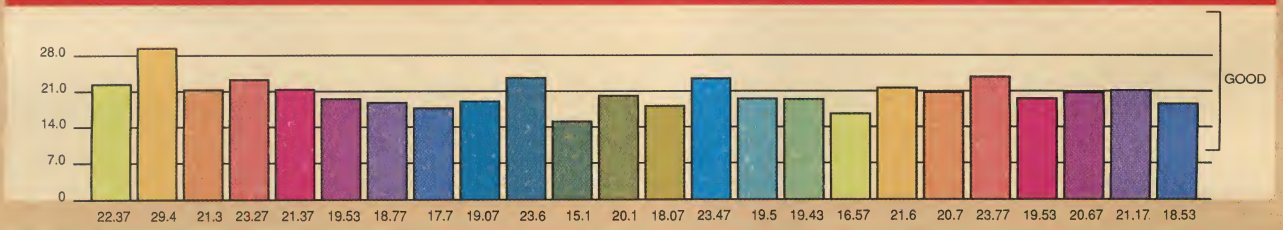
Drift — Distance (mils)



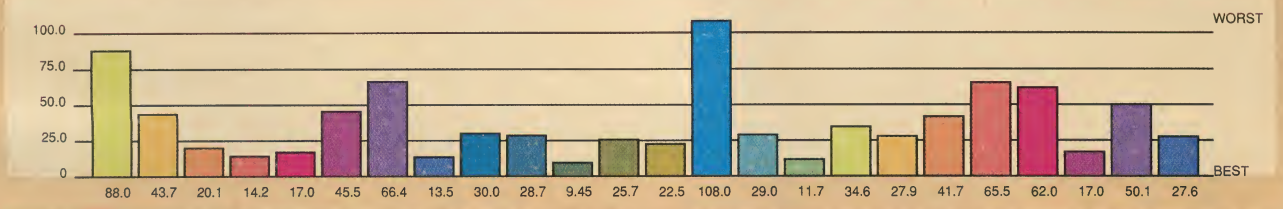
Horizontal Line Width — (mils)



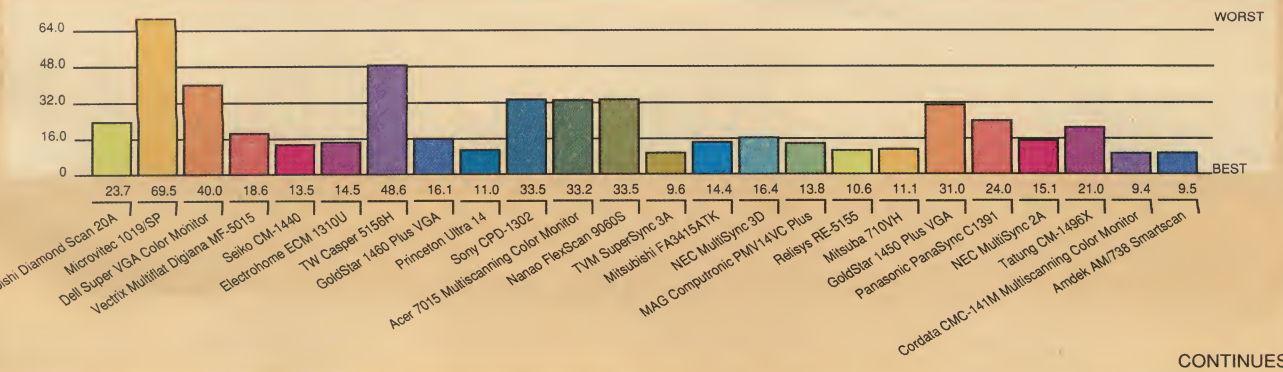
Vertical Line Width — (mils)



Horizontal Pincushioning — Distance (mils)



Vertical Pincushioning — Distance (mils)



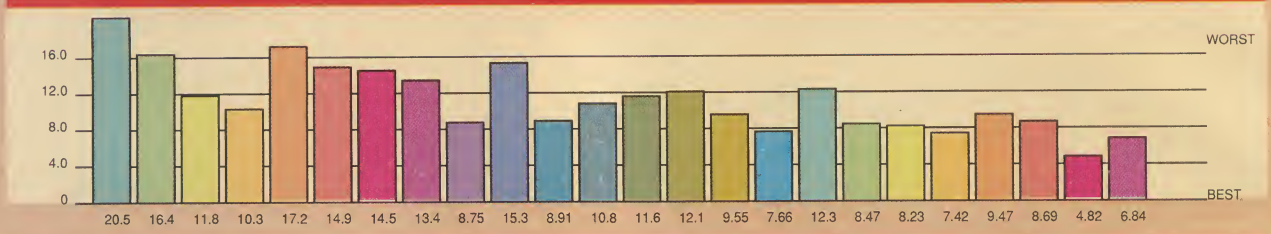
CONTINUES

VGA MONITORS: PERFORMANCE TESTS

PC LABS

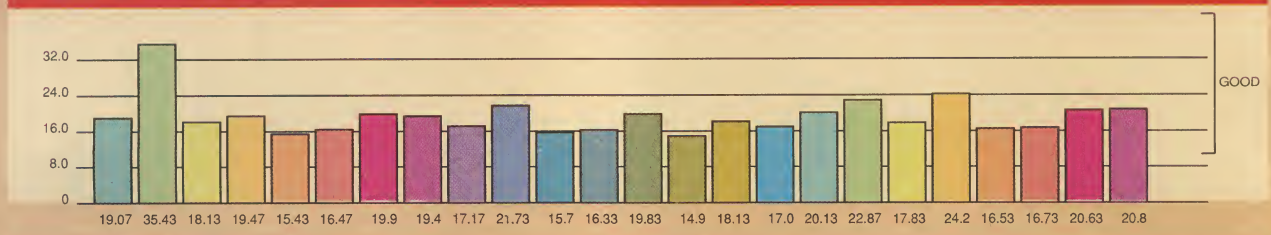
Drift

Distance (mils)



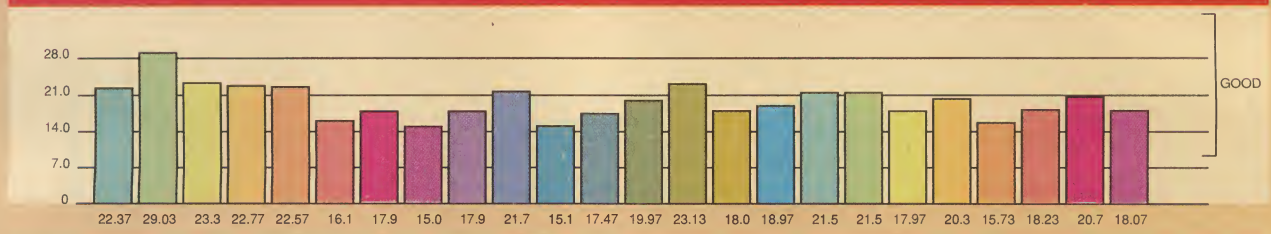
Horizontal Line Width

(mils)



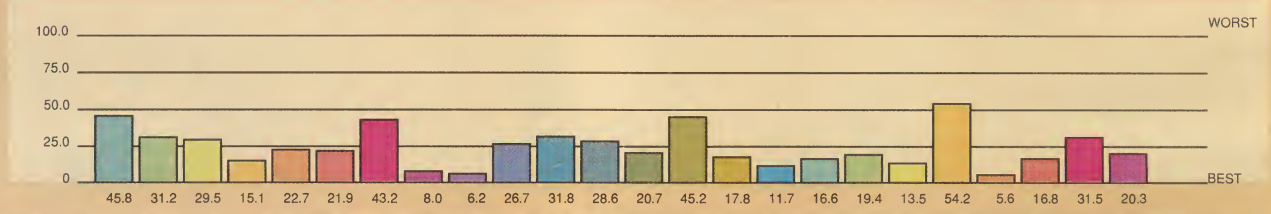
Vertical Line Width

(mils)



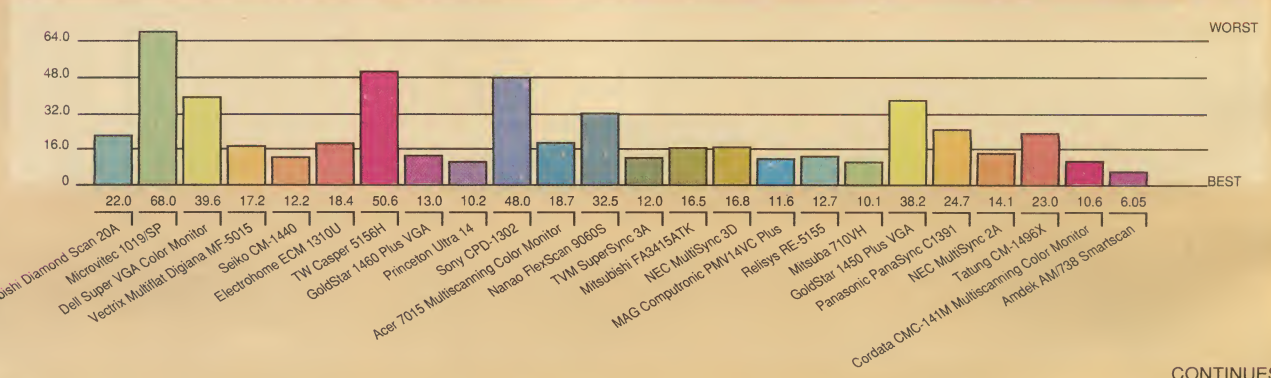
Horizontal Pincushioning

Distance (mils)



Vertical Pincushioning

Distance (mils)



CONTINUES

There are two kinds of innovations in the computer business. The ones you just talk about. And the ones you actually use.

Introducing I

The new Macintosh IIfx. 53 innovations, one powerful idea: to give you more power to do more things more easily than ever before.

Introducing the computer you've all been waiting for.

It's just not the company you've been expecting it from.

The new Macintosh® IIfx from Apple Computer, Inc.

While others have just been talking about the computer of the future, we've actually been building it.

A computer that combines astonishing levels of speed, performance and flexibility with the power of thousands of proven second- and third-generation programs that all work in the same graphic, consistent, human way.

A pair of new video cards turns 18 new ideas from Apple labs into 16,776,960 more colors you can actually see. But only on a Macintosh.

And most impressive of all, you can put it on your desk and actually use it today.

The IIfx alone incorporates 53 major innovations—too many to list here. But a few merit special mention:

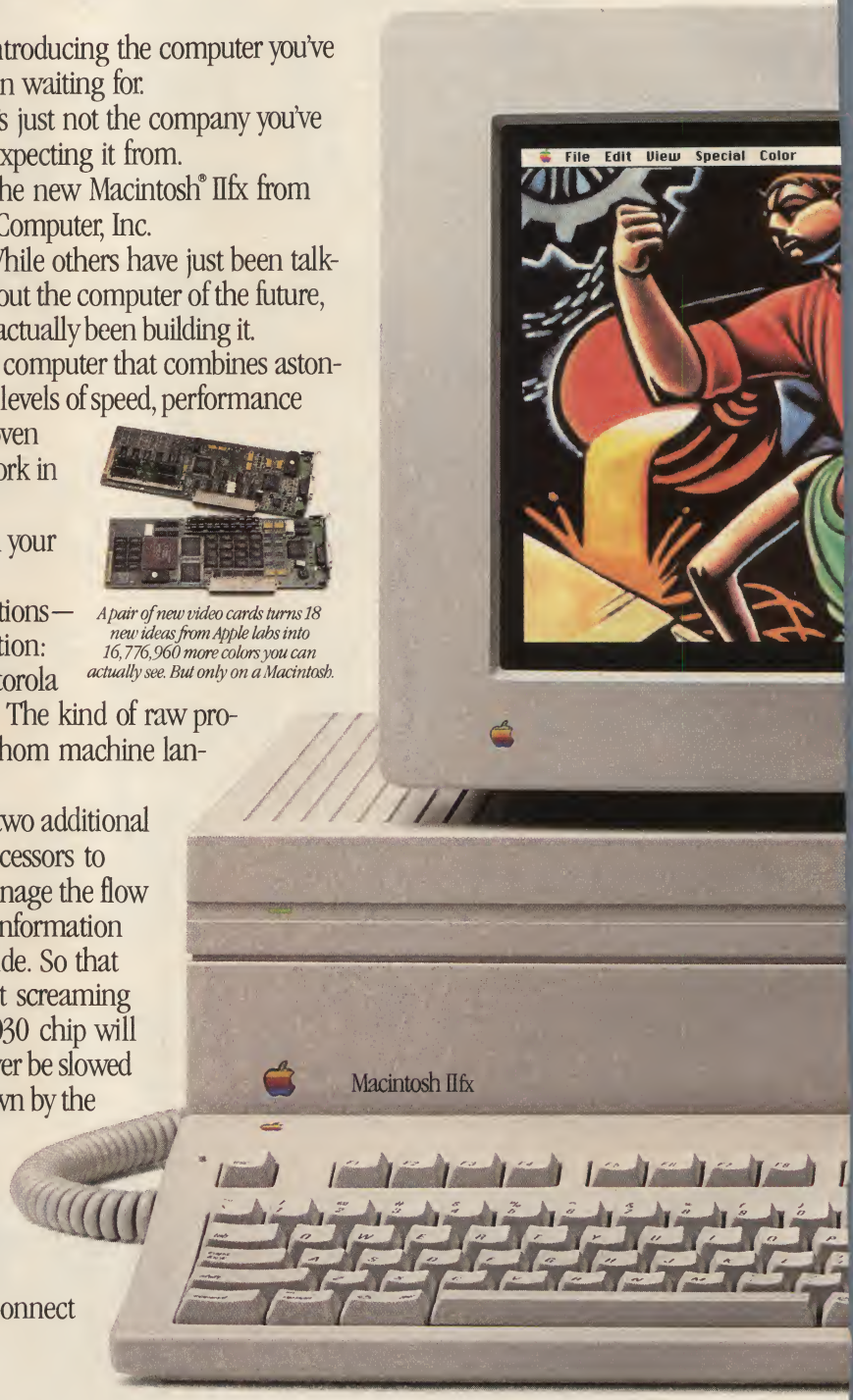
It is the first personal computer to offer a Motorola 68030 microprocessor running at 40 megahertz. The kind of raw processing power that will impress even those for whom machine language is a first language.

It is also the first personal computer to have two additional processors to manage the flow of information inside. So that that screaming 68030 chip will never be slowed down by the more mundane tasks of computer housekeeping.

Apple's latest version of UNIX, A/UX 2.0, lets you run UNIX, UNIX X Window System and off-the-shelf Macintosh programs at the same time. 32 innovations for Apple, hundreds more choices for you.

It comes standard with 4 megabytes of memory and up to 160 megabytes of storage capacity. And six NuBus™ slots to let you expand its awesome capabilities even more.

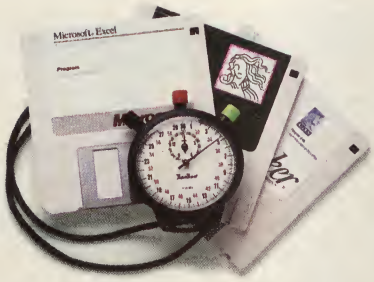
It even has built-in networking capability to connect



The new Macintosh IIfx. Mea

National Software Testing Laboratories ran benchmarks comparing the Macintosh IIfx with the IBM Model 70/486 running Microsoft Excel, Aldus Pagemaker and Adobe Illustrator. NSTL found the IIfx was 34% to 270% faster running these three popular programs, doing the things you normally do in business. In the same tests, the IIfx was also faster than the Compaq 386/33. The full NSTL test reports are available on request. *© 1990 Apple Computer, Inc. Apple, the Apple logo, Macintosh and A/UX are registered trademarks, and SuperDrive and "The power to be your best"*

03 of the latter.



*The most powerful personal computer is the one people actually use. But just for the record, the IIfx blew the windows off the hottest 486 PC in overall performance tests.**

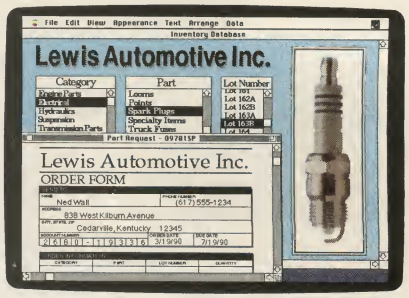
easily to the PCs, mainframes or minicomputers you already own. Plus an Apple® SuperDrive™ disk drive that reads and writes MS-DOS and OS/2 formats, to let you move information between computers on ordinary 3½-inch floppy disks, exploiting the information you've already collected in ways you never could before. And with programs like SoftPC, the IIfx will even run your MS-DOS software. That's real power.

And because those thousands of Macintosh programs all work together to optimize your performance as well as your computer's performance, you can apply all that power to solving the problems you have today.

Of course, the beauty of owning any Macintosh is how easily you can take advantage of the steady stream of innovations from Apple labs.

Take Apple's new 24-bit color card, for example. Just pop it into any modular Macintosh and you'll have the ability, in any program, to work with up to 16.8 million colors (roughly 16,776,960 more than you'll see on your PCs today).

Or slip in Apple's new graphics accelerator card and see those same colors plus lightning redraw speed.



The IIfx runs thousands of proven Macintosh programs that all work in the same consistent, intuitive way. It can even run MS-DOS programs with no extra hardware.

You can even have the benefits of Macintosh in a UNIX® environment.

Apple's latest version of UNIX for Macintosh—A/UX® 2.0—lets you run UNIX programs, UNIX X Window System programs and off-the-shelf Macintosh personal productivity software *at the same time.*

So if you're ready to start using innovations instead of just hearing about them, get your hands on a Macintosh.

The computer with the power to surprise you. The power you buy a computer for in the first place.

The power to be your best.™

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From the most affordable Macintosh Plus to the extraordinary new Macintosh IIfx — Macintosh gives you more power to do more things more easily than any other personal computer system in the world. The only question is, how much power do you want?

It may be difficult for you to imagine Macintosh® as the world's most powerful personal computer system.

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When they're tossing around words like "democracy" and "freedom" in *Pravda.*

When millions of people are looking at the way things work and deciding another system just might work better.

What a perfect opportunity to actually try a Macintosh.

You'll find that there's a Macintosh personal computer for every job, every person, every enterprise and every budget. All different. But all very much the same.

They all run thousands of programs that work in the same graphic, intuitive way. So you can learn the basics of all of them simply by learning one.

They all run the same software, with the same point-and-click simplicity. So when you move from one Macintosh to another, you won't have to replace all your programs.

They all have built-in networking. So you can integrate Macintosh with your mainframe, mini and personal computer systems. And bring their vast information resources to your desktop with the ease and efficiency of Macintosh.

And with innovations like the Apple® SuperDrive™ disk drive built into most of them, you can move information between a Macintosh and your MS-DOS or OS/2 PCs on a standard 3½-inch floppy disk. Or even run MS-DOS programs with no extra hardware.

No other computer system in the world gives you so much power to do so many things so quickly and so easily.

So what do you say? If all kinds of people can work together side by side, why not all kinds of computers?

All we ask is that you give Macintosh a try.

Then, you'll save the money you would spend trying to squeeze the advantages of a graphic interface out of personal computers that aren't designed for it. And have Macintosh personal computers, which are.

Then, you won't have to wait years to see if other systems ever deliver on their promises. And have Macintosh, which delivers on them today.

Then, you'll have the power everyone in the world is looking for. The power you can use right now.

The power to be your best.™ ®

CIRCLE 251 ON READER SERVICE CARD

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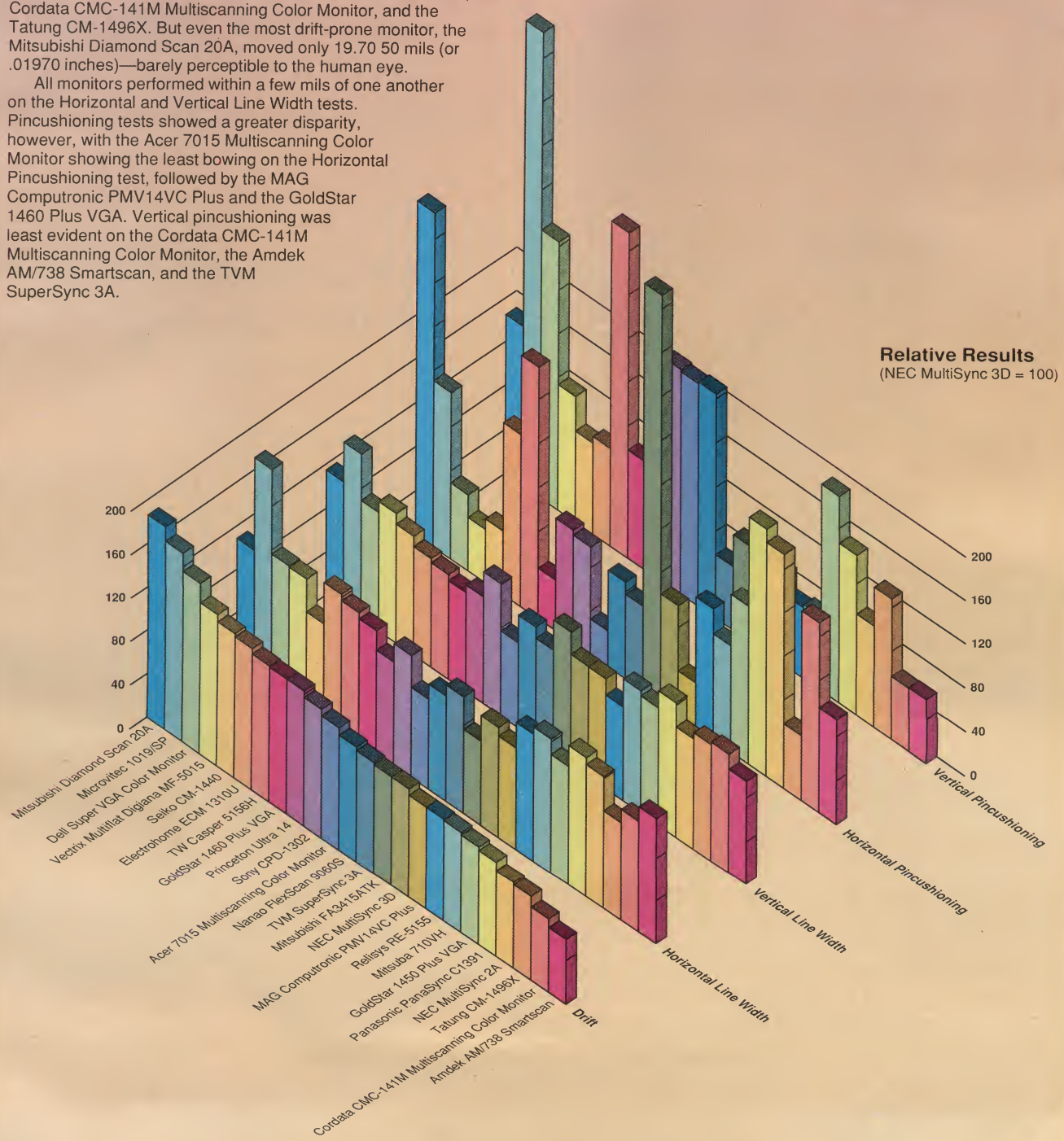
SUPER VGA MONITORS: PERFORMANCE TESTS

PC LABS

Overall, the monitors in this roundup produced acceptable results on PC Labs' tests in Super VGA mode. Minimal movement during our Drift test was achieved by the Amdek AM/738 Smartscan, the Cordata CMC-141M Multiscanning Color Monitor, and the Tatung CM-1496X. But even the most drift-prone monitor, the Mitsubishi Diamond Scan 20A, moved only 19.70 50 mils (or .01970 inches)—barely perceptible to the human eye.

All monitors performed within a few mils of one another on the Horizontal and Vertical Line Width tests. Pincushioning tests showed a greater disparity, however, with the Acer 7015 Multiscanning Color Monitor showing the least bowing on the Horizontal Pincushioning test, followed by the MAG Computronic PMV14VC Plus and the GoldStar 1460 Plus VGA. Vertical pincushioning was least evident on the Cordata CMC-141M Multiscanning Color Monitor, the Amdek AM/738 Smartscan, and the TVM SuperSync 3A.



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720 x 480 (31K)
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WD/Paradise Chip Set
256 Colors (512K)

The LOOP-Sync CT1458 MULTI-frequency monitor and the LOOP CT-418 monochrome monitor completes the LOOP video line.

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108	CT-1458 (Multisync)	14", 0.29 mm Dot Pitch, Non-Interlaced

LOOP HAND-HELD COLOR SCANNER

JX-100 ID #503 **$599.00**

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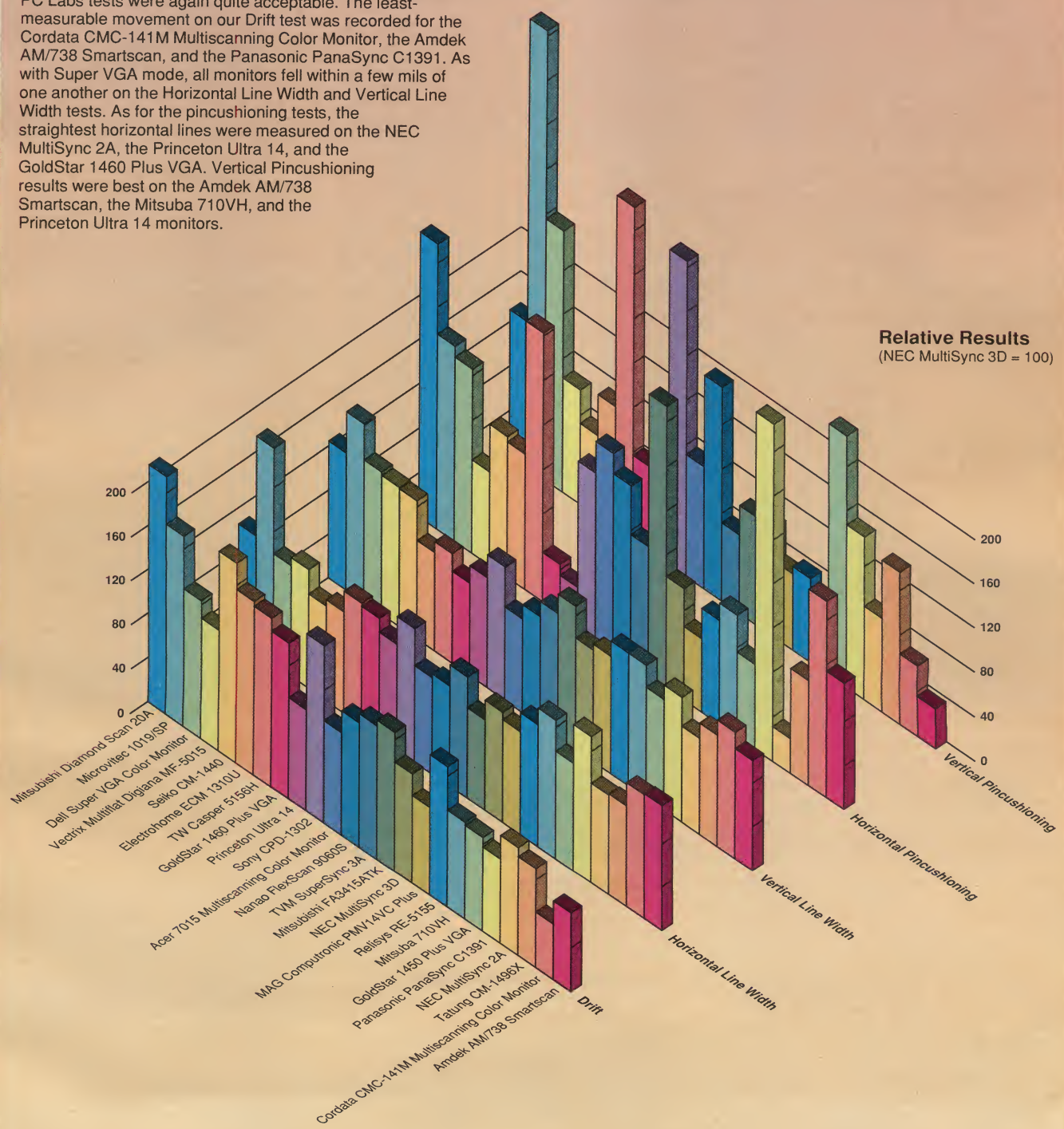
CIRCLE 329 ON READER SERVICE CARD

VGA MONITORS: PERFORMANCE TESTS

PC LABS

Although VGA (640 by 480) mode on these monitors involves different electronics than Super VGA does, overall results on all PC Labs tests were again quite acceptable. The least-measurable movement on our Drift test was recorded for the Cordata CMC-141M Multiscanning Color Monitor, the Amdek AM/738 Smartscan, and the Panasonic PanaSync C1391. As with Super VGA mode, all monitors fell within a few mils of one another on the Horizontal Line Width and Vertical Line Width tests. As for the pincushioning tests, the straightest horizontal lines were measured on the NEC MultiSync 2A, the Princeton Ultra 14, and the GoldStar 1460 Plus VGA. Vertical Pincushioning results were best on the Amdek AM/738 Smartscan, the Mitsuba 710VH, and the Princeton Ultra 14 monitors.



ENDS

accurately, so it is not surprising that this one is off. The difference could contribute to the overall lower image quality, however, and could indicate that the unit was not as carefully adjusted in the factory as some of the competitors' monitors.

Keep in mind that the image quality was not poor; it simply was not as crisp as some of the others. Its low price is an undeniable attraction, so if you are willing to accept slightly less than the very best in order to keep a tight budget, then the Mitsuba 710VH may be a satisfactory solution.

MITSUBISHI ELECTRONICS AMERICA INC.

Mitsubishi FA3415ATK

by Winn L. Rosch

No matter what color display standard you use, Mitsubishi's FA3415ATK can handle it. The $1,015 monitor will reach back to CGA, ahead to 8514/A, and cover its 14-inch screen with any standard in between. Besides the $30 tilt/swivel base, it has enough options to make it a good choice as a general-purpose monitor.

The FA3415ATK is built around a conventional shadow-mask CRT with accommodating wideband electronics. Its 40-MHz bandwidth accepts analog or digital signals with horizontal frequencies ranging from 15.75 to 35.5 kHz and vertical frequencies from 50 to 87 Hz.

Although the manual accompanying the FA3415ATK claims only 850 by 560 resolution, the factory reports that the monitor will function up to 800 by 600 noninterlaced (which our testing confirmed) and interlaced 1,024 by 768 signals. Note, however, that Mitsubishi recommends a $1,095 companion model, the FA3425L9AT, with long-persistence phosphors for use with interlaced signals.

A single 15-pin jack on the back of the FA3415ATK handles both analog and TTL inputs; the signal type is selected with a slide switch. Mitsubishi supplies special cables to match the monitor to different graphics adapters as options. A VGA cable costs $35. The power cable cannot be removed.

Rear-panel DIP switches select among 8-color, two 16-color (normal and pastel), and 64-color digital modes as well as the color of TTL text displays (green, amber, or white). Other side switches nearby select normal or overscan mode to match digital signals and a preset control for IBM VGA autosizing.

You can fine-tune the shape and location of the FA3415ATK's image from its front panel using the horizontal and vertical size and positioning thumbwheels that hang under its front edge just to the left of its brightness and contrast controls.

The screen background of the FA3415ATK is quite dark; the standard B22 short-persistence phosphors are quite bright. The .28-mm-dot-pitch tube delivers images with good sharpness and no obvious deficiencies across the 13.25 inches of screen visible through the bezel. With the size controls set at their detents, the FA3415ATK produced VGA screens measuring 10.0 by 7.25 inches.

In testing, the FA3415ATK proved schizophrenic, giving widely divergent performance on horizontal lines (the best measured) and vertical lines (among the worst). Despite mixed scores, it displayed the best image in this roundup.

The unit's manual is thorough—albeit not always well written—and includes pinouts for any cable you'd want to make for the FA3415ATK. Signal timing diagrams are also included. But the manual has some ominous translation lapses. For example, an asterisk at the illustration of the power switch warns "Please refrain the power on and off excessively can be a cause of fires, damages and/or electrical shocks." Read that and you'll think at least twice before pushing the switch.

Mitsubishi covers the Japan-made FA3415ATK with a one-year parts and labor warranty. It is FCC Class B certified. With its spectacular display and versatility in handling other video standards, the FA3415ATK is an excellent choice for your VGA and super VGA needs.

FACT FILE
EDITOR'S CHOICE

Mitsubishi FA3415ATK
Mitsubishi Electronics America Inc., Information Systems Division, 991 Knox St., Torrance, CA 90502; (800) 556-1234 ext. 209 (outside Calif.), (800) 441-2345 ext. 209 (within Calif.), (213) 217-5732.
List Price: $1,015 (EGA cable included); tilt/swivel base, $30; cable, $35.
Requires: CGA, EGA, VGA, or Super VGA graphics adapter.
Visible Diagonal Screen Size (inches): 13.25.
In Short: The Mitsubishi FA3414ATK offers the most attractive display in this roundup. Compatible with just about any video standard and offering front-panel controls, it's an excellent monitor.

CIRCLE 411 ON READER SERVICE CARD

MITSUBISHI ELECTRONICS AMERICA INC.

Mitsubishi Diamond Scan 20C

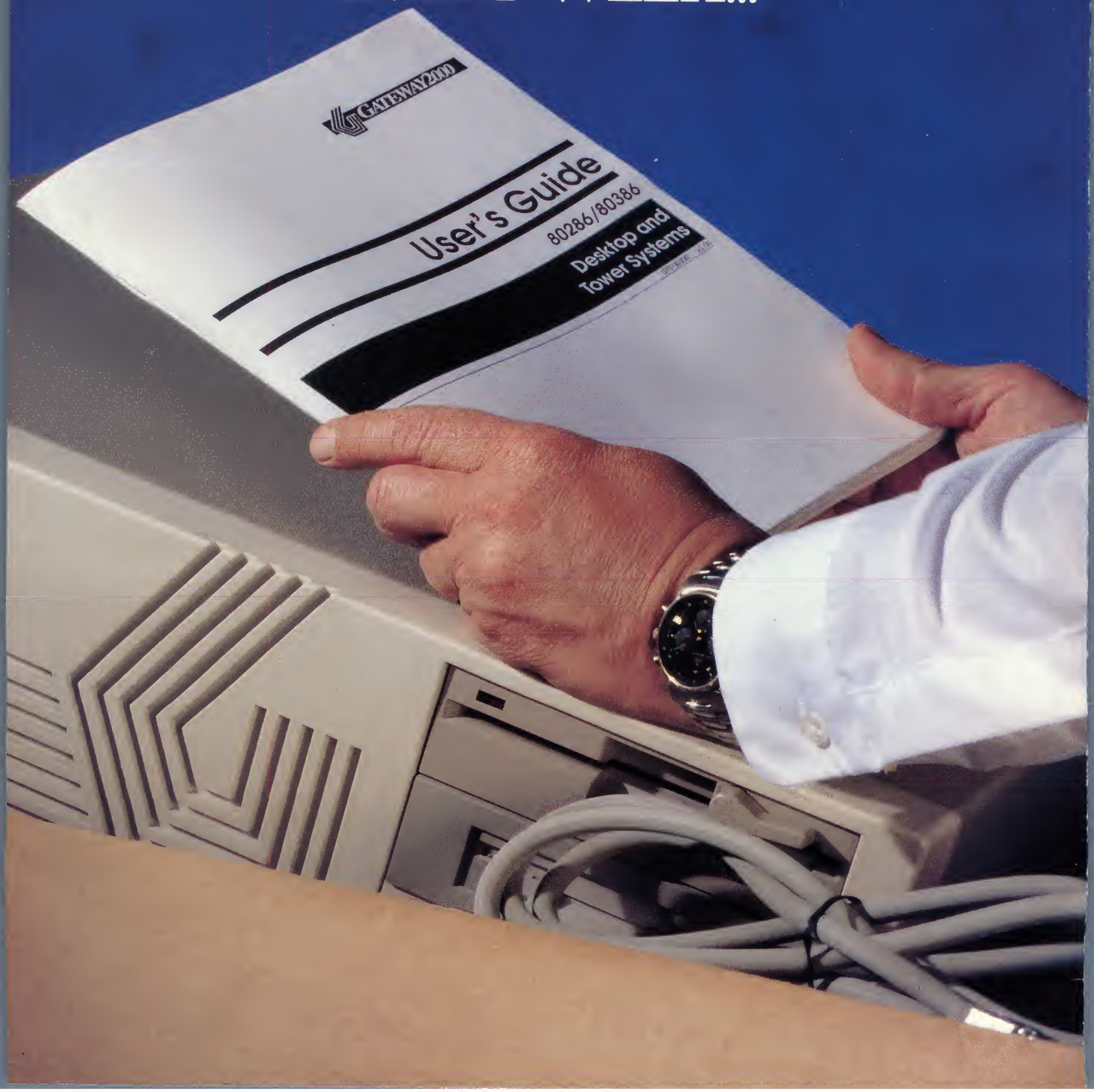
by Bruce Brown

Big, beautiful, powerful, and expensive, the $2,670 Diamond Scan 20C, also known by its model designation HC3905ATK, weighs 66 pounds and has a diagonal screen size of 20 inches. Sold by Mitsubishi Electronics America's Information Systems Division, the 20C displays gorgeous colors and crisp graphics. Maximum noninterlaced resolution is 800 by 600; in interlaced mode, resolution can be as high as 1,120 by 780, depending on the display adapter. This monitor can also work with a Macintosh II.

Depending on the cable you use (an extra) you can run the Diamond Scan from TTL or analog, with inputs for 15-pin and 3-, 4-, and 5-wire coax cable setups. The coax connectors can also be set to output for what Mitsubishi refers to as *loop-through strings*. The cable for our test environment connected to a Paradise Super VGA card and was a $35 option. A tilt/swivel base is a $90 option.

In addition to several signal input and output options, the Diamond Scan 20C has a full complement of user-adjustable controls, so full that perhaps *fuller* would be a better adjective. On the front, in addition to analog brightness and contrast controls and the power button, there's a button to force monitor degaussing. On the back, there's an 8/16/64 color switch and a TTL/analog signal switch. On the monitor's right side, behind a removable panel, a picture-control dial lets you select from nine picture-dimension controls, including horizontal phase, size, and position; vertical position, size, and fine size; contrast,

THOUSANDS OF PEOPLE DO THIS EVERY WEEK...



12 MHZ 286 VGA

- 80286-12 Processor
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- 16 Bit VGA with 512K
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- 110 Meg ESDI Drive
- ESDI Controller with 32K Cache
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- 1.44 Meg 3.5" Drive
- 150 Meg ESDI Drive
- ESDI Controller with 32K Cache
- 16 Bit VGA with 512K
- 14" 1024 x 768 Color Monitor
- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01

$5295.00

This device has not been approved by the Federal Communications Commission. This device is not, and may not be offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.

WE'LL TELL YOU WHY

Ray: That's where we shine. Gateway's tech support is the best in the industry. We know what we're talkin' about, but most importantly, we care. We'll bend over backwards to take care of you. You won't hear us saying, "Sorry ma'am, that's a software problem." We don't care whose problem it is. If the machine is not working for you, we'll do everything in our power to get you up and running.

Ted: What if you can't fix a problem over the phone?

Ray Kayl, Technical Support Manager

Ray: Then we can send a technician to almost anyplace in the nation.

Ted: Kathy—bet you thought I forgot you—what about customer service?

Kathy: Customers get very personal service here. When you call Gateway, you'll be

Kathy Skidmore, Customer Service Manager

assigned to one customer service representative who will follow your order from start to finish. Your personal rep will make a special effort to get to know you and make sure you're completely satisfied.

Norm: Hey, this sounds almost too good to be true.

Ted: Some people think that. But our customers don't—ask them. They know Gateway 2000 is the best value in the industry.

Norm: Do we have an ad yet?

Ted: Yeah, I think so. All I have to do is cut some prices on our systems. Then get ready for a really hot summer...(Tape End Indicator.)

Norm Waitt, Vice President

GATEWAY 2000

"You've got a friend in the business."

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CIRCLE 364 ON READER SERVICE CARD

PULL UP A CHAIR AND

Ted: OK, we're putting together another ad for the magazines and I thought you should be the ones to write it.

Todd (laughing): Hey, Ted, I'm no writer.

Ted Waitt, President

Ray: Me neither. Don't you s'pose we could hire somebody to write our ads? (Laughter.)

Ted: No, because we've always been straight forward in our advertising. I've analyzed the market and I can't understand why anyone would buy a computer from anyplace except Gateway. Now I know you all agree with me, so I want you to tell the world what you can do for them. Just straight talk from a friend in the business. I'm recording this—

Troy: Is this legal?

Ted: —and I'm gonna give the tape to word processing for a transcription. And that's gonna be our ad.

Norm: This oughta be good! (Laughter.)

Ted: Todd, you're on. I'm looking for a computer system. Why should I buy from Gateway 2000?

Todd: Because Gateway has the best value. We lead the market in price, quality and service. It's that simple. You wanta get the best system for the best price from a company you can depend on? Then buy from Gateway 2000.

Todd Osborn, Sales Manager

Troy: Yeah, shop around. But don't be fooled by stripped-down systems. Compare Gateway feature for feature and we blow the competition away.

Norm: And read the reviews. Our systems out-perform machines that cost twice as much.

Ted: Troy, you're on. You run the plant so you tell me what kind of quality I can expect?

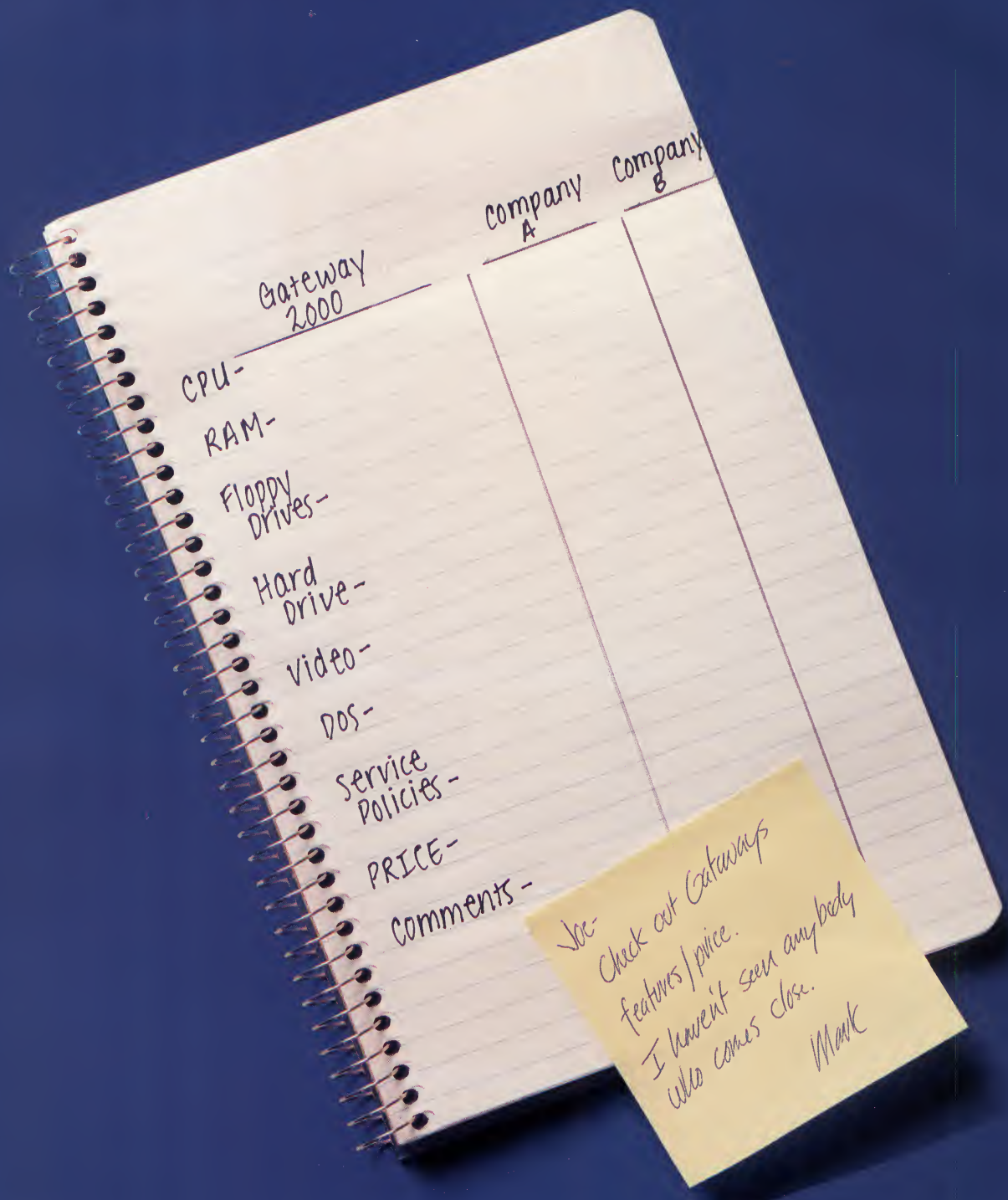
Troy Miller, Plant Manager

Troy: Well we use a component that's not very common today—pride. Each machine that goes out the door is custom-built by one person. That person's pay is determined by how satisfied you are as a customer. We use only top-of-the-line components. You combine that with the midwest work ethic and you've got an unbeatable combination.

Ted: OK, Gateway's got great prices on quality systems. But we can't guarantee everyone that they'll never have a problem.

Ray: If we could, I'd be out of a job. (Laughter.)

Ted: Yeah, Ray. Tell me about your job. What happens if a customer does have a problem?



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FACT FILE

Mitsubishi Diamond Scan 20C
Mitsubishi Electronics America Inc., Information Systems Division, 991 Knox St., Torrance, CA 90502; (800) 556-1234 ext. 209 (outside Calif.), (800) 441-2345 ext. 209 (within Calif.), (213) 217-5732.
List Price: $2,670; tilt/swivel base, $90; cable, $35.
Requires: CGA, EGA, VGA, or Super VGA graphics adapter and cable.
Visible Diagonal Screen Size (inches): 19.
In Short: Slightly more expensive than its Microvitec competitor, the Mitsubishi Diamond Scan 20C offers a better image, autosizing, and FCC Class B certification.

CIRCLE **410** ON READER SERVICE CARD

pincushion side gain, and pincushion side phase. You can set each of these nine calibration controls via increase and decrease buttons to adjust the controls according to input signal frequencies.

As befitting its larger case and tube size, the Diamond Scan 20C has a bigger-than-usual visible display area. In higher resolution modes this monitor can be terrific for displaying lots of data at once as well as for the obvious CAD and desktop publishing applications. Other potential uses for the 20C that take advantage of its size are demonstration applications and instances in which an operator or user has to be physically farther than normal from the display.

The Mitsubishi comes with very classy documentation printed on glossy paper with clear line drawings and ample charts, tables, and figures. If the plethora of controls intimidates you, you'll be happy to know that calibration is greatly helped by the manual, which graphically demonstrates the effect of increasing and decreasing the values for each setting.

Everybody doesn't need a 66-pound 20-inch monitor, especially when it costs over $2,500. On the other hand, if you need the Diamond Scan 20C's size, performance, variety of input sources, and controls, this impressive machine is a real pleaser. Compared with the 19-inch Microvitec 1019/SP, the Diamond Scan 20C offers a better image and autosizing.

NANAO USA CORP.

FlexScan 9060S

by Alfred Poor

The FlexScan 9060S from Nanao USA Corp. is a 14-inch monitor that carries a hefty $1,053 list price tag. The 9060S comes with a host of interesting features, however, which may influence your buying decision.

The monitor comes with a tilt/swivel base and sports a power switch and brightness and contrast controls on the front, where they're easy to reach. Unlike some other designs, the 9060S also has the picture size and location controls up front as well. There is a full set of four controls: size and location for both horizontal and vertical dimensions. The monitor even includes a switch that allows you to select different colors for text modes.

There are more controls in the back: a mode switch and a 8/16/64 color selection switch are present because the monitor accepts either analog RBG or digital (TTL) signals. This gives you the flexibility of using the display with just about anything from a CGA to an 8514/A adapter.

The Nanao FlexScan 9060S carries a top-range list price but delivers a good image and a wide range of features.

The 9060S even has pincushioning and convergence controls on the back. These two affect the image only horizontally, but some control is better than none. In fact, the pincushion and convergence looked pretty good at the factory setting, so I didn't attempt to improve them with the controls. All the monitor's test results were about average for the group.

I did need to make some adjustments to the picture, however. The vertical size of the image did not remain steady as I switched from VGA to 800 by 600 resolution, and I had to tweak the vertical size each time. It was not difficult, but it would be better if the monitor could maintain picture size more consistently between modes. Compared with an IBM 8513 VGA monitor, the 9060S's colors were not as vivid, but the image was much sharper. The picture quality was very good, though not as impressive as its sibling, reviewed in the April 10, 1990, issue.

If you need to mount two monitors next to each other, the FlexScan 9060S offers a feature that may be of interest. According to a Nanao representative, the monitor incorporates special "saddle/saddle winding coils" in the deflection yoke on the picture tube. This design reportedly generates a smaller magnetic field around the monitor. Two monitors of traditional design need about 60 cm between them to avoid interference, according to Nanao, but two monitors with the saddle/saddle design can be as close together as 15 cm without affecting the images. Note that it takes two monitors with this feature to get this design benefit.

The Nanao FlexScan 9060S carries a top-range list price but delivers a good image and a wide range of features. If you need its various bells and whistles, it can be a good choice, but if you don't need all its flexibility, you may find a better value among its competitors.

FACT FILE

Nanao FlexScan 9060S
Nanao USA Corp., 23510 Telo Ave., #5, Torrance, CA 90505; (213) 325-5202.
List Price: $1,053 (tilt/swivel base and cable included).
Requires: EGA, VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 13.
In Short: The FlexScan 9060S accepts both digital and analog signals and can work with everything from EGA to 8514/A adapters. The picture quality is acceptable, but you pay top dollar for its varied features. If you do not need all this flexibility, you may find a better value elsewhere.

CIRCLE **412** ON READER SERVICE CARD

NEC TECHNOLOGIES INC.

NEC MultiSync 2A

by Mitt Jones

When it comes to Super VGA monitors, you can't get more straightforward than the $799 NEC MultiSync 2A—the least expensive of NEC's color VGA offerings. Priced $350 less than the MultiSync 3D (also reviewed in this article), the MultiSync 2A works only with analog adapters and offers far fewer controls than the 3D. But the 2A's six controls are so easy to use that even novices could handle them immediately.

The curved back surface of the MultiSync 2A—the area where you would ordinarily find the controls—stands surprisingly barren. At the base of the monitor, you'll find the power-cord connector and the signal cable, which is permanently attached to the monitor and terminates in a DB-15 connector. Using the monitor is as simple as hooking up the two cables and flipping on the power switch.

That switch, along with the MultiSync 2A's five thumbwheel controls, finds its home at the front of the monitor, underneath the bottom-front ledge of the etched, nonglare display. The horizontal position, vertical position, and vertical size controls lie towards the left of the case; the brightness and contrast controls lie near the power switch to the right.

Once up and running, our evaluation unit performed respectably. Measurements taken with the Microvision test equipment showed narrow line widths, indicative of a sharp image, and respectable readings otherwise.

The automatic image sizing of the MultiSync 2A worked flawlessly, maintaining a nicely constant picture size throughout VGA modes. My only complaint here concerns the rigidly narrow image. Our evaluation unit left a gap of about ⅞ of an inch on each side in VGA modes and ⅝ in Super VGA mode. The monitor makes no provisions for manual control of horizontal size.

In less-scientific tests, the screen image consistently seemed much sharper but less vibrant than the IBM 8513 VGA monitor. Even with the NEC adjusted to its brightest level, the white background of a *Windows* screen looked a bit dim and gray when compared with the same image on the IBM. At normal brightness levels, the dark colors of the NEC matched those of the IBM, while the lighter colors seemed slightly washed out. In all fairness, however, these differences were not great. I'd take the crisp NEC over the fuzzy IBM image any day.

All in all, the NEC MultiSync 2A rates as a good, safe choice for those who have no need for TTL capabilities. Though by no means boasting the best overall picture quality of the monitors reviewed here, the MultiSync 2A carries the advantage of a relatively low price and the backing of a company that's firmly established.

NEC MultiSync 2A
NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; (800) FONE NEC, (708) 860-0335.
List Price: $799 (tilt/swivel base and cable included).
Requires: VGA or Super VGA graphics adapter.
Visible Diagonal Screen Size (inches): 13.
In Short: The 14-inch NEC MultiSync 2A brings up the rear of NEC's color VGA-capable monitor line. Overall picture quality is sharp but otherwise unexceptional.

CIRCLE **413** ON READER SERVICE CARD

NEC TECHNOLOGIES INC.

NEC MultiSync 3D

by Alfred Poor

The NEC MultiSync 3D may look like just another 14-inch color monitor that can handle resolutions as high as 1,024 by 768 interlaced, but it's more. It may seem expensive when you consider its $1,049 list price, but for those who need the 3D's features, it's well worth it.

Most monitors are based on analog controls—dials or knobs that allow you to adjust picture size or location. Typically, these controls allow only one or two settings that must be applied to all the resolutions the monitor can handle.

Not so with the MultiSync 3D. Instead of rollers for picture location and size, it has buttons. These are digital controls, and they allow you to make adjustments for all the different signals sent to the display.

NEC MultiSync 3D
NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; (800) FONE NEC, (708) 860-0335.
List Price: $1,049 (tilt/swivel base and cable included).
Requires: Hercules, CGA, EGA, VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 13.
In Short: The MultiSync 3D uses digital controls and can accept either analog or digital video signals, thus giving it enormous flexibility in terms of the kinds of images it can accept and display. Its image quality is a bit above average, but you will want to pay the extra price this monitor carries only if you have a need for its varied capabilities.

CIRCLE **414** ON READER SERVICE CARD

The MultiSync 3D can accept either analog or digital signals using the same cable that's permanently attached to the back of the case. It comes with factory presets for the major resolutions, including Hercules, CGA, EGA, VGA, Super VGA, and 8514/A 1,024 by 768 interlaced. You can alter these settings or create your own for nonstandard signals; the 3D can store up to 19 different sets of adjustments.

Incidentally, the cable is the only thing you will find on the back of the tilt/swivel base. All the controls are mounted on the front panel, where they are easy to reach and use when you're adjusting an image on-screen. Brightness, contrast, and power are all out in front where they can be seen easily, while the rest hide discreetly behind a small, drop-down cover.

All these features are well described and illustrated in the MultiSync 3D's manual, which is one of the best in the group.

As far as performance goes, the 3D performed adequately, though it was not a standout in any particular area. The image sharpness was slightly above average for the class of machines as a whole. There was one convergence problem in the upper-right-hand corner, where the red beam was slightly low, but in general convergence seemed very good. Its benchmark

ALL PLUS, NO MINUS.

Introducing the Plus Series from GoldStar. A new family of seven color monitors that qualitatively and quantitatively add up in more than a few areas. The Plus Series unites the latest in technology with a completely new design that is functional yet elegant. The controls move to their most logical place, the front. We also designed slide control levels for brightness/contrast. And made the entire family very, very easy on the eyes. With sharp definition, clean design and inviting colors. They're here now, complete with a very appealing price and a free set of wipes to keep them sharp. Visit your GoldStar dealer today. Check his addition, then ask for the Plus.

Model	Description	Resolution	Maximum Resolution
1410 Plus	14″ 0.51	CGA	640 x 200
1420 Plus	14″ 0.39	EGA	640 x 350
1425 Plus	14″ 0.39	VGA	640 x 480
1430 Plus	14″ 0.31	VGA	640 x 480
1450 Plus	14″ 0.31	VGA/SuperVGA	800 x 600
1460 Plus	14″ 0.28	VGA/SuperVGA/ 8514A	1024 x 768*
1610 Plus	16″ 0.31	VGA/SuperVGA/ 8514A	1024 x 768*

*Interlaced Mode

The Plus family works with all IBM® PCs.
The 1450 Plus works with both IBM and Apple® Mac II.®

GoldStar

CIRCLE 233 ON READER SERVICE CARD

GoldStar Technology, Inc. 3003 North First Street, San Jose, California 95134 (408) 432-1331

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test measurements were typical for this roundup.

In the end, it is this monitor's capabilities that set it apart. It can be set up to work with more different display adapters than just about any other monitor we tested. Its ability to store different picture settings for all these resolutions is a unique feature. Still, you pay a premium price for these capabilities. If you do not intend to take advantage of the MultiSync 3D's flexibility, you probably can get more for your money elsewhere. But if you are looking for a monitor that you will be able to use in a wide range of settings, you'll find that the 3D is well worth it.

PANASONIC COMMUNICATIONS AND SYSTEMS CO.

Panasonic PanaSync C1391

by Mitt Jones

Panasonic endowed its 13-inch, $899 PanaSync C1391 with a few features that are difficult to resist. For starters, the monitor automatically senses whether the incoming signal is TTL or analog and adjusts itself accordingly—a nice safety feature in case you hook up to the wrong adapter. Panasonic also placed most of the monitor's controls on a hidden panel along the bottom front of the monitor, a trick other manufacturers should note. Unfortunately, the PanaSync's faults are as notable as its virtues, and those faults lie at the heart of the monitor—with the quality of the picture itself.

The PanaSync comes with both its power cord and adapter cable permanently attached. The 9-pin connector plugs directly into any IBM-standard TTL adapter. To connect to a VGA or Super VGA card, you attach the DB-9 to DB-15 cable adapter. An optional cable adapter allows connection to the Apple Mac II.

Though smart enough to adjust automatically to TTL or analog signals, the PanaSync enlists the help of numerous switches to configure itself for a specific adapter. If you want to connect the monitor to a VGA or Super VGA adapter, you simply move the Mode switch to the Auto position. Life gets a bit more difficult if you're using other adapters, but not much. You'll find that the documentation includes clear, step-by-step configuration instructions for each type of adapter. It also goes to great lengths via charts to show the various display options available by using different combinations of switch settings.

Alas, despite all this flexibility and attention to detail, the PanaSync doesn't measure up when it comes to picture quality. For instance, within moments after I displayed the PC Labs single-pixel test grid in 800 by 600 mode, I noticed a significant dip along the top of the screen and a bow along each side. PC Labs' pincushioning measurements verified the distortion. Also, the vertical lines of the grid were a dimmer than the horizontal; so dim that our test apparatus had difficulty focusing on the vertical lines.

In subjective comparisons with an IBM 8513 monitor, the PanaSync's colors lacked the IBM's brightness and depth. The PanaSync's colors appeared either too dark and stale or too light and washed out, depending on the brightness and contrast levels. In text modes, the characters were clear but dim.

And one final complaint: while the PanaSync's autosizing keeps the image constant across all VGA modes, it does so in a distracting manner. Instead of popping into place in the right dimensions after a split-second adjustment, the screen comes up immediately in the wrong proportions and then slowly grows or shrinks to the appropriate size.

In all fairness, none of these drawbacks is all-important. The colors may not be the best, but they are still attractive. It would be nice if the pincushioning were less obvious, but a little distortion isn't the end of the world.

The bottom line, however, is that there are plenty of alternatives. If the PanaSync C1391 is the only monitor with the features you want or need, buy it. Otherwise, hold out for a monitor with a more attractive and precise display.

FACT FILE

Panasonic PanaSync C1391
Panasonic Communications and Systems Co., Division of Matsushita Electric Corp. of America, Two Panasonic Way, Secaucus, NJ 07094; (800) 742-8086, (201) 348-7000.
List Price: $899 (tilt/swivel base and cable included).
Requires: Hercules, CGA, EGA, VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 13.
In Short: The PanaSync C1391 boasts a few innovative features and compatibility with all IBM-standard video adapters. Unfortunately, its overall picture quality leaves room for improvement.

CIRCLE **415** ON READER SERVICE CARD

PRINCETON GRAPHIC SYSTEMS

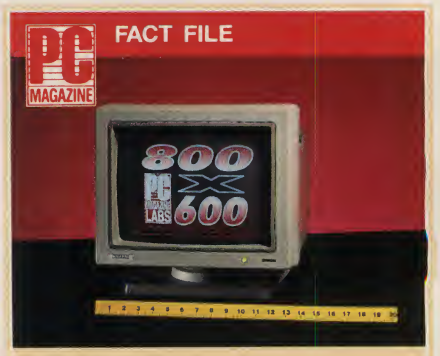
Princeton Ultra 14

by M. David Stone

At a list price of $899, the Princeton Graphic Systems Ultra 14 is a bit expensive for a 14-inch monitor that has a maximum resolution of 800 by 600. The obvious question is whether you'll find this price worth paying. The answer is a clear "maybe."

One of the strongest features of this monitor is its flexibility. The Princeton Ultra 14 can handle either TTL or analog signals over a continuous range of video modes that runs from CGA to Super VGA, including all stops in between. And with a horizontal range of 15 to 36 kHz and vertical range of 45 to 120 Hz, the monitor should also work with any reasonable vari-

FACT FILE

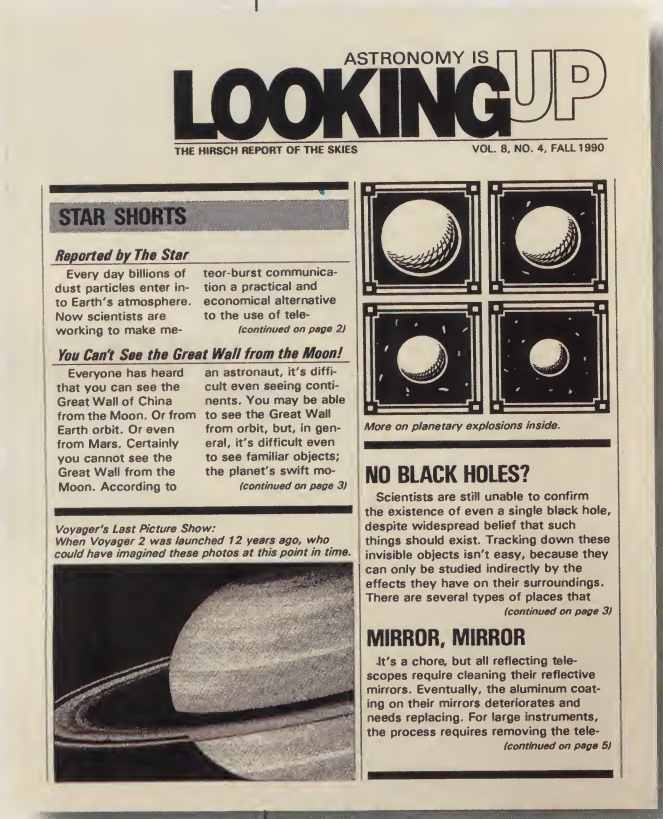


Princeton Ultra 14
Princeton Graphic Systems, 1100 Northmeadow Pkwy., Bldg. 150, Roswell, GA 30076; (800) 221-1490, (404) 664-1010.
List Price: $899 (tilt/swivel base and two cables included).
Requires: Hercules, CGA, EGA, VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 14.
In Short: As a VGA monitor, the Ultra 14 is somewhat expensive. However, for those who have applications that use 800 by 600 resolution, the Ultra 14 may justify its high price by the crispness of its image.

CIRCLE **416** ON READER SERVICE CARD

Other laser printers play with one standard dot size.

HP makes it a



ASTRONOMY IS **LOOKING UP**

THE HIRSCH REPORT OF THE SKIES — VOL. 8, NO. 4, FALL 1990

STAR SHORTS

Reported by The Star

Every day billions of dust particles enter into Earth's atmosphere. Now scientists are working to make meteor-burst communication a practical and economical alternative to the use of tele-

(continued on page 2)

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

Everyone has heard that you can see the Great Wall of China from the Moon. Or from Earth orbit. Or even from Mars. Certainly you cannot see the Great Wall from the Moon. According to an astronaut, it's difficult even seeing continents. You may be able to see the Great Wall from orbit, but, in general, it's difficult even to see familiar objects; the planet's swift mo-

(continued on page 3)

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

More on planetary explosions inside.

NO BLACK HOLES?

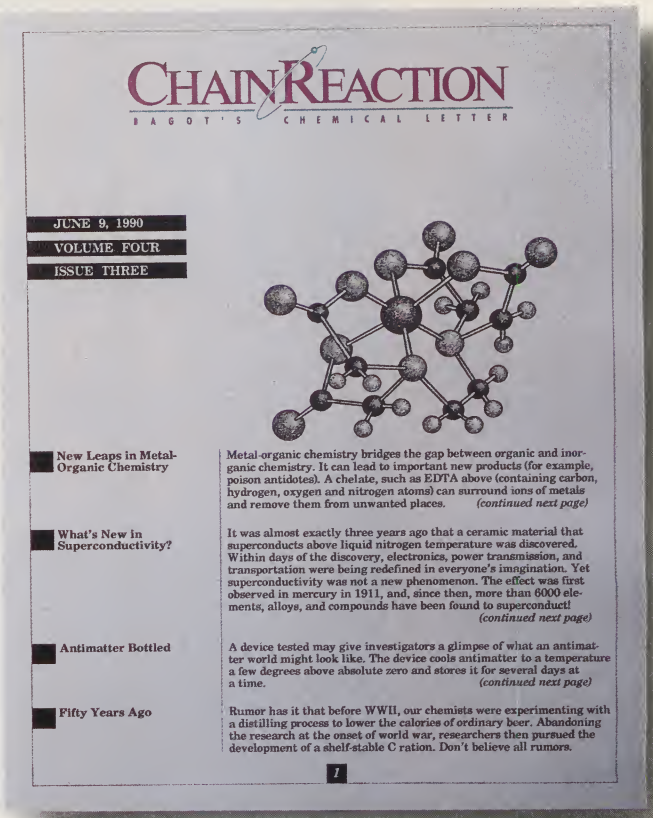
Scientists are still unable to confirm the existence of even a single black hole, despite widespread belief that such things should exist. Tracking down these invisible objects isn't easy, because they can only be studied indirectly by the effects they have on their surroundings. There are several types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

(continued on page 3)

MIRROR, MIRROR

It's a chore, but all reflecting telescopes require cleaning their reflective mirrors. Eventually, the aluminum coating on their mirrors deteriorates and needs replacing. For large instruments, the process requires removing the tele-

(continued on page 5)



CHAIN REACTION

BAGOT'S CHEMICAL LETTER

JUNE 9, 1990
VOLUME FOUR
ISSUE THREE

New Leaps in Metal-Organic Chemistry

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

What's New in Superconductivity?

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

Antimatter Bottled

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

Fifty Years Ago

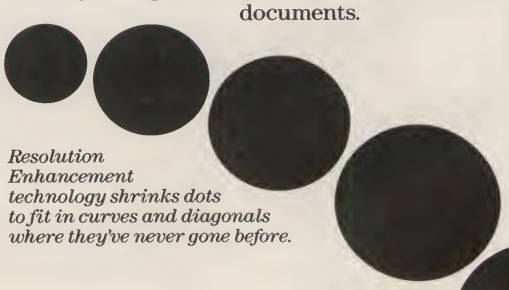
Rumor has it that before WWII, our chemists were experimenting with a distilling process to lower the calories of ordinary beer. Abandoning the research at the onset of world war, researchers then pursued the development of a shelf-stable C ration. Don't believe all rumors.

1

Introducing the new HP LaserJet III printer with Resolution Enhancement technology.

The rules have changed. Now the name of the game is Resolution Enhancement technology. You'll call it the best thing to happen to laser printing since the very first HP LaserJet printer. It gives you clearer resolution. Curves that really curve. And edges that are never jagged.

Instead of a "one-size-fits-all" dot, HP's built-in intelligence varies dot sizes. So they can fill areas where they could never go before. For clearer, more professional-looking documents.



Resolution Enhancement technology shrinks dots to fit in curves and diagonals where they've never gone before.

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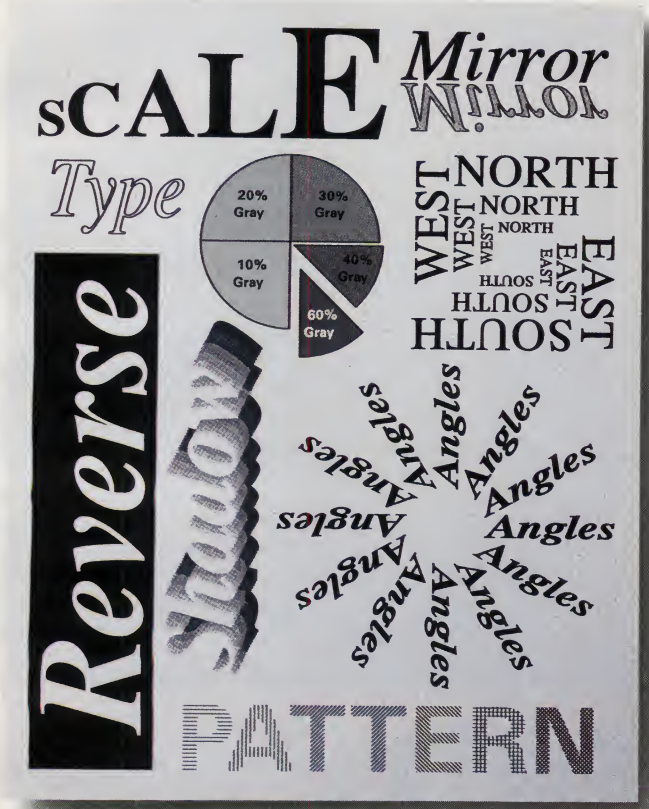
whole new ball game.



But there's more than better print quality. 14 bit-mapped fonts and 8 internal scalable typefaces provide thousands of options. And enhancements to our PCL5 printer language, including our HP-GL/2 graphics language, let you print portrait and landscape on the same page. Reverse and angled type. Spirals. Even shaded text. You can also plug in Adobe PostScript® software.

For all its new features, the $2,395* list price of the HP LaserJet III is a good deal less than the HP LaserJet

Series II printer it replaces. With the same hardware compatibility, wide range of applications, 8 ppm print speed, and software compatibility, including WordPerfect 5.1 and WordStar® 6.0. And the same reliability as the rest of the HP printer family.

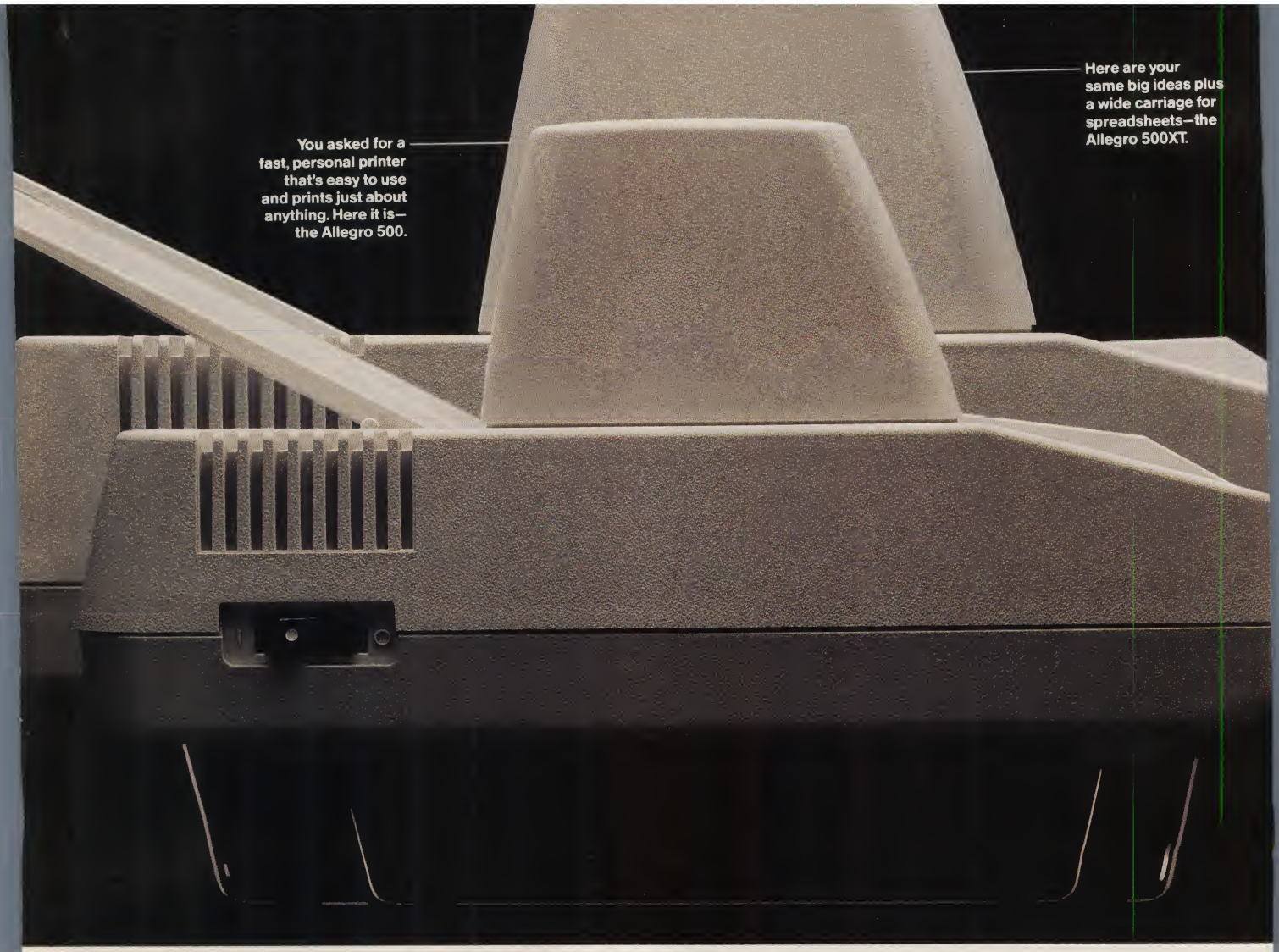
So call **1-800-752-0900, Ext. 1007.** Ask for our booklet on Resolution Enhancement technology and where to find your nearest authorized HP dealer. We'll put you in a whole new league.

There is a better way.

HEWLETT PACKARD

*Suggested U.S. list price. WordStar is a U.S. registered trademark of WordStar International Incorporated. Adobe and PostScript are registered trademarks of Adobe Systems, Inc.

CIRCLE 491 ON READER SERVICE CARD



YOU AND YOUR BIG IDEAS.

Now see what you've done.

You told us you wanted an inexpensive, 24-pin printer that could handle all your printing needs. Which is why our new ALPS Allegro 500 and wide carriage 500XT give you great letter quality output and business graphics—on everything from envelopes and spreadsheets to multi-part forms and transparencies. (Sorry, no origami.)

You didn't want paper jams. So the 500 and 500XT have a unique flatbed design that provides a straight paper path. We like to call it the path of least resistance.

You wanted convenience. We gave both Allegros an Auto Tear Bar to automatically reset your paper, eliminating paper waste. And we created ALPS MacroMind to save three of your most coveted paper settings.

"What about paper-parking?" you asked. Our answer—one button that automatically parks continuous paper so you can easily switch to single sheets.

You wanted letter-quality fonts. Both have six, plus one draft font. And you wanted speed. So the 500 hums along at 216 cps in draft mode and the 500XT at 300 cps.

To see how we fit the rest of your big ideas into two affordable packages, call 1-800-825-ALPS for the name of an Authorized ALPS Reseller. Or just ask your favorite reseller.

CIRCLE 242 ON READER SERVICE CARD

ALPS
AMERICA

Built by popular demand.

Allegro 500 and 500XT are trademarks of Alps Electric Co., Ltd.
© 1990, ALPS America.

ation in 800 by 600 resolution.

Regardless of the graphics card you use, setting up the Ultra 14 is straightforward. The unit has a single DB-25 connector on the back for either TTL or analog connections. It also comes with two cables: the TTL cable has a DB-9 connector at one end, and the analog cable has a DB-15. Both have a DB-25 connector on the other end to plug into the monitor. Setup consists of plugging in the appropriate cable on both sides, plugging in a power cord, and setting a push button on the back of the unit to TTL or analog, as appropriate for your needs.

The Ultra 14 also sports several other controls on the back, including an overscan control and a button for setting the maximum number of colors to 16 or 64 for TTL modes. More problematic is the placement of the horizontal and vertical size and position controls: they're on the back as well.

As should be obvious (to everyone except, apparently, those who design monitors), putting these controls on the back where they're not easily accessible makes them difficult to use. Fortunately, the Ultra 14 has an autosizing feature that minimizes—but doesn't eliminate—the need for adjusting the image. In PC Labs' tests, switching from 800 by 600 to VGA mode left the image slightly off-center and slightly smaller than it might be but still acceptable. In real-world use, you'd probably leave it unchanged. But if the controls were easier to get to, you might want to adjust the image more often.

You'll find that all the other controls are on the sides, with contrast and brightness thumbwheels on the left and the monochrome-text and power switches on the right. All the controls are clearly labeled, and all the picture controls are purely analog and easy to handle. The manual is terse, but you'll find that it contains most of the information you're likely to need.

In PC Labs' tests the Ultra 14 fared well enough. But far more impressive is the crispness of text on a *Windows* screen—an effect that may be partly due to the .28 mm dot pitch. At Super VGA resolution, the Ultra 14 is notable for its well-formed characters—in sharp contrast to some of the competition we looked at. If you don't have any applications that take advantage of 800 by 600 resolution, this crisp image won't matter much. But ultimately, the Ultra 14's resolution may be the best justification for the somewhat high cost of this monitor.

RELISYS

Relisys RE-5155

by M. David Stone

It may be impossible to be all things to all people, but the RE-5155 Multiscan Color Monitor from Relisys makes a valiant attempt. With the ability to handle either TTL or analog signals and a frequency range that runs continuously from CGA level up to 800 by 600 noninterlaced resolution, this $799 monitor should work with virtually any video card.

Physically, the RE-5155 is typical, sporting a 14-inch screen and a tilt/swivel base. Setup is straightforward. The single DB-9 connector on the back serves for either TTL or analog input, with a nearby switch letting you set the monitor for one or the other. A notable convenience is that the unit comes with two cables: one with a DB-9 connector on both ends, for CGA, EGA, and other TTL adapters, and one with a DB-9 at one end and a DB-15 on the other, for VGA cards. You have only to pick the cable that matches your card.

Also on the back are a few additional setup controls with which you probably won't need to bother—for scan mode, number of colors, and choice of text colors. Scan mode can be automatic or manual. In most cases, you'll want to leave the switch at auto. However, for non-IBM color modes with TTL signals, the manual mode activates the color choice, so you can set the number to 8, 16, or 64 to match your video card. Three additional switches let you choose one of seven colors for text mode. Be aware that text mode works only with TTL signals.

Except for the power switch—which is on the front of the monitor—all other controls on the RE-5155 are on the right side. These include analog controls for contrast, brightness, horizontal position, vertical position, vertical size, and vertical hold. Notable for its absence is a control for horizontal size. Significantly, in PC Labs' tests, the RE-5155 image failed to fill the screen, leaving a total left and right margin of about 1.5 inches in both VGA and Super VGA modes.

Two other controls on the right side are the switch for text mode and a switch labeled "Multi" and "PS/2." The PS/2 position is for all VGA modes; the Multi position is for all other modes. All of the controls are labeled well enough; however, they are more difficult to use than they might be, since you can't read the labels unless you crane your neck around the side of the monitor.

Except for the minor inconvenience of having the controls on the side of the unit, the RE-5155 scores well—including its performance on PC Labs' tests. If you need a VGA/Super VGA monitor that can also stretch down to CGA, the Relisys entry belongs on your list.

FACT FILE

Relisys RE-5155
Relisys, 320 S. Milpitas Blvd., Milpitas, CA 95035; (408) 945-9000.
List Price: $799 (tilt/swivel base and two cables included).
Requires: CGA, EGA, VGA, or Super VGA graphics adapter.
Visible Diagonal Screen Size (inches): 14.
In Short: This 14 inch monitor handles both TTL and analog signals. It offers a continuous frequency range that runs from CGA level up to Super VGA for 800 by 600 resolution.

CIRCLE 417 ON READER SERVICE CARD

SEIKO INSTRUMENTS USA

Seiko CM-1440

by M. David Stone

Seiko is probably better known for its watches than its computer monitors, but that doesn't mean the monitors aren't worth the time it takes to look at them. Quite the contrary—as demonstrated by the CM-1440 from Seiko Instruments USA. Priced at $899 and built around the same Sony Trinitron CRT that has such a good reputation for televisions and video monitors, this 14-inch analog-only monitor offers a one-stop solution for VGA, Super VGA, and 1,024 by 768 interlaced 8514 modes.

Setting up and using the CM-1440 is simple. The monitor comes with both power cord and video cable attached. You only need to plug the DB-15 connector into a video card and plug the power cord

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CIRCLE 368 ON READER SERVICE CARD

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into an outlet. The continuous frequency range of 31 to 40 kHz horizontal and 50 to 90 Hz vertical ensures that the monitor will work with just about any proprietary Super VGA scheme, as well standard VGA and 8514/A cards.

The image controls—all of which are strictly analog—are completely straightforward, limited to horizontal and vertical size and position controls, plus brightness and contrast. The only other control is the power switch. All are clearly labeled, and all work as advertised.

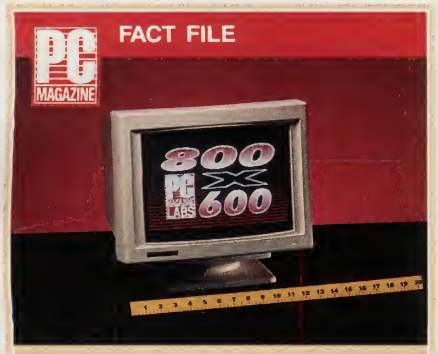
Though size and position controls are placed on the back of the unit where they are hard to reach, the monitor offers autosizing for VGA, Super VGA, and 8514 modes, which minimizes the need to adjust these settings. On PC Labs' tests, going from Super VGA to VGA mode yielded about a half-inch difference in vertical size. If the controls were easier to reach you might adjust the size, though for most purposes the difference won't matter.

The user's guide for the CM-1440 is better written than most monitor manuals, but it's largely confined to explaining installation, controls, and warranty. Technical information is sparse, limited to less than two pages in an appendix.

Trinitron CRTs are notable for using vertical slots rather than the round dots found on other monitors. The slots yield greater color saturation and more vivid colors. Another result is that horizontal lines tend to be thin, sharp, and bright; vertical lines are a little thicker, fuzzier, and dimmer. This is true both to the naked eye and to PC Labs' test equipment, which noted that horizontal line widths clustered at about 16 mils, while vertical line widths measured up to 24 mils.

In general, whether you like the effect of the Trinitron tube is partly a matter of personal taste and partly an issue of the application you're using. More than most other monitors reviewed here, you'll want to see the Seiko for yourself before you make a decision about purchasing it.

FACT FILE



Seiko CM-1440
Seiko Instruments USA, PC Products Division, 1144 Ringwood Ct., San Jose, CA 95131; (408) 922-5900.
List Price: $899 (tilt/swivel base and cable included).
Requires: *VGA, Super VGA, or 8514/A graphics adapter.*
Visible Diagonal Screen Size (inches): 13.
In Short: Built around a Sony Trinitron CRT, this 14-inch, analog-only monitor offers greater color saturation of the Trinitron tube, along with the tendency to draw crisper horizontal lines than vertical lines.

CIRCLE **418** ON READER SERVICE CARD

SONY CORP. OF AMERICA

Sony CPD-1302

by Winn L. Rosch

Sony monitors are instantly recognizable because of their different bent—their screens curve in one dimension rather than two, giving them a cylindrical rather than spherical face. This same curve distinguishes the $995 CPD-1302, a 14-inch multisynchronizing monitor capable of handling VGA signals and beyond.

The CPD-1302 earns its one-way curve with a Trinitron picture tube. Its fine phosphor pitch measures .26 mm (the aperture grille, set back somewhat from the screen, is actually slotted at intervals of .25 mm), giving the CPD-1302 a potential edge in sharpness. Its line width and convergence proved undistinguished, however, with the result that the on-screen image of the CPD-1302 is good but not exceptional.

Although Sony rates the CPD-1302 for a resolution of 900 by 560, it claimed compatibility with Super VGA, and the monitor did not disappoint in testing. Its scanning frequency range—50 to 100 Hz vertical and 15.75 to 36 kHz horizontal—is sufficient to embrace every video standard from CGA through 8514/A as well as PGA and Mac II.

The CPD-1302 handles both digital and analog signals through its lone 9-pin input jack. No input cable is supplied with the monitor, although Sony sells a VGA cable with a 15-pin connector for $25.95.

A switch hidden behind a removable door on the rear panel of the CPD-1302 selects analog, CGA-style, or EGA-style input signals. Shafts for horizontal and vertical size and positioning controls are also located here.

If you flip between Super VGA and ordinary VGA modes, you'll become intimate with these controls because the Sony CPD-1302 autosizes only between these two VGA modes. Brightness and contrast thumbwheels and the power switch are tucked away conveniently on the right side of the display.

FACT FILE

Sony CPD-1302
Sony Corp. of America, Sony Dr., Park Ridge, NJ 07656; (201) 930-1000.
List Price: $995; tilt/swivel base, $39; cable, $25.95.
Requires: CGA, EGA, VGA, or Super VGA graphics adapter and cable.
Visible Diagonal Screen Size (inches): 13.25.
In Short: A 14-inch multiscanning Trinitron display, the CPD-1302 is remarkable for its cylindrical face and fine 0.26 mm phosphor pitch. It produces good image quality with any standard IBM display adapter, although it autosizes only in its VGA operating modes.

CIRCLE **419** ON READER SERVICE CARD

The case of the CPD-1302 looks more massive than its dimensions would make you think because the curvy case tapers only slightly to the rear. Although the basic display does not include a tilt/swivel stand, one is available from Sony (the CTG-535L) for a relatively modest $39.

The on-screen image occupies 13.25 inches (diagonal) of visible screen. In testing, the CPD-1302 was entirely unremarkable; its measurements put it in the middle of the pack. However, it showed only one unsatisfactory characteristic. The color tracking of the evaluation unit was a bit off, resulting in the image turning noticeably pink as its brightness was reduced. The problem is electronic; the CPD-1302 uses an entirely conventional B22 short-persistence color phosphor.

Sony backs the Japan-made CPD-1302 with a warranty for 90 days labor, one year parts; and two years on the Trinitron itself. The monitor is FCC Class B rated.

Whether you like the cylindrical face of the CPD-1302 is personal preference. Otherwise, it's an undistinguished though competitive color display.

TATUNG CO. OF AMERICA INC.

Tatung CM-1496X

by M. David Stone

Tatung Co. of America bills the 14-inch CM-1496X as a Super VGA monitor, meaning that it offers both VGA and Super VGA compatibility, with a maximum 800 by 600 noninterlaced resolution. As a bonus, the monitor is 8514/A-compatible. In short, you can think of the $749 CM-1496X as a VGA monitor with pretensions, or more favorably put, with enhancements.

In keeping with its minimalist theme, the CM-1496X offers only two horizontal frequencies: 31.5 kHz for VGA and 35.5 kHz for Super VGA and 8514 modes. Vertical frequencies are 50 to 70 Hz for noninterlaced modes and 80 to 90 Hz for interlaced modes.

You'll find that setting the monitor up is a trivial task. Take it out of the box, plug in the power cord and cable, and adjust the stand for a comfortable viewing angle. The video cable is permanently attached on the monitor side. To connect it, all you have to do is plug in the DB-15 connector to a VGA card.

Controls are on all four sides of the box, with vertical size and position knobs on the back, horizontal size and position thumbwheels on the front, brightness and contrast thumbwheels on the left, and the power switch on the right. All the picture controls are analog, and all controls are clearly labeled. There is little here that needs explanation. Even so, the installation procedure and all controls are fully explained in the manual.

Having the vertical size and position controls on the back makes them difficult to reach, but you won't need them often thanks to autosizing in all modes. In PC Labs' tests, the monitor didn't need any adjustment when switching from 800 by 600 to VGA. In fact, the size controls don't affect VGA mode. You can set them once for Super VGA or 8514, then leave them alone.

Another nice touch is two horizontal position controls: one for VGA mode and one for Super VGA and 8514/A. Here again you can set position for each mode and otherwise ignore the controls. However, be aware that whether using autosizing or manual adjustment, the image does not fill the screen. In PC Labs' tests, the monitor showed a total margin of about 1.5 inches in VGA mode and about 2 inches in 800 by 600 mode.

Also, until the monitor had warmed up in our tests, it showed a distinct flicker in *Window*'s full white background in Super VGA mode, plus the diagonals in certain letters such as *M* and *W* were noticeably thin. If you have less-than-perfect eyesight, this could make reading text a strain. Despite these minor problems in 800 by 600 mode, the CM-1496X scored well on PC Labs' tests. As a VGA monitor with some additional capabilities, the CM-1496X is a creditable choice.

FACT FILE

Tatung CM-1496X
Tatung Co. of America Inc., 2850 El Presidio St., Long Beach, CA 90810; (800) 829-2850, (213) 979-7055.
List Price: $749 (tilt/swivel base and cable included).
Requires: VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 13.
In Short: Billed as a VGA monitor, the 14-inch CM-1496X offers only two horizontal frequencies—one for VGA and one for Super VGA and interlaced 8514 modes. In testing, the monitor showed some minor problems in 800 by 600 mode, but performed well enough in VGA mode.

CIRCLE **420** ON READER SERVICE CARD

TVM PROFESSIONAL MONITOR CORP.

TVM SuperSync 3A

by Alfred Poor

The TVM SuperSync 3A monitor is a 14-inch display capable of handling resolutions from VGA up to interlaced 1,024 by 768. Its list price of $845 places it in the middle of the range, though it has some features that set it apart from the pack.

One unusual feature is that the tilt/swivel base does not include any controls on the front panel. Instead, the power switch is located on the right side, while the brightness and contrast rollers are on the left side. These controls are still easy to reach, and you can operate them from the front of the screen.

There are no picture size adjustments at all—neither horizontal nor vertical. There are position controls, however: one for vertical and two for horizontal. The two horizontal controls share the job by splitting different horizontal scanning frequencies. One handles signals in the VGA range of 31.5 kHz, while the other makes adjustments in the higher-resolution modes around 35.5 kHz.

The picture-location controls are mounted at the back, which makes them awkward to reach when you are trying to adjust the image. On the plus side, the video cable is permanently attached to the case.

The image on the screen was not as sharp as on some of the other monitors we tested in this roundup. The convergence settings looked good on our test image, and line widths were fairly consistent between resolution modes and the horizontal/vertical dimensions. Despite these quantitative results, the SuperSync 3A's image just was not the best.

The SuperSync 3A does distinguish itself in one positive way: it has one of the best manuals of all the monitors I saw in this group. It is well written, and the pages are generously illustrated with pictures that make the setup and operation of the monitor quick and easy. While it is true that many users will not need to refer to the documentation, TVM does set a high

FACT FILE

TVM SuperSync 3A
TVM Professional Monitor Corp., 1109 W. 9th St., Upland, CA 91786; (714) 985-4788.
List Price: $795 (tilt/swivel base and cable included).
Requires: VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 14.
In Short: The TVM SuperSync 3A comes with an average price and undistinguished performance. The picture quality is adequate, but overall there are better monitors and better values available.

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standard with its materials.

In the final analysis, however, the SuperSync 3A falls short of top marks. Its middle price coupled with average performance and picture quality does make this monitor an acceptable choice, but not an outstanding one.

TW CASPER CORP.

TW Casper 5156H

by Bruce Brown

You may not have heard of TW Casper Corp., but this competent 14-inch-diagonal, 800 by 600 VGA monitor is certainly no ghost. The very real Casper 5156H lists for $680, including an attached 15-pin analog signal cable and a tilt/swivel stand.

The Casper is a moderate-size monitor with a 13.25-inch diagonal screen size. It weighs just over 25 pounds with the display cable. A detachable power cable is also standard.

There are no input provisions other than the accompanying cable. Casper doesn't limit the display cards it will work with, as long as they output analog signals in one of the frequencies the monitor understands. A three-way mode switch on the back lets you select from Super VGA, PS/2, and 1,024 by 768 modes.

The Casper's 1,024 by 768 resolution works in interlaced mode only, appropriate with IBM 8514/A or compatible display adapters. With the switch set to PS/2 mode, the signal is 720 by 480, higher than standard VGA.

The Casper 5156H was also a good performer in our line-width, jitter, swim, drift, and pincushioning tests, with no unusual results. In more-subjective observations, the Casper had nice even edge lines in both VGA and 800 by 600 mode. Text, graphics, and colors were just what you'd expect as well.

The user control set consists of the power switch and the analog brightness and contrast dials on the lower front of the case. In back you'll find four controls: vertical size, horizontal hold, and two horizontal phase controls. These require a small screwdriver. The three-position mode control is also in back.

The Casper 5156H's documentation is adequate but somewhat sparse.

While the Casper 5156H isn't revolutionary in any sense, it's a capable VGA and 800 by 600 monitor that won't give you any surprises. Despite the company name, this is one vision that makes a fine and permanent impression.

TW Casper 5156H
TW Casper Corp., 47430 Sea Bridge Dr., Sea Bridge 1, Bldg. A, Fremont, CA 94538; (415) 770-8500.
List Price: $680 (tilt/swivel base and cable included).
Requires: VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 13.25.
In Short: A capable VGA and 800 by 600 monitor, the Casper 5156H includes a tilt/swivel base and attached video adapter cable. No surprises here: the Casper does just what it should.

CIRCLE **422** ON READER SERVICE CARD

VECTRIX CORP.

Idek Multiflat Digiana MF-5015

by M. David Stone

In most ways, the $1,045 Idek Multiflat Digiana MF-5015 is simply a lower-resolution version of the MF-5115 reviewed in *PC Magazine*'s look at 1,024 by 768 monitors (see "1024 Color," April 10, 1990). Limited to a maximum noninterlaced resolution of 800 by 600, the 15-inch MF-5015 shares the same parentage as the MF-5115 and offers similar features.

Both monitors are manufactured in Japan by Idek, the Iiyama Electric Co., and both are available through U.S. importers. If you compare the two reviews, however, don't be confused by the company names. The MF-5115 was listed as being available from Pixelink Corp., which provided that unit for review. The MF-5015 was provided by Vectrix Corp., another U.S. importer. Vectrix, not so incidentally, imports the MF-5115 also.

The MF-5015 offers a frequency range that runs continuously from 15.5 to 37 kHz horizontal and from 50 to 90 Hz vertical. For additional flexibility, you'll find two connectors on the back of the unit: a DB-9 for TTL signals and a DB-15 for analog. Taken together, these two features let the monitor handle the full range of noninterlaced standards, from CGA through VGA, plus interlaced 1,024 by 768 resolution for 8514/A compatibility.

Setup consists largely of plugging in the appropriate cable and power cord. A nearby slide switch lets you choose between the analog and TTL inputs, with several TTL choices available for setting the maximum number of colors. The MF-5015 comes with a cable for the DB-15 analog connector. A second cable with a DB-9 on both ends for TTL connections is available for $12.

Also on the back of the unit are the vertical and horizontal size and position controls. Fortunately, this isn't as much of a problem as it might be, thanks to the autosize feature. Vectrix claimed that autosizing worked in all modes, and indeed, when switching between VGA and Super VGA on PC Labs' tests, the monitor produced an acceptable image.

Controls on the front of the monitor include the power switch, brightness and contrast, and three buttons for choosing color in monochrome text. All controls are clearly marked, and the image controls are strictly analog.

In PC Labs' tests, the review unit had

Idek Multiflat Digiana MF-5015
Vectrix Corp., 204 S. Olive St., Rolla, MO 65401; (314) 364-7500.
List Price: $1,045 (tilt/swivel base and cable included).
Requires: Hercules, CGA, EGA, VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 15.
In Short: With separate connectors for TTL and analog connections, and a frequency range that is both wide and continuous, the 15-inch MF-5015 is one of the few monitors that can connect to any card from CGA to 8514 level—and Mac II also.

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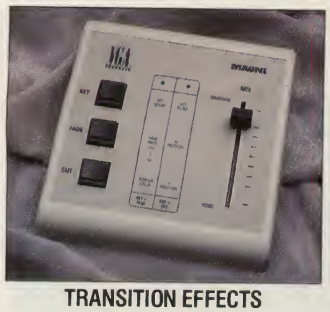

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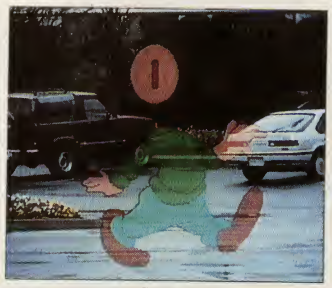

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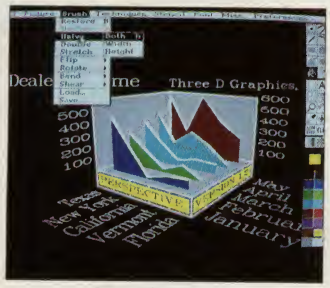

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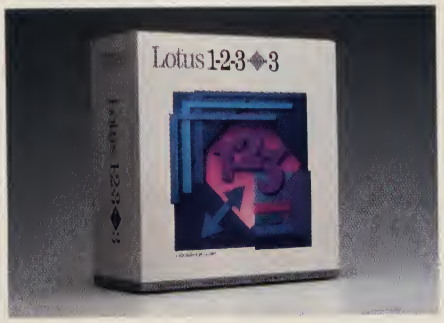

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System Requirements: IBM PC AT, PS/2 models 50Z, 60, 70, P70, 80, Compaq 286, 386 or 100% compatibles. OS/2 1.1 or higher. Minimum 4Mb RAM.

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1-2-3/G	_____	5.25″	9190 (9193)	$150 ($75†)	_____
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visible convergence problems, with a white line drawn across the top of the screen showing a distinct blue edge. However, colors were bright and crisp, and text in Super VGA mode was quite readable. Also, you'll find that the square flat tube technology helps give the image a truly flat look. For most purposes, the MF-5015 has more going for it than against it. And the continuous frequency range should ensure its ability to work with nearly any 800 by 600 card.

WYSE TECHNOLOGY INC.

Amdek AM/738 Smartscan

by Mitt Jones

Behind every noteworthy product lies a theory. In the case of Wyse Technology's 14-inch Amdek AM/738 Smartscan monitor, the theory is that you'll pay for a high-quality display but not for a back panel full of controls you'll probably never use. This $835 analog-only unit offers everything most people need in a VGA monitor, including a maximum resolution of 800 by 600. It also stands among the best when it comes to overall picture quality.

You'll find only two connections on the Smartscan, a 15-pin connector and a standard shell-type power connector. Getting the monitor up and running is as simple as hooking up the two cables.

The primary monitor controls rest along the right side of the cabinet. The power control, a large spherical button, is easy to find and operate by touch, as are the roller-ball contrast and brightness adjustments. The remaining three controls—vertical size, horizontal size, and horizontal position—find their home on the back of the case and are of the commonplace, tiny-knob variety.

Other features are an etched antiglare screen and a tilt/swivel stand that offers more freedom of movement than you're likely to need.

Throughout PC Labs' tests, the Smartscan performed admirably, if not perfectly. Line thicknesses were on the small side, as were the measurements of time variance and pincushioning—good indications of a quality display. And, in subjective comparisons with an IBM 8513 monitor, the Amdek actually boasted the better picture: its colors were every bit as true as those of the IBM and even more vibrant, and it generated brighter, crisper text.

Lest the Smartscan sound too good, it does have a couple of failings. In 800 by 600 mode, our test unit positioned the image above center by about .2 inches. As I reached to the back of the monitor to adjust the picture, I remembered that it didn't have a vertical-position control. You're simply stuck with an off-center image.

In VGA modes, the image stayed well centered and maintained a wonderfully constant size, but that size was significantly smaller than the maximum in Super VGA mode—.7 inches smaller along the horizontal axis and .2 inches along the vertical. Here again, you're stuck with the image the monitor gives you. The two horizontal picture adjustments and one vertical work well in 800 by 600 mode, but they do nothing to affect the picture in VGA modes.

You shouldn't take either of these complaints too seriously, especially in a monitor that otherwise performs so well. Most of us don't even think of touching the image controls once the thrill of unpacking the monitor has come and gone.

Unless you just won't buy a monitor without all the bells and whistles, the Amdek AM/738 Smartscan should prove an excellent choice. Its reasonable price, vibrant colors, and excellent overall image quality distinguish it in a crowded field. ■

FACT FILE

Amdek AM/738 Smartscan
Wyse Technology Inc., 3471 N. First St., San Jose, CA 95134; (800) PC-AMDEK, (408) 473-1200.
List Price: $835 (tilt/swivel base and cable included).
Requires: VGA, Super VGA, or 8514/A graphics adapter.
Visible Diagonal Screen Size (inches): 14.
In Short: The Amdek AM/738 Smartscan, an analog-only display, should appeal to those looking for top-notch picture quality at a reasonable price. Its image sizing and positioning controls may be insufficient for some buyers.

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With the remarkable new Norton Backup™ we're out to save your data once again—*before* you have a chance to lose it.

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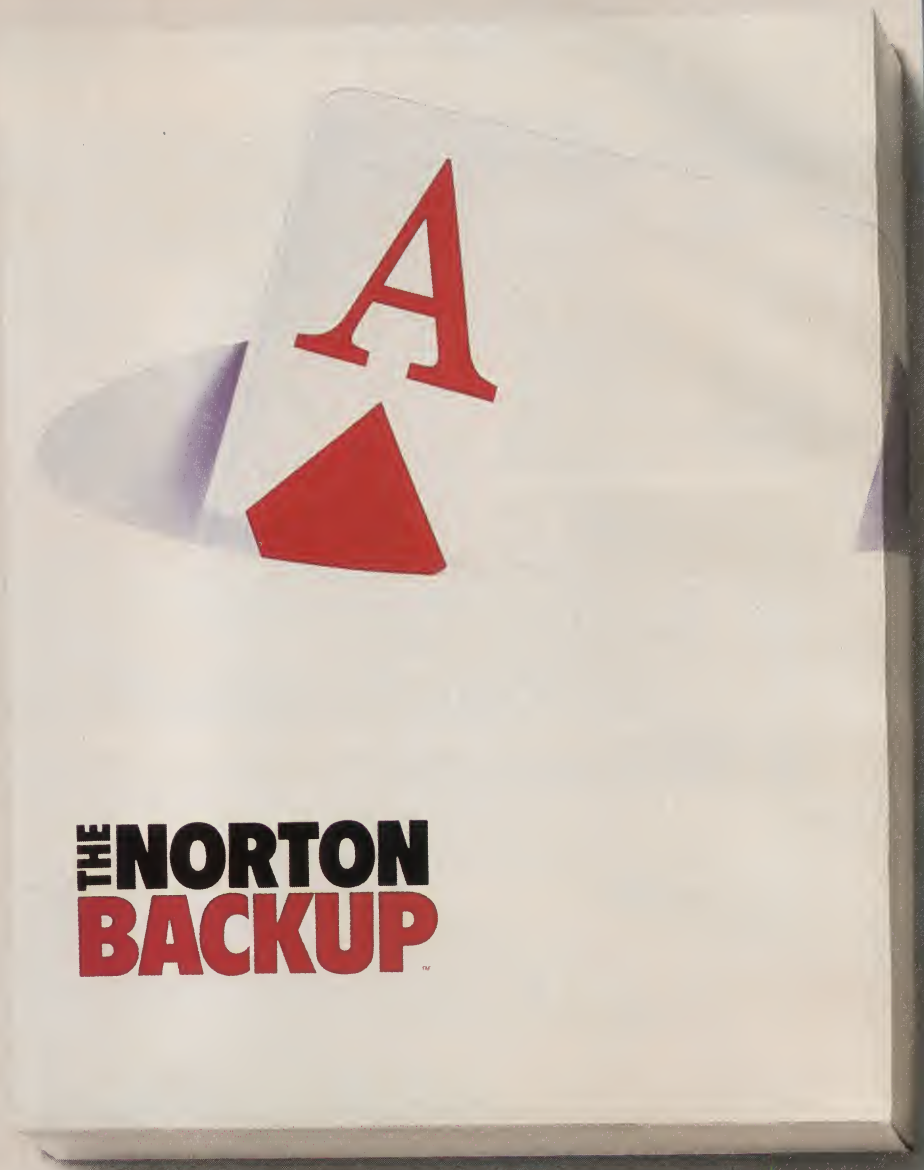
Which is all you really need to know to buy the Norton Backup right away.

But since there are a couple of other companies out there making similar claims, you might want to read on.

To see if we can back it up.



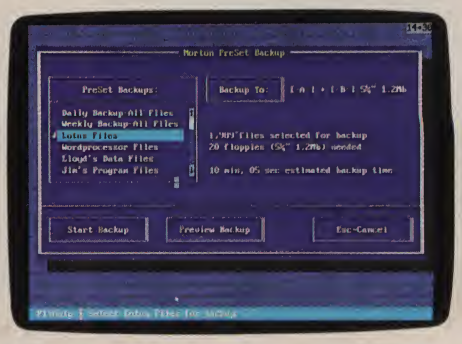
Your data isn't the only thing we save.

Although regularly backing up your data is time well spent, you don't want to spend any more time than you absolutely have to shuffling floppies and listening to grinding disk drives.

So you'll be glad to know that our unique Fastpath™ technology makes the Norton Backup as much as 200% quicker than the next quickest competitor.

Fastpath is actually a combination of technologies: Dual-DMA data transfer that reads your hard disk and writes to your floppy simultaneously, plus an advanced disk control method that minimizes interruptions in the writing process.

Of course, you don't need to know any of that to appreciate the Norton Backup right away.



Selecting and deselecting files couldn't be more flexible—or intuitively obvious. Choose our unique Preset Mode and you can execute the entire process in three keystrokes. Whatever level of interaction you use, you'll backup in less time than ever before.

New tricks from the top dog.

In fact, you don't have to know anything at all.

What you don't know can help you.

The Norton Backup loads at a keystroke and automatically configures itself to your particular system—no ponderous parameters to enter.

No complex syntaxes either. Because everything you need to know appears on your screen in highly organized pop-up windows.

Which means that saving—and restoring—everything from selected files to entire disks is as easy as point and shoot.

How often you point and shoot is up to you. Because the Norton Backup gives you a choice of three user interface levels.

(Not to mention five backup types, three levels of data verification, three levels of data compression and five display modes all the way up to 50 lines per screen.)

In fact, if you take advantage of our handy setup files, you—or someone on your staff who thinks backup is something you do with a gearshift—can execute the whole process in as little as three keystrokes.

Whichever interface you choose, you'll know *before* you start precisely how much time and how many floppies you'll need.

You won't need many floppies, because the Norton Backup packs the most data onto the fewest diskettes. It even does the formatting for you.

You won't need much time, either. Especially if you're on a network. Because, in addition to being faster than a speeding bullet, it backs up from and restores to multiple drives in a single bound.

Namely the one between speed and safety.

Whether it's backing up, restoring or alerting you to file selection inconsistencies, the new Norton Backup is designed to be exceedingly reliable.

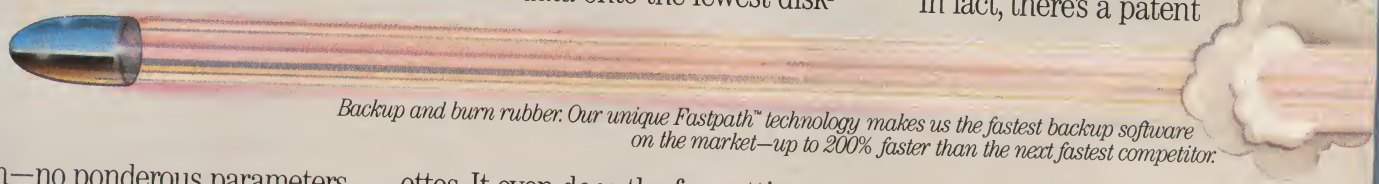
In fact, there's a patent pending on our Distributed Error Correction, a remarkable feature that actually does something that others have only claimed to do—restore backed up data from severely damaged disks.

Which is just the sort of data-saving ingenuity you'd expect from the people who brought you *UnErase*®, the *Norton Disk Doctor*® and the rest of the Norton Utilities.

You'll find the Norton Backup, the Norton Utilities and the critically-acclaimed Norton Commander® at your favorite software dealer.

If you'd like to see us do our tricks for free, call us right away at **1-800-624-8999 Ext. 79A.**

We'll send you a Norton Backup demo disk.



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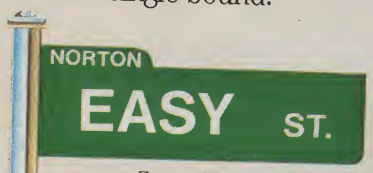

Forget those cryptic command syntaxes and ponderous parameters. Our handy dialog boxes pop up to display all the information you need. All you do is point and shoot.

In Norton you trust.

Although we give you more choices than any other program, one of the nicest things about the Norton Backup is the choice you don't have to make.

Peter Norton COMPUTING

CIRCLE 302 ON READER SERVICE CARD

Designed for the IBM PS/2 and PC families and 100% compatibles.

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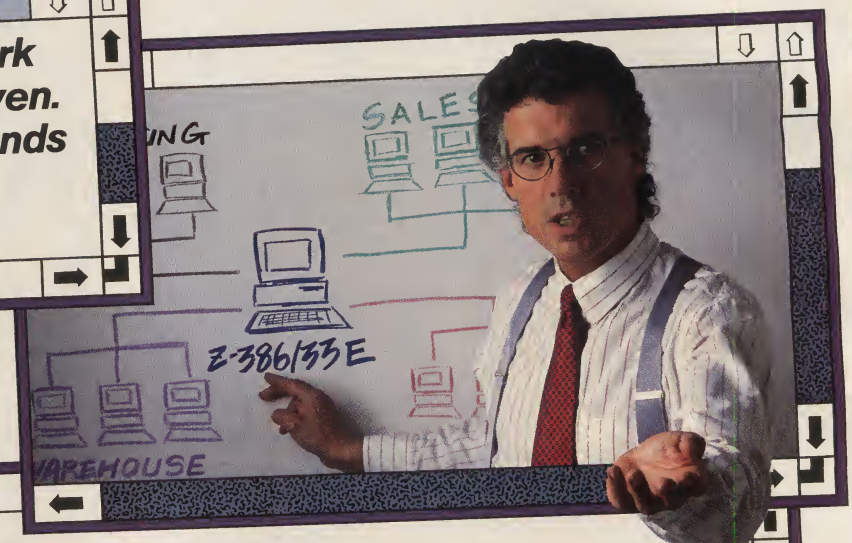

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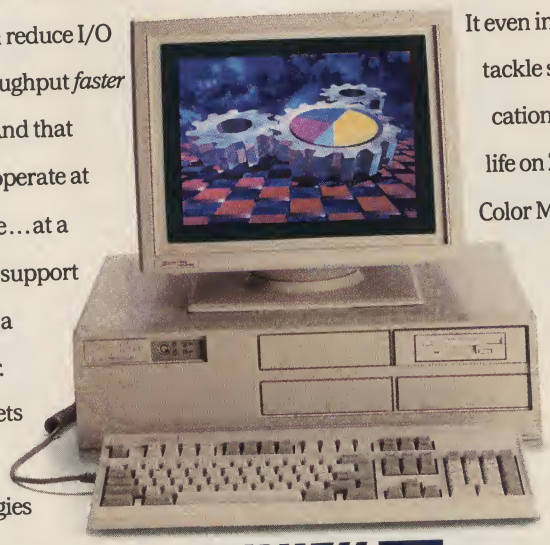

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CIRCLE 732 ON READER SERVICE CARD

COMPUTER ILLUSTRATION: LAURENCE M. GARTEL

THE AUDIO VISUAL CONNECTION

Turnkey Multimedia From IBM

by Alfred Poor

Everyone's talking multimedia, but IBM has dreamed up a system that turns this buzzword into a working reality.

Brace yourself. The hot topic of the year is *multimedia,* and just as with the other trendy technologies of recent years, you may find it hard to separate hype from hard fact.

Merely identifying the components of a multimedia system—and subsequently figuring out how to string the components together—has, until now, been a Sisyphean task. A task best left to dedicated production studios or highly motivated tinkerers.

Enter IBM's Audio Visual Connection (AVC), perhaps the most visible and exciting product in this fledgling multimedia category. AVC gives you the tools to combine brilliant color, animated images, lifelike video pictures, and synchronized voice and music soundtracks into a unified presentation. AVC is not the first multimedia product, nor the only one, but it's the first to offer a turnkey solution for producing and replaying multimedia presentations on the IBM PC.

IBM will face some stiff competition in the very near future. The hottest new technology is Intel's DVI (Digital Video Inter-

active). This technology compresses video images and, in its latest version, can produce animated scenes at 30 frames per second. DVI makes lifelike video recordings possible.

New programs such as *Authology: MultiMedia* from CEIT Systems make DVI available to end users. Other non-DVI-based PC packages that mix recorded sound, video, and animated graphics include *Prometheus* from Software Clearing House and *Animax* from VisionBase. On the Macintosh, MacroMind's much-acclaimed *Director* offers many of the same multimedia features as IBM's AVC, but since the Macintosh is better equipped for producing sound and using a graphical user interface, the product design is substantially different. Rumors indicate that MacroMind is looking for ways to bring its multimedia magic to the PC environment.

In the PC world, the AVC has set the standard, at least for the moment. We gave the product a quick review in a First Looks article (*PC Magazine,* January 16, 1990, page 33) but its tight integration of so many elements deserves a closer look. What does AVC do? How well does it perform? How experienced do you have to be to do anything with it? And how do the myriad components work, separately and together?

To find out, we loaded up an IBM PS/2 Model 70-A21 (a 25-MHz 386) with 5MB of RAM and a 60MB hard disk, and we went to work.

A NATURAL EVOLUTION

The history of business presentations is a history of one-upmanship. The AVC is a logical step beyond the simple slide-show software of yore. In one of its earliest incarnations, desktop presentation software let you create and display a series of computer-generated images. Subsequent generations added fancy dissolves and transitional effects between static images. Most recently, programs such as *Grasp* from Paul Mace Software and *Animator* from Autodesk have made it possible to animate text and objects on the screen.

The Audio Visual Connection takes all of this a step further. While it's difficult to find two people in agreement on the meaning of *multimedia,* most will agree that the term covers microcomputer systems that allow you to create and control presentations including graphics, video images, and digitized sound. IBM's AVC does all this and more.

It gives you control over the way images appear and disappear from the screen. It allows you to capture and manipulate images from video sources and to incorporate sound from live or recorded sources. Unlike the linear presentation of images in a screenshow, AVC presentations can accept interactive responses from the viewer, branching to different segments as desired. But the most important feature of the sys-

THE MAKING OF A PRESENTATION

by Alfred Poor

IBM's Audio Visual Connection won't instantly turn you into a graphics presentation genius, but it will make the creation of a sound-and-light show far easier than it would be with traditional tools. Although we can't display sound and motion, the six images shown here should give you a feel for the creation process.

The first screen is part of the AVC script for a presentation as it appears in the show editor. The first line, "play shadow1", causes a digitized soundtrack to begin, reaching full volume over a 3-second period—as indicated by the row's contents on the right side of the screen.

2

Prompt Tell Edit View Print File Exit Help

Story: ALFRED1 1 of 17

Sound----->	Method	Channl	Vol	Time	Wait	Size
play shadow1 /* music	FADE		100	3	0	FULL
show back1 /* background	FADEIN	IN_H	NONE	MEDIUM	A BEGIN	FULL
paste newback /* small logo	STRIPES	DOWN		1	A p1	PART
paste newback	PUSH	DOWN		1		PART
paste newback	EXPLODE	DOWN		1		PART
show IBMEQP1A /* montage of comp	FADEIN	DOWN			A p2	PART
paste IBMEQP1a /* video equipmen	fadein	down		1	A d1	PART
paste ibmeqp1a /* video equipment	fadein	down		1		PART
paste ibmeqp1a /* video equipment	fadein	down		1		PART
paste ibmeqp1a /* video equipment	fadin	down		1		PART
show PICSET3 /*set of images ('	EXPLODE	UP			A d2	PART
show picset2 /* audio equipment	REPLACE	UP			A d3	PART
show sfbridg /* bridge w/ text	CHECKER			SLOW	A d4	FULL
show back1 /* background	FADEIN	IN_H	NONE	MEDIUM		FULL
paste newback /* small logo	CHECKER	UP		SLOW	A p1	PART

1

The next line causes the background to fade in, as shown in the second screen image; then text and a scanned image are brought in on top (the third screen image).

The fourth screen shows a montage of computer images, which is built up in a series of steps synchronized with the music.

The fifth screen displays a pair of video images that has been altered by changing the color palette—a handsome visual effect. Text has also been added here.

The final picture is a full-screen video image with text superimposed. ■

tem is that it lets you combine all of these elements into a synchronized whole.

THE SUM OF THE PARTS

The Audio Visual Connection is primarily a software program, which can be used in conjunction with a set of optional expansion boards for your Micro Channel or AT-bus computer. The program is comprised of five basic modules: graphics and text editing, sound capture and editing, video-image capture and editing, show scripting, and a file management system. All of these components use a similar table-editor interface, with plentiful pop-up prompts and option boxes to help you. There is also a standalone runtime module that lets you view or distribute presentations without having the full AVC package installed.

The file management module is the hub of the program—and the first level you encounter. Here, the AVC uses a hierarchical structure to organize the numerous files that compose a presentation. The topmost layer is the Library, and it contains Applications and a System Profile. Applications are collections of files; each Application represents a single "show." The System Profile stores default settings for a presentation. You may have multiple Libraries on a disk, and it is possible for an Application to share component files with other Applications.

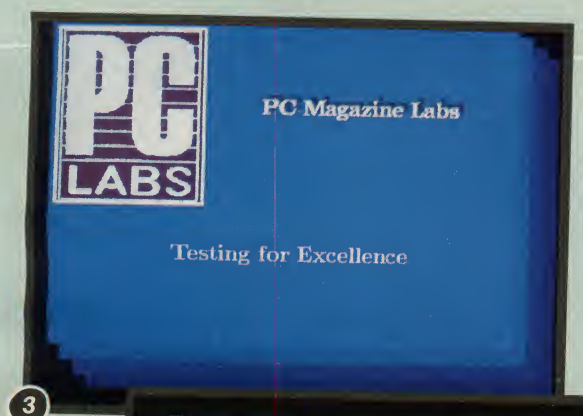
The AVC is a logical step beyond the simple slide-show software of yore.

The most important files in an Application are Image, Audio, and Story files. Each of these is created and edited in its respective AVC module. You select the file you wish to edit and then use a pull-down menu to invoke the edit module. The Audio Visual Connection is smart enough to summon the applicable editor based on the file type you have selected. The menus are fairly consistent between modules, and there are many combination-keystroke commands that bypass the menus.

BUILT-IN GRAPHICS

The Image editing module serves a variety of purposes including image creation, editing, and text insertion. Large portions of the Image editing module resemble any basic paint program. And while AVC's painting capabilities won't replace your favorite bitmapped paint program, it does have a couple of unique font and image-fill features you'll find quite effective.

The Image editing module provides an array of drawing primitives. There are



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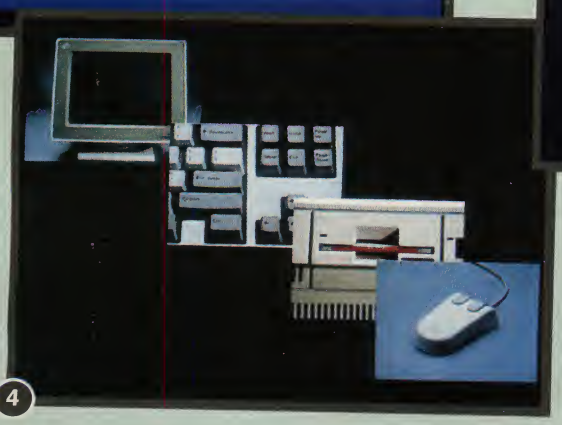

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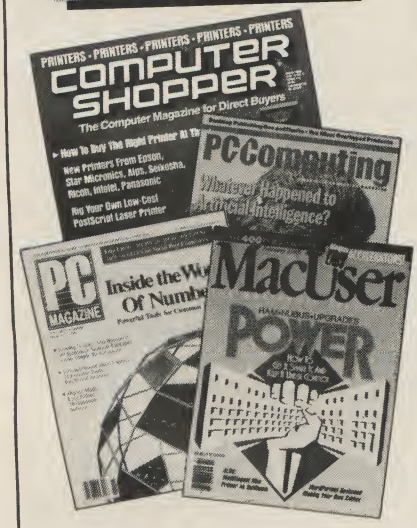
RETAILERS:
DEAL YOURSELF IN



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tools for straight lines, rectangles, ellipses, and freehand lines, and tools for selecting line widths and colors. You can resize objects and fill solid objects with colors or patterns. You can also perform some relatively sophisticated operations, such as outlining an irregularly shaped object with a color and then filling it, or using an object as a repeating fill pattern.

> **The AVC not only lets you capture and manipulate images and sound from different sources, it lets you combine them into a synchronized whole.**

The Image editing module is also where you'll annotate (or enter text on) your graphics screens. As a matter of fact, you can bring video images into this module and add text to them as well. You can choose from five different font outlines and define up to nine different fonts at once. Each font has its own size, color, margins, spacing, and even shadowing as part of its definition.

Text and images exist on separate planes, which makes it possible to edit the text without obliterating the images behind it. The text looks especially good when compared with that of most business graphics programs because it uses *anti-aliased* fonts. These fonts use levels of shaded pixels that blend the edges of the line or curve with the background, tricking the eye into believing that the image has no jagged edges.

VIDEO VISIONS

Fortunately, you don't need to hand-draw everything in your AVC presentations. The system accepts digitized video images and imports images from other graphics formats. The import facility converts TIFF (Tagged Image File Format), TGA (Targa File Format), and IMDS (Image Data Stream—produced by IBM's *ImagEdit*, a gray scale image editor). These files are converted to the AVC's native file format.

A built-in screen-capture program provides another alternative for incorporating images created elsewhere into the AVC environment. And you can also capture video images, provided that you spring for the Video Capture Adapter/A, a Micro Channel-only option with a list price of $2,250.

The Video Capture Adapter accepts signals from a wide range of video sources, including cameras, VCRs, and videodisks. It can use composite video (NTSC) signals, RGB, or S-video (a high-resolution format also known as Y/C). Once the signals are captured, AVC editing software lets you modify the image by adjusting color levels for both brightness and contrast. Finally, captured and modified images can be digitized and stored on-disk. (Note that once you have taken this step, you can no longer alter the image settings as you could before you stored it.)

SOUNDS FOR THE DISCRIMINATING EAR

Another all-important optional card that boosts the multimedia prowess of the AVC is the Audio Capture and Playback Adapter, which lists for $565 in either the AT-bus or Micro Channel version.

This card has four ⅛-inch mini-plug jacks in the mounting bracket: a stereo line input, a mono microphone input, and two stereo output connectors—one for headphones, and the other for line output.

For our tests, I used a standard component-stereo tape deck and a pair of amplified speakers (the kind used with a Walkman or similar portable stereo). The little speakers sounded deep and beautiful—a far cry from the tinny sound we've endured from our PCs.

The AVC is able to capture and store sound in three different resolutions: voice, music, and stereo. The stereo setting is superlative, but high fidelity has its trade-offs: top-quality sound uses up disk space.

Voice-quality sound takes up 5.5K of disk space every second, which adds up to a megabyte in just over 3 minutes. The music-quality setting stores twice as much data for each moment of sound; it fills a megabyte in just a minute and an half. And since the stereo setting actually stores two music tracks, it uses twice as much space again; you will fill a megabyte in just 45 seconds. Stereo sounds great but should be used judiciously.

The voice quality, described by IBM as near-AM quality, is the poorest of the lot.

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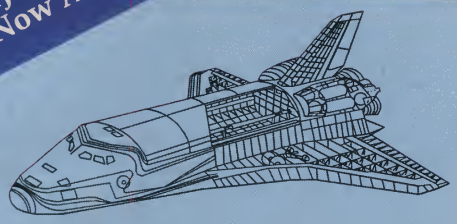
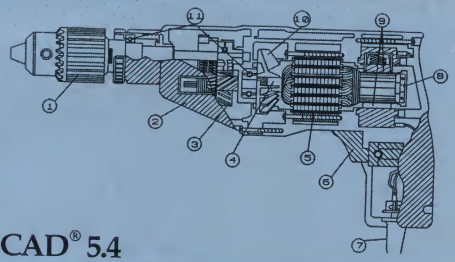
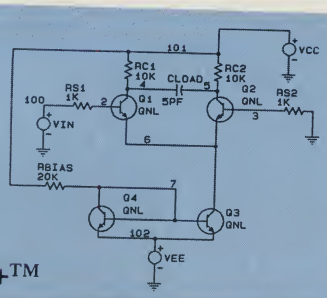
	Plotter in a Cartridge™	HP 7475A Plotter	Software Plotter Emulation
 AutoCAD® Release 10	15 seconds	3 minutes 17 seconds	1 minute 2 seconds
 VersaCAD® 5.4	49 seconds	9 minutes 45 seconds	3 minutes 11 seconds
 Schema II+™	17 seconds	5 minutes 15 seconds	2 minutes 13 seconds

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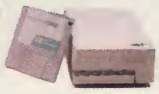

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AVC À LA CARTE

by Alfred Poor

In its plain-vanilla form, IBM's Audio Visual Connection comes with few frills; you get the software and that's it. But there are a wide range of accessories you might want to add to your system to extend its multimedia talents.

Four options are available for extending the software-based AVC program. First and foremost are the two display options—the 8514/A display adapter and its companion, the 8514 color monitor. This combination will provide you with the most attractive and useful images possible.

The other two items are the ACPA (Audio Capture and Playback Adapter) and the VCA (Video Capture Adapter). These boards don't work on their own, but they do make it possible to add on a variety of input and output devices that will expand your presentation capabilities.

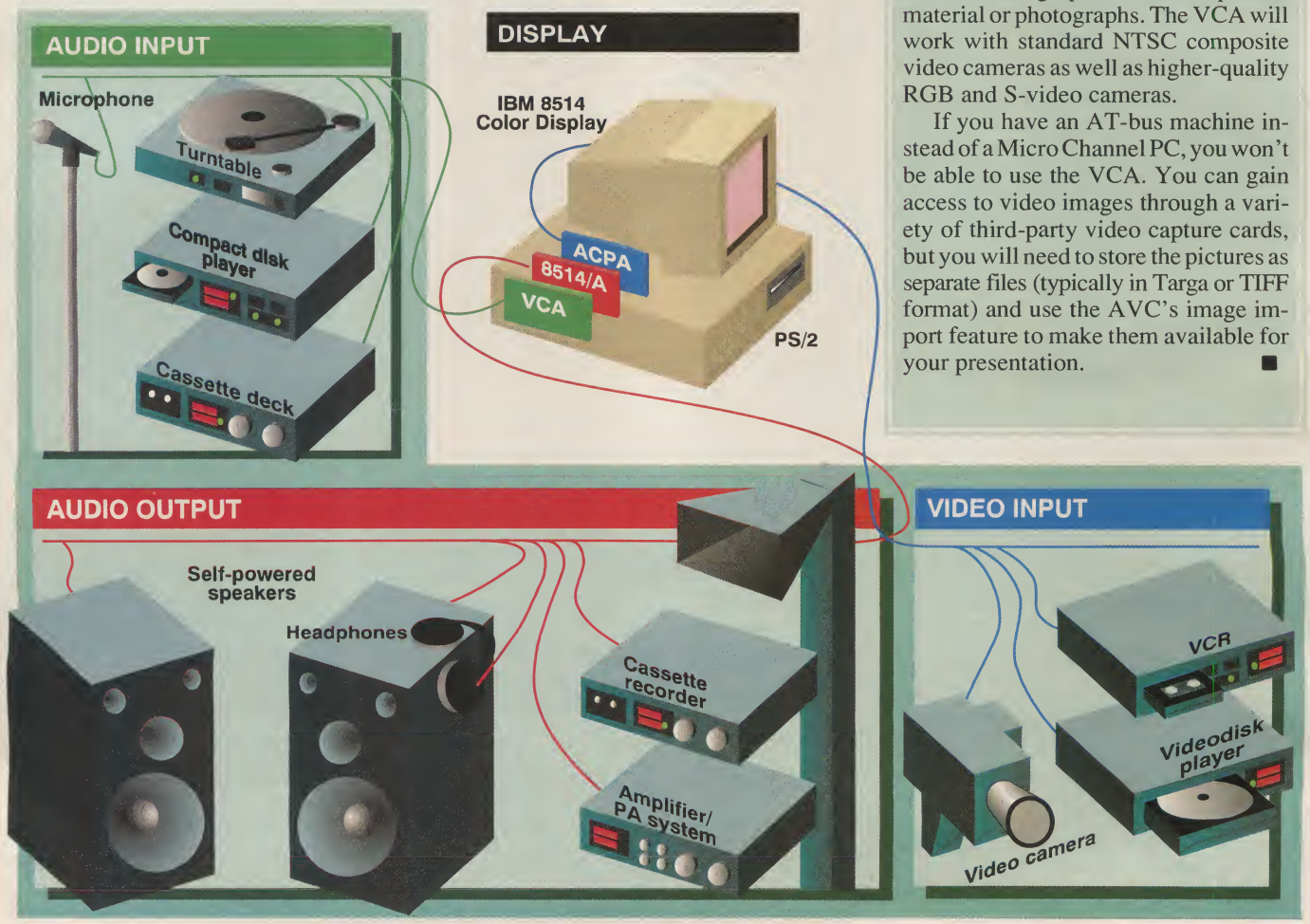
The ACPA accepts a variety of audio input and output devices and gives you sound-studio capabilities. The ACPA accepts stereo signals from components like cassette decks, turntables, and compact disk players. Most stereo systems also have output devices like amplifiers and speakers that the ACPA can use. You can choose to maintain stereo separation or have the AVC combine the tracks into a single mono signal.

You can also plug in a microphone for live recordings, but here the ACPA accepts only a mono signal. If you want to record voice-overs or other live material in stereo, you will need to put it on a cassette first and then play it back into the ACPA.

For audio output, you can plug in a pair of stereo headphones. This technique is ideal for presentation developers monitoring their sound-tracks in the working stages, or for end users who want to view an AVC presentation without disturbing others. For group presentations, you can direct the output to self-powered speakers or to a traditional sound system driven by an amplifier. You can also record the sound output if you need a copy of the audio portion of a presentation.

On the video side, the VCA captures images from a variety of sources. You can use a VCR or a videodisk player to access stored images, or you can use a video camera. A camera can be used to capture live material or to take pictures of nonvideo graphics such as printed material or photographs. The VCA will work with standard NTSC composite video cameras as well as higher-quality RGB and S-video cameras.

If you have an AT-bus machine instead of a Micro Channel PC, you won't be able to use the VCA. You can gain access to video images through a variety of third-party video capture cards, but you will need to store the pictures as separate files (typically in Targa or TIFF format) and use the AVC's image import feature to make them available for your presentation. ■



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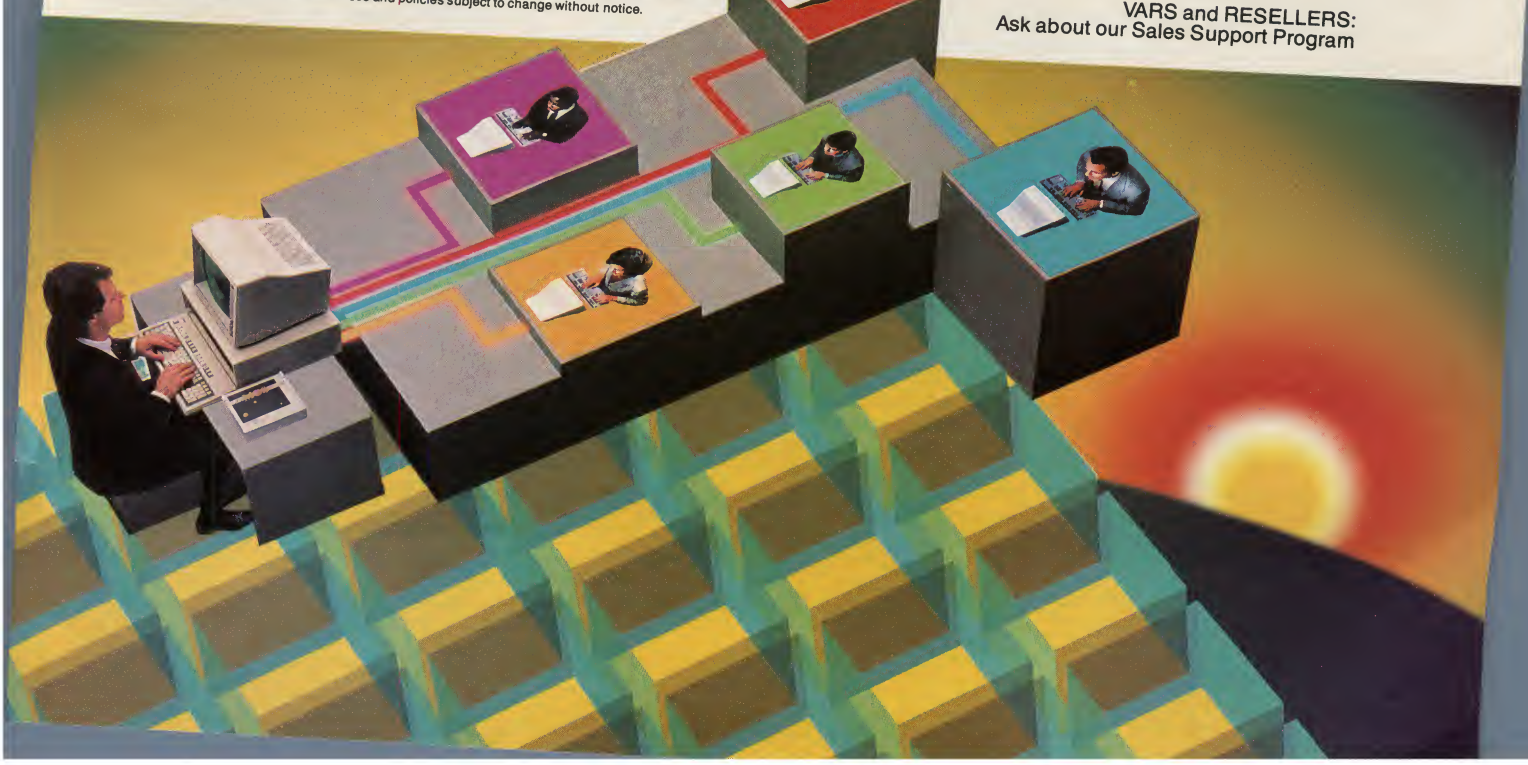

But it was at least as good as my car radio, not hard on the ear, and perfectly suitable for the speaking voice during a tutorial session. The music setting is described as above AM but below FM in quality. Like the voice setting, the music setting combines the two tracks of a stereo signal into mono, but the sound quality is definitely better. This setting works well for most music. The stereo setting produces the same quality as the music setting, but it keeps the two stereo signals intact and is best when you want to dazzle your audience.

Once the soundtrack is recorded, you can have a field day with the Sound edit features. I recorded about 20 seconds of instrumental music and then deleted extra measures to tailor the piece for my presentation. Next, using a series of interactive pop-up menus, I inserted some effects to control the volume of certain transition points.

With AVC's Authoring language, you can concoct complex shows within shows using preprogrammed effects that provide quick-canned, editable animation.

This was a good start, but I needed a longer soundtrack. Using the word processing–like editing commands, I was able to block portions of the piece and copy them. Some of the joints between my blocks were a bit on the rough side, but since the AVC lets you work in either 1-second or $^1/_{10}$-second increments, I was able to smooth them out.

Other sophisticated features hone your sounds. You can read in two separate sound files and synchronize them, then store them as a new, combined file. You can also identify points in the soundtrack that you may later refer to in the presentation script. Thus, visual effects can be synchronized with the audio elements.

The AVC will never be mistaken for a full-featured digital sound-editing program. For example, you cannot change the pitch or pace of a recording. But for adding sound to images, it is an excellent, imminently manageable tool.

ALL TOGETHER NOW

The Story editor is an interactive workspace that pulls the pieces of the presentation together into a unified script. Using the same sort of "fill-in-the-blank" table layout used in many of the other modules, this editor has columns to specify the filename, effects, timings, and on-screen locations. For example, you can set a sound segment to start silently and fade in over a fixed period of time. Or you can specify the locations for a portion of an image to appear on the screen, replete with special effects, and define how it will appear.

A glance at an existing script can be daunting, to say the least (see the sidebar "AVC à la Carte"). The dozens of script lines with varied parameters seem overwhelming at first. But, more than any other module, the Story editor shows off AVC's native intelligence.

For example, if you were to start a line with the command PLAY SOUNDS1, then move to the Method column, you could call up a list of effects that includes FADEIN and FADEOUT. Subsequent columns let you interactively select the target volume level and the duration between sounds. Prompts appear throughout the program to help you keep track of your options.

For images, you can choose from a series of 16 different effects, with descriptive names such as WEAVE, CRUSH, DIAG, STRIPES, and EXPLODE. Again, you can specify the interval between effects. You can even call up a list of synch labels (the key points you defined in the audio module) so that an image makes its debut at the proper sound cue.

Best of all is the way the AVC handles portions of images. With just a few mouse clicks, you can call up the source image, select a section of it, and then place it on the target image. This allows for some quick, flexible work strategies. For example, you never have to be careful about where you place elements of an image in the Image edit module, since you'll always be able to adjust the placement in the script. You can also create a single image that will be laden with all the text you'll need, and then select portions as necessary from within the Story editor.

PRO PRESENTATIONS

Those who are more ambitious will have plenty of room to grow with AVC's Audio Visual Authoring language, known as AVA. This is a full-featured programming language, complete with DO loops, conditional IF branching, and recursive subroutine calls. There are also dozens of commands and functions designed to handle audio, visual, and file-management operations.

AVA allows you to call subscripts in the middle of a script, concocting complex "shows within shows." A set of preprogrammed effects, such as Cascade, Galaxy, Swirl, and Scissors, provide quick-canned animation. Since these effects are preprogrammed story scripts, you can edit them individually, use them as a tutorial, and then create your own effects.

Still not enough? AVA includes facilities that allow you to manage host computer connections, integrate C programs, and call on the special capabilities of OS/2. There is no shortage of building blocks here for those with the skill, aptitude, and patience to assemble them.

MULTI-SHORTCOMINGS

While AVC covers most of the multimedia basics, a number of features are lacking. There are only rudimentary provisions for animating graphics objects. You have access to a slew of transition effects, and you can create one sprite or element at a time that can be moved across the screen without affecting the background, but there is no provision for serious tweening animation as is found in Autodesk's *Animator*. There's also no way to input live, moving video images from an external source, or to replay video images from the disk for a semblance of live video. AVC works best when it brings in still video and graphics images and strings them together.

The quality of the displayed image also has its share of problems. AVC is designed to work in MCGA mode (320 by 200 resolution), which yields a coarse-looking image despite the 256 colors. The VGA mode is only slightly better. Here, the 640 by 480 resolution is an improvement, but the 16-color limitation is terribly depressing. The best image display available is via the 8514/A, in a 640 by 480 display with 256 colors. Still, you can't help but wish that AVC would take advantage of the 8514/A's higher 1,024 by 768 resolution

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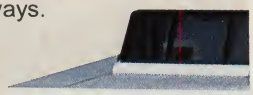

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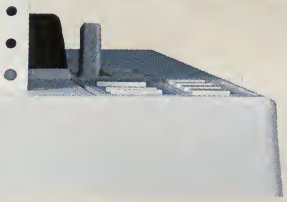

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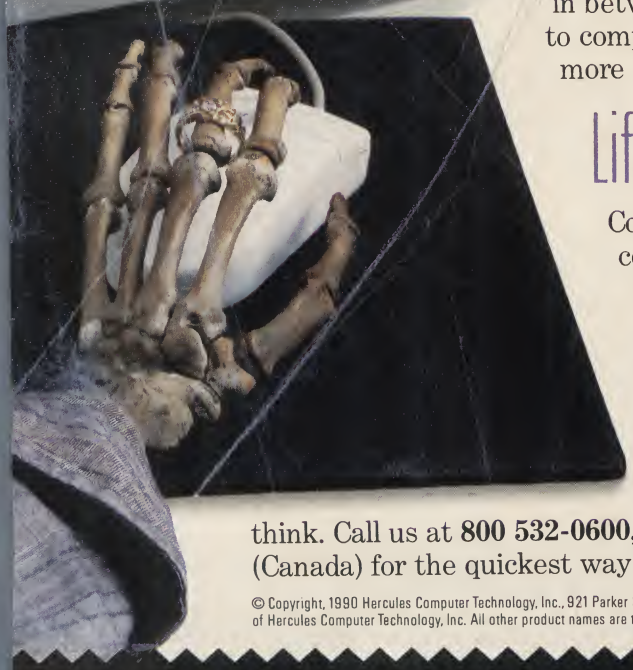

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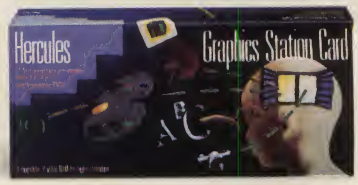

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Takes the wait out of Windows!

FACT FILE

IBM Audio Visual Connection
IBM Corp., Contact your local authorized dealer.
List Price: AVC software, $495; Audio Capture and Playback Adapter (for the AT bus) or Audio Capture and Playback Adapter/A (for Micro Channel), $565; Video Capture Adapter/A (for Micro Channel), $2,250.
Requirements: 286- or 386-based PC with OS/2 1.1 or later, 4MB RAM, 30MB hard disk, VGA or 8514/A display; or 386-based PC with DOS 4.0 or later, 640K RAM, 2MB to 4MB expanded memory. For Playback systems under OS/2, 4MB RAM; under DOS, 640K RAM plus 4MB expanded memory.
In Short: The AVC offers video and graphics, digital sound, and a scripting program that make it possible to assemble presentations containing a combination of disparate elements. It's a little weak in documentation and its animation capabilities are limited, but its thoughtful design and extensive interactive on-line help system make it relatively easy to master. In the multimedia contest, the AVC is the first with the most.

CIRCLE **620** ON READER SERVICE CARD

with 256 colors and provide really stunning images.

Another small glitch was that our test system, complete with the 8514/A adapter and monitor, produced on-screen snow when loading images during the playback of a show. This is something I have hardly seen since the days of CGA. According to an IBM representative, this results from noise generated by the operating system.

Assembling a collection of images with mixed color palettes poses problems as well. If you take two images that were created with different palettes and place a portion of one on the screen while a piece of the other is already displayed, you will find that the colors of the first image may change to bizarre and unpredictable combinations.

But the AVC's error messages were the greatest source of frustration. When trying to draw a new graphic, I received an "Out of memory" error. I knew the program was resource-hungry, but on a machine with 5MB of installed RAM this error seemed extreme. Then the audio recording module bombed out after 20 seconds of recording. The message informed me that the hard disk was either too slow or too fragmented to keep up with the recording. I also got a few other strange error messages, too cryptic to interpret. I discovered that many of these messages are not explained in the manuals. There are error messages listed for the runtime and installation programs, but none for the main AVC program.

To compound the problem, the error messages I received had nothing to do with the cause of the difficulty: I had filled the hard disk almost to capacity. (This was quite a feat inasmuch as AVC was the only application installed on a 60MB hard disk.) Once I deleted some extraneous directories, the errors disappeared, but I learned that it's best to consider installing a large hard disk if you're going to create any sizable presentation. And don't put too much stock in the program's error messages, either.

It's not just the error messages; the entire reference document is rather scant and does not measure up to typical IBM standards. The content is generally presented using a quasi-tutorial approach, and it does not come close to an exhaustive treatment of material. This may work as a strategy to avoid intimidating potential users, but it makes for a lousy reference tool.

Perhaps AVC's designers intended to have the on-line help system take the place of a document. This help system, written using the AVC system itself, is a hypertext/graphics tour de force. There are icons of books with tabbed dividers (these represent the on-screen index), plus buttons and prompts that lead to a myriad of highly designed explanations and examples. Many subjects even include accompanying audio tracks. It's a comprehensive but cumbersome system. It seems to take an eternity to load the correct help topic, even on a 25-MHz 386 computer! Call me old-fashioned, call me a spoilsport, but give me some well-designed reference screens and a thick manual with a long tutorial to make me a happier fellow.

THE BIG PICTURE

The Audio Visual Connection is ambitious and impressive, and it has system requirements to match. To create your own stories using the AVC, you need a 286 machine with OS/2 1.1 or later and 4MB of memory. If you have a 386, you can use the same OS/2 requirements or else run AVC under DOS 4.0 or later with 640K and an additional 4MB of expanded memory. Both configurations require a minimum of 30MB storage space, but our experience indicates that you can easily use three to five times that amount—especially if you intend to run any other applications on the machine.

To show your presentations, the memory requirements drop to 2MB (2MB of expanded memory with the DOS 4.0 configuration) and a 20MB hard disk. You also need a supported VGA or 8514/A-compatible monitor.

While no single module is truly extraordinary, AVC's tight integration of video-capture, image-edit, sound-recording, and story-scripting components earn it groundbreaking status. The programmability and access to all sorts of third-party options make the AVC all the more powerful (see the sidebar "The Making of a Presentation").

IBM recently announced its M-Motion Video Adapter/A board for the Micro Channel, a full-motion video board that supports live video from external sources such as VCRs, video disks, and cameras. IBM plans to incorporate support for this board in future versions of the AVC, but for the moment the board is a standalone product with its own software. The introduction of a motion video product is another indication of IBM's determination to beat the competition with a full suite of multimedia products.

For now, IBM's AVC has a lead on a pack of competitors who are just beginning to gear up for the race. But this business has proven that there are no prizes just for being first.

Remember that AVC is the first of many multimedia products. *PC Magazine* will be taking its first in-depth look at this burgeoning scene in an upcoming issue. For now, IBM's Audio Visual Connection has an early lead on a pack of competitors who are just beginning to gear up for the race. But this business has proven that there are no prizes just for being first. ■

Alfred Poor is a contributing editor of PC Magazine.

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What also sets 8900 Series printers apart is their combination of intelligent forms handling with flexible printing and paper handling capabilities. For example, TI's special Z-Axis Control™ printhead controller automatically senses a document's thickness and adjusts the printhead to its optimal position.

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The 8900 Series also features a user-friendly control panel with a liquid crystal display. You can select options like print quality, font styles, menu status and others with the touch of a Powerkey™ button.

More features in one product.

An 18-pin printhead ensures crisp, readable text, even on the last copy of up to nine-part forms. With five print speeds, the printers can handle high-speed reports as well as letter-quality correspondence.

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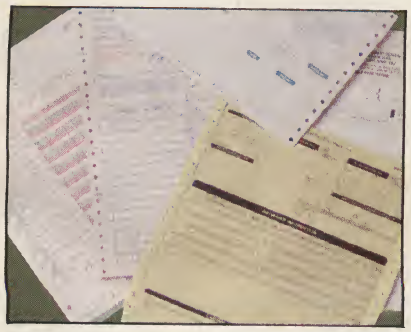


TI's 8900 Series prints a variety of forms for a variety of users.

For single-user printing, try TI's new 83X Series.

TI also provides you with a workstation printer solution. The Model 830 and 835 printers combine such personal printer features as an easy-to-use control panel and key forms printing features like short tear-off and a straight paper path.

The Model 830 is a narrow carriage printer while the 835 has a wide carriage. Both printers feature such versatile paper-handling characteristics as bottom, rear and top feed; automatic cut-sheet insertion; paper parking; and up to five-part forms printing.

You can also choose from options like a user-installable serial interface board; a sheet feeder; and a pull tractor (required for bottom-feed paperhandling).

Choose from three print speeds, including high-speed draft mode (300 cps), utility mode (250 cps) and near-letter-quality mode (63 cps). Whether you need the multi-user 8900 Series or the single-user 83X Series, TI offers you the printers you need when your needs are demanding.

TEXAS INSTRUMENTS

© 1989 TI 44365

*Based upon 2,000 characters per page.

Z-Axis Control, Page Finder and Powerkey are trademarks Texas Instruments Incorporated.

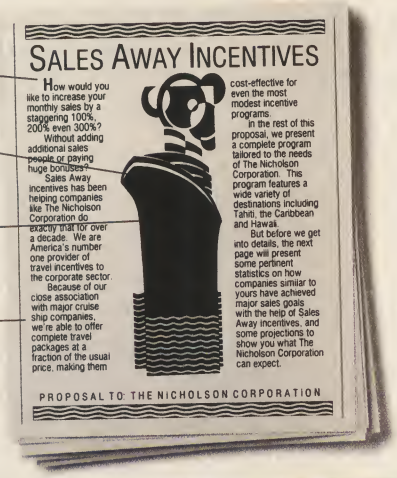
The new MultiMate. Productivity beyond words.

Create nearly any font size.

Easily integrate graphics into your document.

Import graphics from most popular file formats.

Design documents with multiple columns.



SALES AWAY INCENTIVES

How would you like to increase your monthly sales by a staggering 100%, 200% even 300%?

Without adding additional sales people or paying huge bonuses?

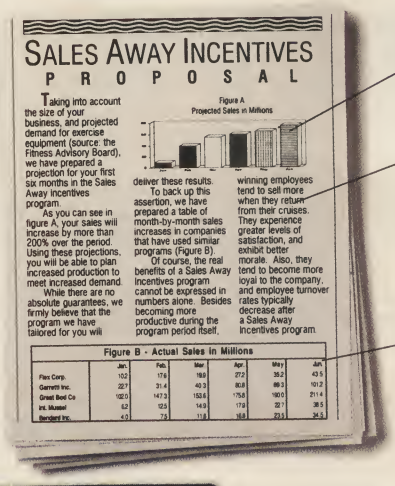
Sales Away incentives has been helping companies like The Nicholson Corporation do exactly that for over a decade. We are America's number one provider of travel incentives to the corporate sector.

Because of our close association with major cruise ship companies, we're able to offer complete travel packages at a fraction of the usual price, making them cost-effective for even the most modest incentive programs.

In the rest of this proposal, we present a complete program tailored to the needs of The Nicholson Corporation. This program features a wide variety of destinations including Tahiti, the Caribbean and Hawaii.

But before we get into details, the next page will present some pertinent statistics on how companies similar to yours have achieved major sales goals with the help of Sales Away incentives, and some projections to show you what The Nicholson Corporation can expect.

PROPOSAL TO: THE NICHOLSON CORPORATION



SALES AWAY INCENTIVES
PROPOSAL

Taking into account the size of your business, and projected demand for exercise equipment (source: the Fitness Advisory Board), we have prepared a projection for your first six months in the Sales Away incentives program.

As you can see in figure A, your sales will increase by more than 200% over the period. Using these projections, you will be able to plan increased production to meet increased demand.

While there are no absolute guarantees, we firmly believe that the program we have tailored for you will deliver these results.

To back up this assertion, we have prepared a table of month-by-month sales increases in companies that have used similar programs (Figure B).

Of course, the real benefits of a Sales Away incentives program cannot be expressed in numbers alone. Besides becoming more productive during the program period itself, winning employees tend to sell more when they return from their cruises. They experience greater levels of satisfaction, and exhibit better morale. Also, they tend to become more loyal to the company, and employee turnover rates typically decrease after a Sales Away incentives program.

Figure A
Projected Sales in Millions

Figure B - Actual Sales in Millions

	Jan	Feb	Mar	Apr	May	Jun
Flex Corp.	10.2	17.6	19.9	27.2	35.2	43.5
Garrett Inc.	22.7	31.4	42.3	80.8	89.3	101.2
Great Bod Co	102.0	147.3	153.6	175.8	190.0	211.4
Int. Muscl	6.2	12.3	14.9	17.9	22.1	38.5
Jordgrd Inc.	4.0	7.5	11.8	16.8	23.3	34.3

You can import charts based on dBASE IV® data.

Text can be transparently imported from other popular word processors in editable form—without complicated conversions.

Tables can be imported from your spreadsheets.

Integrated grammar checker (Grammatik™ IV) helps you enhance the style and effectiveness of your documents.

Pull-down Menus make it easy to grammar check all of your documents.

Ashton-Tate's new MultiMate® version 4.0 takes you beyond word processing. And beyond other word processors.

With a few simple keystrokes, you can import graphics and images from virtually any source. And see exactly how your page is going to look before it prints.

Importing text from other leading word processors is just as simple. MultiMate's new conversion utility does it transparently—from within your document. And exporting is just as easy.

Easy Pull-down Menus help you check the grammar and style of your document. And the integrated Electronic Mail lets you send or receive documents and messages instantly.

Of course, there are more enhancements. Like running other software without leaving MultiMate. Plus redlining, line numbering, *free* Bitstream® fonts, enhanced mail merge and more.

For a brochure, call 1-800-437-4329 ext. 1903.

Or better yet, you can upgrade for only $75 by calling 1-800-2ASHTON. Call now, and experience the productivity of the new MultiMate for yourself.

It's simply beyond words.

Ashton-Tate®

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ENDURANCE TESTS

Graphics Software and Hardware

by Lori Grunin

Our Endurance Test series continues with the results of our months-long investigation into the world of graphics.

You've probably seen the commercial on television. Someone scribbles a drawing on a napkin; then, after some scanning, massaging, and presentation-graphicing, you see the sketch has turned into a fully realized product flying off into the sunset.

In this installment of our Endurance Tests, we wrestled with some of the hardware and software tools that make scenarios such as the one depicted by the commercial a reality. All are related to the creation, manipulation, and output of images; they were chosen because they earned Editor's Choices, hold market leadership, or stir our technological interest.

Our rather eclectic toolbox consists of high-resolution mice, monitors that support IBM's 8514/A standard, presentation graphics software, high-end illustration programs, character recognition systems, and PostScript emulation hardware for HP LaserJets. When the dust settled after our test-athon, some of us repacked or erased our six-month albatrosses; others still sing the praises of their newfound loves.

crash, making it ideal for both workstations and networks.

Bernoulli also makes working backup copies three to four times faster than tape. And due to its active archiving ability, users can bring backed-up data on line immediately, without time-consuming dump/restore commands.

Bernoulli gives companies who depend on their data another important benefit. It doesn't compromise when it comes to data security, because without your data, even the best system is essentially worthless.

BERNOULLI MEANS SECURITY FOR YOUR DATA

"We were so relieved to get that important data back," says Mailman. "Bernoulli's technology is simply outstanding — that's all there is to it."

Give your data the protection it deserves. Call 1-800-777-3049 for free Bernoulli specifications and literature. Because when the heat is on, you can't afford to entrust your data to anyone else.

CIRCLE 378 ON READER SERVICE CARD

BERNOULLI®

STORAGE SOLUTIONS BY IOMEGA®

nouncements I regularly receive, scan them into a file, and archive them for future reference. Now all the press announcements are on-disk, and I've freed up my file cabinet for back issues of *PC Magazine*.

My only complaint with Version 2.0 of OmniPage is the limited number of devices it supports: other than the HP ScanJets, it supports only the Canon Image Scanners IX-12 and -12F. By contrast, Version 2.1 of the software (just released as we went to press) supports 12 different scanners.

Again and again during this endurance test, OmniPage proved itself a winner. Would I keep on using it? You bet.

OmniPage
Caere Corp., 100 Cooper Ct., Los Gatos, CA 95030; (800) 535-7226, (408) 395-7000.
List Price: With coproccessor board for a 286-based computer, $1,995; 386 version, $895.
Requires: 640K RAM (4MB RAM for 386 version), 8MB disk space, full-length slot, DOS 3.1 or later.

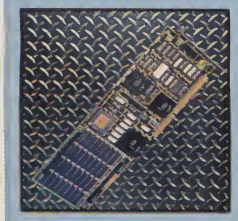
CIRCLE **604** ON READER SERVICE CARD

TrueScan

by Charles Rodriguez

The past few months have given me ample opportunity to experiment with Calera Recognition Systems' contribution to electronic font recognition literacy, the TrueScan. In that time, I've really come to respect this enhancement to my scanner. The product is composed of a midlevel interpreter board powered by a Motorola 68020 running at 16 MHz, with accompanying software.

TRUESCAN



Last Review: March 28, 1989, page 212
Reason Selected: Technical interest
Positive Findings: Double-sided and one-pass scanning abilities speed up operations. Scanning from the DOS prompt facilitates quick scan jobs.
Negative Findings: Some problems when scanning 6- and 8-point characters.

RELIABILITY
COMPATIBILITY
PERFORMANCE

ENDURANCE TESTS
GRAPHICS

Our endurance test was conducted on the Model E, which comes with 4MB RAM and zooms through the recognition process at 100 characters per second. (The Model S with 2MB RAM sells for $1,495.) The software transforms captured text into any of 25 possible formats to fit a variety of word processors; it also allows graphics files to be translated into either .PCX or .TIF formats.

With an HP ScanJet Plus, I not only put the TrueScan through PC Labs' own scanning tests, I also used it for workaday activities (alternating between it and Caere's OmniPage) like scanning in magazine articles that I wanted handy for referencing. Throughout, the TrueScan proved faithful to its claim of character enhancement recognition: for the most part, bold, italic, and underlined characters were recognized and correctly translated into the word processor formats I selected.

Although Calera says the TrueScan will read 6- to 28-point character sizes in any of 16,000 fonts, it consistently had problems with certain types of text. In default mode, it did its best work in the 9- to 12-point range, reading either sans serif or monospaced fonts. But in general, 6- and 8-point text in default mode was peppered with the asterisk TrueScan uses to flag possible translation errors, or else lines were oddly broken. Adjusting the TrueScan's contrast settings corrected most problems. Nonetheless, a feature like OmniPage's character recognition window would have been helpful: had I been able to see and change settings on the fly, I wouldn't have had the trouble of redoing scanning jobs.

One feature that translated into real time savings was the TrueScan's ability to scan a page of text and graphics at a single pass. And the system's operating speed meant that I was able to finish scanning quickly and get on to my other work.

When it came to scanning stacks of two-sided documents, the TrueScan was a lifesaver. Once I scanned the front of the pages, I didn't have to go back and turn them over one by one; I merely had to turn over the entire stack. TrueScan incorporated the backs of the pages—appropriately collated—in the file that contained the original front-page scans.

The system doesn't run under *Windows* like the OmniPage, but I found its menu-based system easy to navigate. A handy feature, which I found myself turning to time and again, is the system's ability to scan directly from the DOS prompt. I could simply switch to the subdirectory in which I wanted to place the scanned image and activate the TrueScan, and the file would be saved to where I wanted it with no additional intervention from me.

Having used the system extensively, I can see how its $3,495 price—which seems high at first glance—would translate into real savings over the long term, particularly in offices where much work is done with double-sided and graphics-intensive documents.

TrueScan
Calera Recognition Systems, 2500 Augustine Dr., Santa Clara, CA 95054; (800) 544-7052, (408) 986-8006.
List Price: Model E, with 4MB RAM, $3,495.
Requires: 512K RAM, one open slot, DOS 3.1 or later.

CIRCLE **613** ON READER SERVICE CARD

MICE

E-Mouse

by Lori Grunin

As I contemplate my past months of using Mitsubishi's E-Mouse with applications that ranged from Sierra On-Line games to *Autodesk Animator* to *Microsoft Word,* I can't help but compare it with its competition—the Microsoft Mouse and the Logitech Mouse. The $179.50 E-Mouse's primary asset is its 400-dot-per-inch resolution; it requires tangibly less mousing area than the more common 200-dpi mice. And the E-Mouse's two buttons have remained properly responsive, so I

E-MOUSE

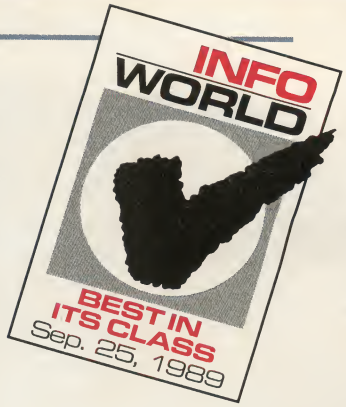
Last Review: *February 14, 1989,* page 262
Reason Selected: Editor's Choice
Positive Findings: 400-dpi resolution, a big improvement over 200-dpi mice. Responsive buttons facilitate double-clicking.
Negative Findings: Design and placement of the ball at the rear make long-term use uncomfortable.

RELIABILITY
COMPATIBILITY
PERFORMANCE

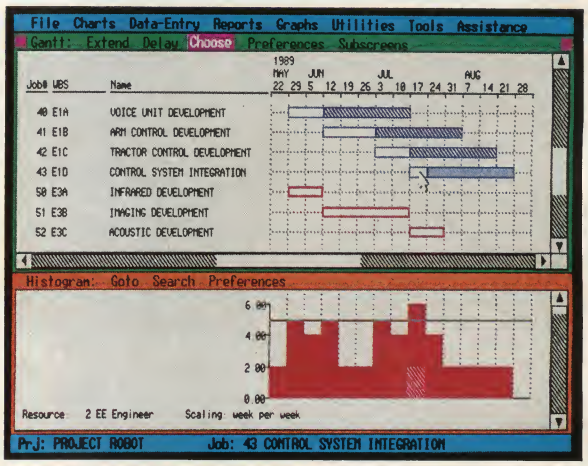
"Project Scheduler™ 4:

Finally, an easy-to-use project manager"

PC MAGAZINE, SEPTEMBER 12, 1989



Everyone promises ease of use. Project Scheduler 4 really delivers. Expert after expert agrees, Project Scheduler 4 is the fast track to automated project management. And once you're started, Project Scheduler 4 keeps you going with outstanding power, world-class speed, and industry-leading capacity. Project Scheduler 4 is the clear choice for today, and tomorrow.



Our Gantt Histogram pinpoints resource overloads.

EXPERT TESTIMONY

PC WEEK, MARCH 13, 1989:
"Easy for novices to learn, but packs enough power and functionality for experienced project managers."

DESIGN NEWS, MARCH 27, 1989:
"PS4 is a thorough and complete management system. Its built-in flexibility and abundant features allow for efficient planning of even the most complex projects."

***DANIEL YAHDAV*, PM SOLUTIONS, JUNE 1989:**
"Project Scheduler 4 earns PM Solutions' highest marks in ease of use. It leads its competition in schedule recalculation and resource leveling performance."

PC MAGAZINE, SEPTEMBER 12, 1989:
"Context-sensitive help and three levels of automatic prompting offer enough assistance that you may never open the fine manual that accompanies the program."

"Project Scheduler 4's project management graphs and charts are simply the best around."

"With good scheduling facilities, excellent graphics, and the best interface in its class, the program is well on its way to becoming the premier project manager."

INFO WORLD, SEPTEMBER 25, 1989:
"Project Scheduler 4 is the one program you can't ignore."

"...Project Scheduler 4 provides a superior balance of features and ease of use."

The difference is graphically clear.™

Project Scheduler 4 is the first PC-based package that integrates high-resolution graphics with all the management tools you need. You understand more because you see more both on screen and in the reports. At last, PERT and Gantt charts make sense. And responsibilities, deadlines, and resource bottlenecks are all spotted at a glance.

Announcing Version 2.0.

We've made the best product even better with expanded memory support and enhanced reporting and tracking. And you still get the benefits of a full graphic environment without expensive hardware upgrades because Project Scheduler 4 runs under DOS on PC systems from the XT on up.

The corporate choice.

Whether you're managing a single project in a small business or multiple projects at a Fortune 500 corporation, Project Scheduler 4 helps you succeed. For more information and a brochure, call or write:

415/570-7700
393 Vintage Park Drive
Suite 140
Foster City, CA 94404

Scitor Corporation

have no complaints there. Nor did I experience any compatibility problems.

But my extended usage really drove home the importance of a mouse's shape and of the placement of its ball. The E-Mouse has a rounded wedge shape, with the bulge at the rear; the location of the bulge made it natural for my hand to rest on the mouse at an angle that necessitated relatively flat-fingered contact with the buttons. This caused more strain on my hand over long periods than the middle-bulged Microsoft and Logitech ever did.

Furthermore, the ball in the E-Mouse lies in the bulge, so I found myself pushing the mouse with the heel of my hand, rather than guiding it with my fingers as the other two mice allow. If the mouse had not been 400 dpi, this would have required excessive arm movement; as it was, it was merely uncomfortable.

Although the high resolution was welcome in paint programs, games, and other graphically based programs, it was far too responsive for word processing. The E-Mouse comes with utility software for setting sensitivity, but trying to locate the optimal vertical and horizontal settings by choosing values between 1 and 255 and setting them via the DOS command line is not my idea of a good time.

When we awarded the E-Mouse our Editor's Choice it was the only 400-dpi mouse around, as well as the most expensive. Now that Microsoft has released a 400-dpi version of what I consider the best mouse in the industry, Mitsubishi's mouse is just the most expensive.

E-Mouse
Misubishi International Corp., distributed by Mouse Systems Corp., 47505 Seabridge Dr., Fremont, CA 94538; (415) 656-1117.
List Price: $179.50.
Requires: 8K RAM, RS-232C serial port, DOS 1.0 or later.
CIRCLE **605** ON READER SERVICE CARD

Key Tronic Professional Series Mouse

by Gary W. Kaplow

The Key Tronic Professional Series Mouse, like a fine wine, ages well. Constant use of it over the past six months has only served to *showcase its winning* combination of performance and quality. For this endurance test review, the company supplied us with the $109 serial version.

My road test of this mouse began with its installation, a very simple process. The ergonomic design of the Key Tronic model resembles the shape and feel of the Microsoft Mouse, so I didn't have to go through the period of adjustment that often accompanies moving from one mouse to another. The Key Tronic's two buttons, which cover over half of the mouse's surface, are flush-mounted and extremely responsive. I found that over the long haul this design minimizes user fatigue in double-clicking. The buttons' good springing action, sustained over these months, helped me confirm that a click had registered.

The Key Tronic mouse has survived a number of unintentional drops onto a hardwood floor.

I work with *Windows* on a daily basis, and moving from my mouse to its shortcut keyboard hotkeys is a regular occurrence. I found the nine raised bumps on the left button a handy guide when moving back and forth between the two input devices.

Software drivers for *Lotus 1-2-3, WordPerfect,* and *dBASE III* are included in the price. Whether I was operating in or out of *Microsoft Windows*, the 200-dot-per-inch resolution made tracking extremely responsive and accurate. While the Key Tronic mouse glides beautifully on a mouse pad, I often let it run across my flat desktop surface, where it performed with equal grace. This can be attributed to its heavily weighted tracking ball.

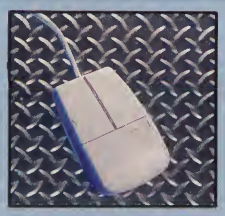
This is one mouse with a case that neither bumps nor bounces nor acts of God seem able to demolish. It has survived a number of unintentional impact tests, falling off my desktop and onto the hardwood floor.

I did find fault with one aspect of the mouse: its cable is shorter than Microsoft's, and the reduced length tended to hamper freedom of movement a bit. Luckily, Key Tronic offers extension cables, along with a variety of other devices such as a Velcro-attached mouse pocket and a mouse programmer's toolkit.

In my book, the Key Tronic has a leading edge in the rat (or should I say mouse) race. In my experience, it ran neck and neck with the Microsoft Mouse, being its equal in both performance and comfort.

Key Tronic Professional Series Mouse
Key Tronic Corp., P.O. Box 14687, Spokane, WA 99214; (509) 928-8000.
List Price: $109.
Requires: 10K RAM, RS-232C serial port (bus version requires available expansion slot), DOS 2.0 or later.
CIRCLE **606** ON READER SERVICE CARD

KEY TRONIC PROFESSIONAL SERIES MOUSE



Last Review: February 14, 1989, page 252
Reason Selected: Editor's Choice
Positive Findings: Good design. Performs well on either mouse pad or desktop; sturdy casing takes a licking.
Negative Findings: Cable is too short.

RELIABILITY
COMPATIBILITY
PERFORMANCE

Logitech Mouse Series 9

by Charles Conover

Six months with the $129 Logitech Series 9 bus mouse proves one *thing: this* three-button, high-resolution model is as comfortable and easy to use as it is technologically advanced.

The mouse is slightly larger than the Microsoft model I use on another computer, and at first it felt awkward. Once I became accustomed to it, however, the Logitech felt right at home in my hand. The model sports an ergonomically designed case, arched so that your fingers fall naturally over its three equally spaced buttons. A slight indentation on the center button kept me conscious of where my middle finger resided, preventing my pressing it when I really meant to access the third button. The middle button itself can be cus-

In 1989, PC Tools™ was the most talked-about utility software.

Central Point Software INC™

Introducing PC
The utility they'll be t

Disk Backup

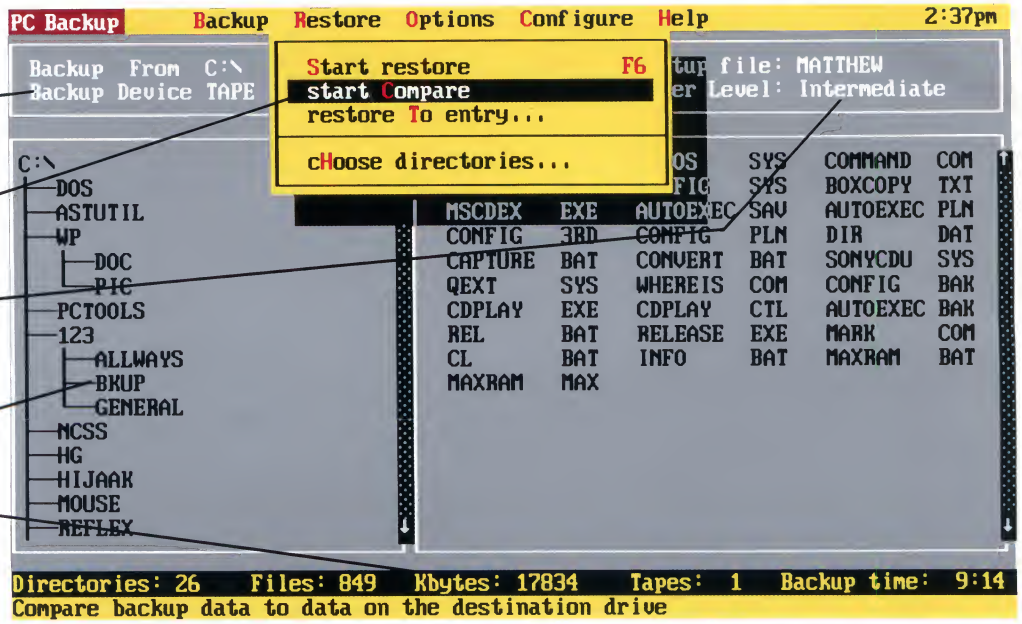
NEW ***Supports tape drives*** *used by IBM, Compaq, Irwin, Mountain and others. Features unattended, scheduled backups.*

NEW ***Advanced error-checking and correction*** *make sure your backup is absolutely reliable.*

NEW ***With three user levels,*** *begin with the basics and add more features when you're ready. Optional password protection. (Also included in PC Shell,™ below.)*

Quick, easy file selection. *Pick the files or directories you want and save your selections in a file for use later.*

NEW ***Fast and economical.*** *Backup at speeds up to 2.5 MB per minute. Our new high-speed compression reduces disk/tape usage up to 60%.*



DOS Shell

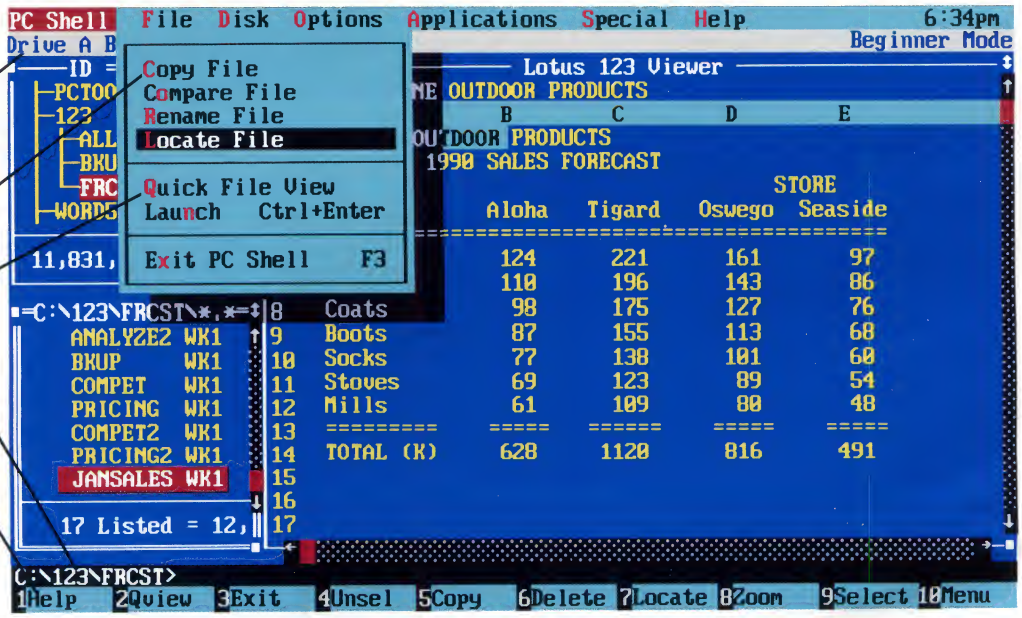
Network support. *Working with files on Novell and IBM PC LANs is as easy as if they were right inside your PC.*

NEW ***Transfer files to your laptop*** *with a built-in version of LapLink from Traveling Software.*

NEW ***Over 30 file viewers*** *let you browse through an entire directory of files in a matter of seconds.*

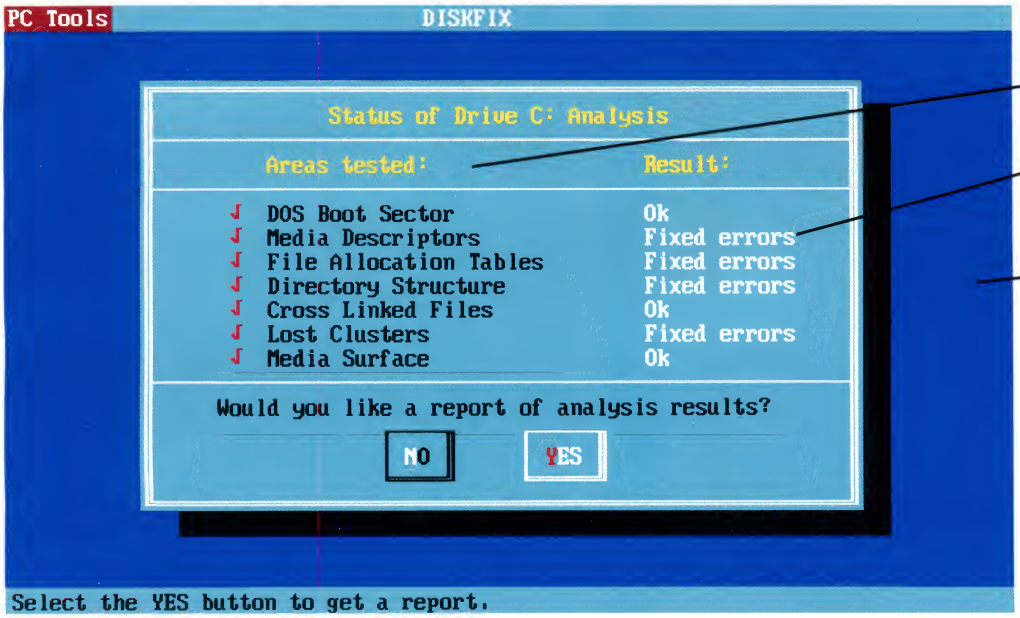
NEW ***Resident DOS prompt.*** *Hot-key into PC Shell and execute any DOS command without leaving your main program.*

NEW ***With user-definable function keys,*** *any of PC Shell's 60 functions are within easy reach.*



In 1989, PC Tools established itself as the world's leading utility product, not only by selling 711,000 copies, but also by receiving nearly every editorial award possible in its class. This year, we're proud to announce PC Tools Deluxe Version 6–more than 70 new features that set new standards for technical depth and ease of use.

Tools™ Version 6. alking about in 1990.



Data Recovery

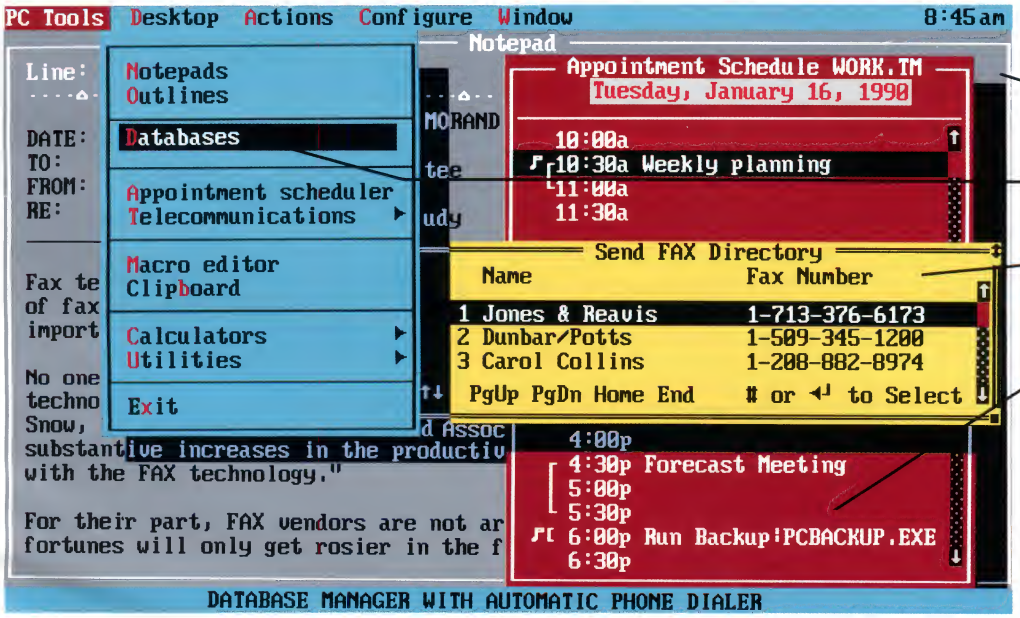
NEW ***Powerful and complete.*** *DiskFix™ is the most comprehensive disk-repair program you can buy.*

NEW ***Simple and automatic.*** *DiskFix analyses and repairs disks on its own. It doesn't ask you to become an expert.*

NEW ***Fast.*** *DiskFix performs over 1,000 tests on a 32 MB partition in as little as six seconds.*

Undelete and unformat *functions provide fast, easy recovery from deleted files or accidental formats.*

To speed recovery, *our Mirror program takes regular snapshots of your partition table, FAT and directory.*



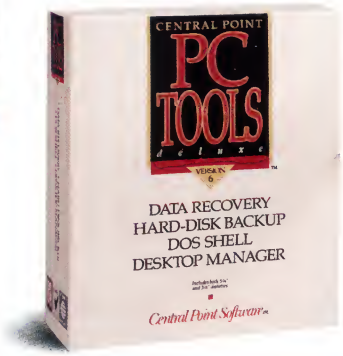
Desktop

Twelve integrated applications, *available on demand. Uses only 40 KB RAM in resident mode.*

NEW ***Our dBASE-compatible database*** *lets you manage lists, create form letters or autodial calls.*

NEW ***Fax support.*** *With a fax board you can send an urgent document anywhere in the world. Works over networks.*

The scheduler *not only tracks appointments, but can do a backup or download e-mail at a predetermined time.*



So discover Version 6 for yourself: Use the attached card to request more information or upgrade from a previous version. And get the utility they'll be talking about in 1990. *Central Point Software* INC™

PC Tools™ is the most powerful collection of data recovery, hard-disk backup, DOS shell, and desktop manager programs available–at any price. ★ Indicates new or improved in Version 6.

CONSISTENT INTERFACE

★ NEW! **VARIABLE USER LEVELS.** Beginner, Intermediate, and Advanced modes for PC Backup and PC Shell.

- **EASY TO USE.** Pull-down menus, context-sensitive help, full mouse support. Movable, resizable windows. IBM SAA/CUA compliant.

DATA RECOVERY

★ NEW! **DISKFIX.™** The most comprehensive disk-repair program available. Quickly and automatically diagnoses and repairs lost or cross-linked files and directories, file allocation errors and corrupt directory/partition information.

- **UNDELETE.** Fast and easy recovery of deleted files and subdirectories.
- **UNFORMAT.** Recover data after an accidental or unintended format.

HARD DISK BACKUP

★ NEW! **TAPE DRIVE SUPPORT.** Backup to QIC-40, QIC-80, and Irwin tape drives from IBM, Compaq, Mountain, Colorado Memory and Archive (QIC-80 only). Record up to 250 MB on one tape.

★ NEW! **COMPARE.** Checks backup against current files–produces report of differences.

★ NEW! **APPENDED BACKUPS.** Allows full and incremental backups to be retained on a single set of disks/tapes.

★ NEW! **FAST BACKUP.** Backup at speeds up to 2.5 MB per minute or faster, depending on your CPU speed.

★ NEW! **STANDARD DOS FORMAT.** Backup disks are now readable by DOS. Saves time and allows re-use of media without formatting.

★ NEW! **ADAPTIVE DATA COMPRESSION.** High-speed compression reduces disk/tape usage by up to 60%.

- **RELIABLE BACKUP.** Complete bit-for-bit verification of all data backed up; can reconstruct missing data from damaged disks.
- **SCHEDULED BACKUPS.** Schedule backups to run automatically.
- **DISK/TAPE/TIME ESTIMATE.** Dynamically estimates disk/tape and time usage for backup.

CENTRAL POINT™

PC TOOLS

d e l u x e

VERSION 6™

DOS SHELL

★ NEW! **OVER 30 FILE VIEWERS.** Quickly view files in their native formats. (See list below.)

★ NEW! **LOCATE.** Locate your files by name or by content; then load selected data and its parent application in one step.

★ NEW! **RESIDENT DOS PROMPT.** Hot-key into PC Shell and execute any DOS command without unloading your main program.

★ NEW! **FILE TRANSFER.** Transfer files to a laptop via serial cable with an integrated version of LapLink from Traveling Software.

★ NEW! **PROGRAMMABLE FUNCTION KEYS.** Customize PC Shell's function keys for quick access to your most-used commands.

- **FAST, EASY OPERATION.** Invoke standard DOS commands (Copy, Rename, Delete, etc.) with just a single keystroke.
- **SORT, MOVE, PRUNE & GRAFT.** Reorder and reorganize files and directories with ease.

FILE VIEWERS

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- MS Works
- Wordstar
- Wordstar 2000
- XyWrite
- Multimate
- MS Windows Write
- PC Tools Notepad
- ASCII Text

SPREADSHEETS
- Lotus 1-2-3 (1A, 2.X)
- Symphony
- MS Excel
- MS Works
- Quattro
- Words and Figures
- Twin
- VP-Planner Plus

DATABASES
- dBASE III, IV
- Paradox
- R:Base
- FoxBASE
- Clipper
- dBXL

OTHER
- Binary
- PC Paintbrush (PCX graphics)
- ARC, LZH, PAK, PKZIP and ZOO catalogs

- **NETWORK SUPPORT.** Supports Novell and IBM PC LAN networks.
- **MEMORY RESIDENT.** Optionally loads memory-resident. Use on top of other applications. Requires only 10 KB RAM.

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★ NEW! **FAX SUPPORT.** Use an Intel, Spectra or other CAS-compatible fax board to send/receive faxes at any time. Supports networks.

★ NEW! **DATABASE.** dBASE file-compatible; lets you manage lists, create form letters or autodial calls. Includes indexing, append/transfer, field-editing and a browse mode.

★ NEW! **TELECOMMUNICATIONS.** Send faxes or e-mail through services such as MCI, Compuserve, and EasyLink. Easily add other services. Can run in background.

★ NEW! **CALCULATORS.** HP-11C scientific, HP-12C financial, HP-16C programmer's, and algebraic calculators.

- **NOTEPADS.** Includes spelling checker, block moves, search/replace, and more.
- **APPOINTMENT SCHEDULER.** Plan and prioritize your schedule. Do a backup, send a fax, or download e-mail at a predetermined time.
- **CUT AND PASTE.** Capture work from your screen and "paste" it into a different program.
- **MEMORY RESIDENT.** Optionally loads memory-resident. Use on top of other applications. Requires less than 40 KB RAM.

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★ NEW! **PC CACHE.** Increases system performance. Includes optional write-caching. Supports conventional, extended and expanded (EMS) memory.

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REQUIREMENTS

IBM PC, XT, AT, PS/2 or 100% compatible with DOS 3.0 or higher and 512KB RAM. Hard disk recommended. Supports Microsoft mouse driver version 6.14 or higher, Logitech/Dexxa mouse drivers version 3.4X or higher, or 100% compatible.

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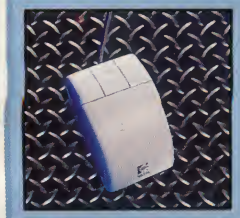
tomized to take the place of the commands you most often use. While I do know of people who take advantage of this feature, in all the months I used the mouse I preferred to stick with the keyboard commands that the middle button offered to replace.

Because of the mouse's dynamic tracking, I could easily scan across the entire screen using very little hand motion. With a resolution that can be programmed anywhere from 50 to 19,200 dots per inch (the default is 320 dpi), this Microsoft-compatible mouse performed with quite a high degree of accuracy during long sessions of pixel editing in ZSoft Corp.'s *PC Paintbrush IV*.

LOGITECH MOUSE SERIES 9



Last Review: February 14, 1989, page 262
Reason Selected: Technical interest
Positive Findings: Wide-ranging resolution; high degree of accuracy in operation. Comfortable movement.
Negative Findings: Lightweight construction (compared with Microsoft Mouse) leads to occasional slips.

RELIABILITY
COMPATIBILITY
PERFORMANCE

A versatile rodent, the Logitech Mouse comes with numerous options and programming features. I had high hopes for the *Mouse-2-3* utility, which lets you use the Logitech with *Lotus 1-2-3*. Indeed, the utility itself performed well, but I must admit to feeling uncomfortable using *1-2-3* with a mouse. With the keyboard, I didn't even have to think about selecting *1-2-3* commands; with a mouse, the entire process became a conscious effort and decreased my productivity. This is certainly not the fault of the Logitech product—just a mental block that other experienced *1-2-3* users might well share.

One problem Logitech must take the blame for is that its mouse would sometimes slip on the surface of my desktop, which never happens with the Microsoft Mouse. The problem seems to stem from the Logitech unit's lightweight construction: the Microsoft Mouse has a much heavier ball and seems to be better weighted to the table.

Over the long term, how does the Logitech fare against the market-leading Microsoft Mouse? Let's put it this way: I'm not about to replace the Microsoft Mouse I use on one of my PCs with the Logitech, but neither do I intend to ditch the Logitech that has served so well on my other system throughout these past few months.

Logitech Mouse Series 9
Logitech Inc., 6505 Kaiser Dr., Fremont, CA 94555; (415) 795-8500.
List Price: $129; serial version, $119; PS/2 serial version, $139.
Requires: 11K RAM (384K RAM with pop-up DOS), 8-bit expansion slot (serial version requires an RS-232 serial port), DOS 2.1 or later.

CIRCLE **607** ON READER SERVICE CARD

MONITORS

Mitsubishi FA3425L9 Princeton Graphic Systems Ultra 16 Taxan Ultra Vision 1000

by Tony Rizzo

When first asked to test three 8514/A-compatible monitors, I thought to myself, "Flicker . . . . I'm going to have to live with flicker for the duration of this endurance test!" Thus, the real question became not one of the monitors themselves enduring, but of my being able to endure. I'm happy to report that I've survived, safe and sound, my eyesight intact, with absolutely no case of the jitters.

The three monitors I tested—the Mitsubishi FA3425L9, the Princeton Graphic Systems Ultra 16, and the Taxan Ultra Vision 1000—all performed admirably. Each spent its fair share of time attached to my IBM PS/2 Model 80, utilizing its fully populated IBM 8514/A board. At one time or another, I also had the monitors connected to the Model 80's built-in VGA adaptor.

The 8514/A board and its interlaced display technology necessarily played a big role in the review process. For the most part, my testing was done by running OS/2 1.2's Presentation Manager with the OS/2 8514/A driver installed.

MITSUBISHI FA3425L9

The $1,175 Mitsubishi FA3425L9 turned out to be an absolutely wonderful monitor for use with the 8514/A. It offered an easy setup and long-persistance phosphers that produced a pretty solid and steady image at all times during the months I used it. I found no flicker problems here.

The flip side to this is that when I needed to drop down to VGA, long-persistence phosphors suddenly became considerably less tolerable. When scrolling text, working with *Microsoft Windows*, or running animations using *Autodesk Animator*, I met with annoying ghosting. I also found that the only way to obtain a satisfactory picture was to have the brightness and contrast knobs turned to their highest positions. Moreover, the $30 swivel base didn't seem quite as solid as it could be, but it did stay put once I found a good position, and prolonged use didn't bring on any neck cramps.

MITSUBISHI FA3425L9

Last Review: February 14, 1989, page 216
Reason Selected: Editor's Choice
Positive Findings: Steady and solid; flicker-free image in 8514/A mode.
Negative Findings: Ghosting in VGA mode. Swivel stand seems less solid than the competition.

RELIABILITY
COMPATIBILITY
PERFORMANCE
8514/A MODE
VGA MODE

PRINCETON GRAPHIC SYSTEMS ULTRA 16

As with the Mitsubishi monitor, set-up of the Princeton Graphic Systems Ultra 16 was easy. All I had to do was make sure this $1,375 monitor was set for analog input and plug it in.

My experiments with picture quality in VGA mode produced excellent results. In 8514/A mode, operation was smooth: I did observe some flicker, but it was barely perceptible and therefore tolerable. One minor problem revolved around the horizontal size control. In underscan mode the picture came up a bit too small, whereas in overscan mode it was just a mite too large: the knob *would not* bring the picture out enough in underscan mode, or in enough in overscan mode. A minor nuisance, to be sure, and I had no trouble compromis-

PRINCETON GRAPHIC SYSTEMS ULTRA 16

Last Review: February 14, 1989, page 223
Reason Selected: Editor's Choice
Positive Findings: Fine picture quality; sturdy swivel base.
Negative Findings: Picture came up a bit too small in underscan mode, a touch too large in overscan mode (a minor nuisance).

RELIABILITY
COMPATIBILITY
PERFORMANCE
8514/A MODE — VGA MODE

ing—setting the monitor in underscan mode with the horizontal size control turned to its maximum position.

You'll want to avoid placing paper or other objects atop the monitor. In daily operation, I found that the Princeton runs much hotter than the other monitors tested.

In the time I had it, I certainly put the monitor's swivel base through a fair amount of abuse. It remained solid and reliable throughout.

TAXAN ULTRA VISION 1000

This brings us to the Taxan Ultra Vision 1000. I'm *not* giving this back! This is one solid monitor, worth every penny of its $3,695 price. In fact, it's so solid that I suspect its model number was based on its weight—it feels like a 1,000-pound unit. (All right, the actual weight is only 77 pounds.) Needless to stay, it sits, immovable, on my desk.

With rock-steady performance, a big 16.5-inch picture (easily legible from 5 feet away, and great for small-scale presentations), and effortless handling of the 8514/A, the Taxan Ultra Vision has quickly become my standard for running Presentation Manager.

The monitor accepts only analog input, this through five BNC connectors—but once again setup is simple. Controls include brightness and contrast thumbwheels and a handy built-in degausser. The contrast setting was fine in its middle postion, but I had to keep the brightness knob turned all the way up to get a suitably

TAXAN ULTRA VISION 1000

Last Review: February 14, 1989, page 231
Reason Selected: Editor's Choice
Positive Findings: Rock-steady performance; solid design; a large screen legible from a generous distance.
Negative Findings: Fingerprint-sensitive antiglare screen.

RELIABILITY
COMPATIBILITY
PERFORMANCE
8514/A MODE — VGA MODE

bright picture. As with the Mitsubishi, this is probably just a matter of personal taste.

A special compartment holds controls that allow for fine tuning of the picture (vertical/horizontal size and position) in either 30- or 60-kHz scanning mode. These controls can be accessed with a small, supplied screwdriver, but I never needed to make any adjustments.

I don't make a habit of resting my hand against my display, but the antiglare screen does pick up and reflect back the

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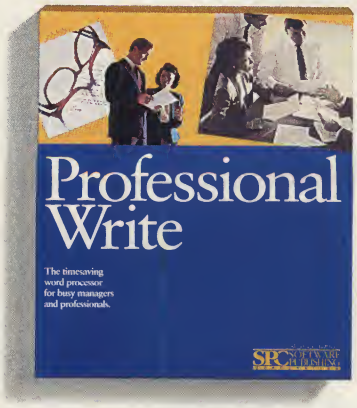

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slightest fingerprint. Either be careful or be prepared to clean the screen often.

GENERAL OBSERVATIONS

In general, as far as the 8514/A display mode goes, any of these monitors will suffice. While some industry observers complain long and loudly about the 8514/A standard, in months of steady work with these monitors, I haven't seen anything to moan about.

In fact, I got used to the 8514/A mode fairly quickly, and VGA just doesn't look quite as good to me anymore. Flicker? Poorly designed 8514/A monitors may have this problem, but quality 8514/A models, like the ones that survived this endurance test, are as free (or nearly as free) from that problem as quality monitors that operate in any other mode.

Mitsubishi FA3425L9
Mitsubishi Electronics America Inc., 991 Knox St., Torrance, CA; (213) 217-5732.
List Price: With long-persistence phosphors, $1,175; with short-persistence phosphors, $1,015. Tilt-and-swivel base, $30; VGA cable, $35.
Requires: Any VGA or 8514/A display adapter.
CIRCLE **608** ON READER SERVICE CARD

Princeton Graphic Systems Ultra 16
Princeton Graphic Systems, 1100 N. Meadow Pkwy., #150, Roswell, GA 30076; (800) 221-4190, (404) 664-1010.
List Price: $1,375.
Requires: MDA, Hercules, CGA, EGA, VGA, or 8514/A display adapter.
CIRCLE **609** ON READER SERVICE CARD

Taxan Ultra Vision 1000
Taxan USA Corp., 161 Nortech Pkwy., San Jose, CA 95134; (800) 829-2641, (408) 946-3400.
List Price: $3,695.
Requires: VGA or 8514/A display adapter.
CIRCLE **610** ON READER SERVICE CARD

POSTSCRIPT ADD-IN BOARDS

PC Publisher Kit Series II

by Stuart R. Greenberg

PostScript holds an undying attraction for would-be desktop publishers, although it may seem out of reach for those who barely scraped together *enough cash* to buy a Hewlett-Packard LaserJet. Now I love my LaserJet, but we're talking about scalable fonts, high-quality graphics, and dazzling special effects. So I welcomed the chance to bring PostScript power to my LaserJet for a few months—courtesy of QMS's PC Publisher Kit Series II.

The $1,995 PC Publisher Kit consists of a circuit board for the PC and one for the LaserJet. Installation proved simple, and I was up and running in minutes. But after a few sessions of playing around I discovered one important fact: I need my LaserJet. Although I do my fair share of desktop publishing, I *am* a programmer: code listings, screen dumps, and other tasks require unmodified LaserJet output.

Happily, the PC Publisher Kit allows unrestricted use of the LaserJet in two ways. If the PostScript driver software was not loaded, the LaserJet functioned normally. Better yet, even with the PostScript drivers loaded I could use the LaserJet. I simply directed the driver to send all output intended for LPT2 to the PostScript processor; any output destined for LPT1 was sent directly to the LaserJet. I had my cake and was eating it too!

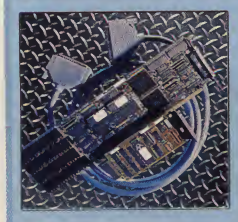
The PC Publisher Kit operated almost flawlessly all through the months I used it. The print speed wasn't blinding, but the results were worth the wait. The PostScript pattern fills in *Corel Draw!* were particularly impressive.

The only problem occurred early on, when I was using the PostScript driver software with *Corel Draw!*. Initially, everything I prepared printed properly except for special PostScript effects. Closer examination of the Print dialog box indicated that *Corel Draw!* thought I was printing on a non-PostScript device. It turned out that *Corel Draw!* requires the *Windows* PostScript driver to have a particular name, and it was not the one supplied with the PC Publisher Kit. All I had to do was use the original *Windows* driver or rename the QMS driver. Kudos must go to the technical staffs at QMS and Corel: each immediately knew the solutions.

Over time, the PC Publisher Kit became an extension of my LaserJet—one that I could quickly and easily put to work. But I also realized something about PostScript in general during these months. Recent products like *MoreFonts* and *DigiFonts* have brought special effects to the LaserJet itself, making PostScript less of a necessity for some tasks. But that's not to say that the wide-eyed desktop publisher in me has grown blasé about PostScript: no other way can I fulfill creative tasks like indulging in *Corel Draw!*'s spectacular fills, or manipulating graphics through direct programming.

PC Publisher Kit Series II
QMS Inc., One Magnum Pass, Mobile, AL 36618; (800) 631-2692, (205) 633-4300.
List Price: $1,995.
Requires: 16K RAM, 2.8MB hard disk space, HP LaserJet Series II printer.
CIRCLE **611** ON READER SERVICE CARD

PC PUBLISHER KIT SERIES II



Last Review: April 11, 1989, page 224
Reason Selected: Editor's Choice runner-up
Positive Findings: Excellent technical support; impressive output (especially Corel Draw!'s patterns fills).
Negative Findings: Slower than the PS-388 Accelerator (but less expensive).

RELIABILITY
COMPATIBILITY
PERFORMANCE

PS-388 Accelerator

by Luisa Simone

Everyone who owns a PC must usually make choices between mutually exclusive standards: EGA versus VGA, high-density versus low-density floppy disks, Hewlett-Packard's Printer Control Language (PCL) versus PostScript. But in the past seven months, I haven't had to choose between PCL and PostScript: I was the happy road-tester of Princeton Publishing Labs' PS-388 Accelerator.

This best-of-both-worlds scenario meant that the two print modes were always available. Software configured for the HP LaserJet wrote to LPT1, and applications that took advantage of PostScript sent data to LPT2. The only time during the day when I was consciously aware of the additional board in my printer was when I booted up, because I had to download the 35 Bitstream outline fonts that came with the PS-388.

In all the months that I have used this product I received only one error message from *Microsoft Windows*, which informed

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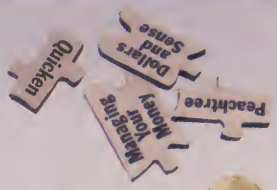

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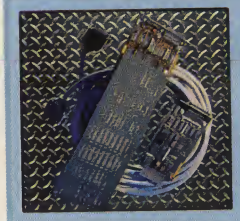
me that it was unable to write to LPT2 even though the pages had printed out properly. It turned out that the Princeton board was

PS-388 ACCELERATOR



Last Review: April 11, 1989, page 214
Reason Selected: Editor's Choice
Positive Findings: Prints out images with blinding speed. The ability to interpret encrypted Adobe fonts makes it a better-than-ever clone of the Apple LaserWriter.
Negative Findings: A woefully inadequate manual.

RELIABILITY
COMPATIBILITY
PERFORMANCE

so fast that it confused the spooler—hence the error message. Now this is the kind of "problem" I can live with. Changing the control panel's time out and retry settings—to 60 and 100 seconds, respectively—ended the meaningless messages.

The Epson emulation mode, which was nonexistent when we reviewed the product for the issue of April 11, 1989, still prints nothing but garbage. And the manual still reads more like someone's notes than actual documentation, though this won't interfere with the simple installation: one of the boards that comprises the PS-388 resides in your PC, the other in the HP's expansion slot. The less-than-stellar manual did make it more difficult to access some features included in Version 2.0, like the new interactive mode.

I appreciated being able to download encrypted Adobe fonts to the PS-388. Yet the poor documentation left me to my own devices to figure out that installing the Adobe fonts for *Windows* required that I use the generic .PFB files, not the more logical *Windows* metric files (PFM).

With Adobe font capability, flawless interpretation of PostScript, 3MB memory, and a list price of $2,500 (down $295 from our previous review), the PS-388 has proved a long-term winner.

PS-388 Accelerator
Princeton Publishing Labs Inc., 19 Wall St., Princeton, NJ 08540; (609) 924-1153.
List Price: $2,500.
Requires: HP LaserJet Series II printer. ■
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by Frank J. Derfler, Jr., M. Keith Thompson, and Michael O. Warren

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PHOTOGRAPHY: IMAGE BANK

Remember when yours was a one-LAN company? You bought a fast file server and a bunch of network cards, and after a little sweat and maybe a few tears, *presto!,* your co-workers were sharing the laser printer, accessing your database files, and sending e-mail like it was going out of style.

Then the marketing department in your crosstown office hooked its PCs together. Next your regional offices in Atlanta, Phoenix, and Los Angeles followed suit. And while each of these offices had developed powerful ways of sharing their own information, they couldn't very easily share that information with one another. To do so meant costly long-distance modem-to-modem hookups monitored by an employee whose time might be better spent elsewhere. It meant using clunky, remote LAN-control software that was limited by its narrow remote-control capabilities.

Keeping constant track of sales figures compiled on a LAN in another office was out of the question, as was the cost of keeping a phone line open from New York to California 24 hours a day. What you needed was a way to access all your offices' LANs whenever you wanted.

GOING THE X.25 ROUTER ROUTE

In this roundup, *PC Magazine* takes a close look at three add-in boards known as X.25 routers that enable you to send and receive data to and from *NetWare*-based LANs transparently and at high speed. All three boards connect up to 11 LANs simultaneously over an X.25 network. And four out of these 11 networks can be local LANs connected to one router PC.

Although it can be as expensive as standard remote LAN-control methods, the X.25 protocol represents an al-

ternative method of full-time LAN-to-LAN communications that's significantly more powerful in terms of both speed and flexibility.

Once you connect your distant LANs through an X.25 router, every client station on every network can, within the limits of network security, access every server on every network. You can assign a local DOS drive letter to a resource on any distant server and use it just as if it were on your LAN. For example, a PC user in New York can access data on a CD-ROM server attached to a LAN in California or send a file to a print server in Atlanta.

Other unique, standalone network operating systems, like *NetWare,* have their own built-in X.25 linking solutions. Banyan has excellent X.25 router capabilities built into its *VINES* network operating system. We limited this review to *NetWare*-compatible products. Eicon's Access/X.25 router can also operate with multitasking operating systems like *3+Open LAN Manager* and DOS-based LANs like LANtastic, DCA 10Net, D-Link, Invisible Network, and other NetBIOS-based networks. Gateway's G/Remote Bridge 64 and Novell's NetWare Link/X.25 operate only with *NetWare*-based LANs.

PUBLIC VS. PRIVATE DATA NETWORKS

Those who wish to take advantage of the speed and flexibility of X.25 data networks will first have to determine whether their LAN-to-LAN connectivity goals will best be served by a private or a public data network. This decision will depend on a number of factors.

A private X.25 network is one where network resources are usually dedicated to a small number of applications and a restricted set of users, such as in a corporation with LANs located on different floors of the same building, or LANs in different buildings within reasonably small geographic distances from one another.

Private X.25 network access is typically constructed to operate through dedicated equipment installed expressly for LAN-to-LAN communications. Such dedicated setups include access circuits, network interfaces between the user and the packet-switching devices (PSDs), packet-switching nodes (PSNs), trunk circuits connecting the PSNs, and control systems for the network.

While the initial cost of such hardware installation is high, your only after-installation cost burden will be that of maintaining your hardware and software links.

Public data networks, on the other hand, usually require a relatively small initial investment because the complex network hardware is owned by a third party—such as Tymnet or Telenet. The network's packet-switching capabilities are leased on a usage basis to many parties, and access to public data networks is typically available through local dial-up circuits. Your only hardware cost is that of the X.25 routing equipment you'll need to install on your LAN. If your X.25 traffic is for the most part low, or if your company's offices are geographically distant and the cost of installing dedicated lines prohibi-

X.25 AT WORK: Terms and Techniques

by F. Lee Maybaum

THE X.25 PROTOCOL

The most widely used, internationally agreed upon protocol for packet switching is X.25. Adopted as an international standard in 1976, X.25 has been revised and updated every four years since.

X.25 details a specific exchange of packets that are required to pass information. A *call request packet* requests permission for a data exchange. A *call accepted packet* grants permission and then it initiates an X.25 data-exchange session.

Once the session is set up, data is exchanged in the form of packets that contain routing information. The call is ended when a *call clear packet* is sent and a clear confirmation packet is received in acknowledgement.

Reset and restart packets add to the robustness of X.25. These, along with other X.25-specified packets such as the diagnostic packet, make X.25 extremely versatile and easy to use. Here is a glossary of terms that identifies some of the components of the X.25 protocol:

CALL PACKET A call packet carries addressing and other pertinent information that is needed to establish an X.25 switched virtual circuit (SVC).

CCITT X.25 RECOMMENDATION An international standard defining communication protocols via an X.25 public or private network. The recommendation is administered by the *Comité Consultatif Internationale Télégraphique et Téléphonic* (CCITT). Along with other CCITT recommendations, the X.25 Recommendation defines the Physical, Data Link, and Network layer protocols necessary to interface with X.25 networks. The 1984 CCITT X.25 Recommendation is supported by the majority of X.25 equipment vendors, but a CCITT X.25 Recommendation is published every four years.

CLEAR PACKET A clear packet performs the equivalent of hanging up the telephone.

DATA PACKET A data packet transports full-duplex information via an X.25 switched virtual circuit (SVC) or permanent virtual circuit (PVC). X.25 data packets may contain up to 1,024 bytes of user data, but the most common size is 128 bytes (the X.25 default).

DCE, which stands for data communications equipment, refers to any X.25 network component that implements the CCITT X.25 standard. For example, packet-switched nodes (PSNs) are typical X.25 DCEs.

DTE, which stands for data terminal equipment, refers to any end-user device that can access an X.25 network using the CCITT X.25 standard, LAP/LAPB, and X.25 PLP (see below).

LAPB/LAP Link access procedures (balanced), is the most common data-link control protocol used to interface X.25 DTEs with X.25 DCEs. X.25 also specifies a LAP, or *link access procedure (not balanced).*

Both LAP and LAPB are full-duplex, point-to-point bit-synchronous protocols. The unit of data transmission is called a frame. Frames may contain one or more X.25 packets.

tive, subscribing to a public data network makes good financial sense.

LOCAL DIAL-UP, LONG-DISTANCE ACTION
How does X.25 work? Several companies, like AT&T, Tymnet, and Telenet, manage worldwide networks of minicomputers connected by high-speed data communications lines. These companies sell the data-handling and data-transmission capabilities of these networks to subscribers under several different pricing schemes.

Worldwide networks, also known as Value Added Networks, or VANs, adhere to an international data-handling standard called X.25.

X.25 denotes a data-transfer protocol called packet switching. Rather than sending a stream of bits, as does a standard modem, an X.25 router gathers the data to be transmitted into a packet. Each packet contains a small amount of the data to be transmitted as well as information about the packet's origin, destination, size, and its place in the order of the packets sent. The packets are then reordered as they are received at their destination by the destination's router. Each router contains a PAD, or a packet assembler/disassembler, which translates the packets back into a form readable by your LAN.

Once distant LANs are connected through an X.25 router, every station on every network can, within limits of security, access every server on every network.

Because X.25 packet-switched VANs route each packet to any destination on-the-fly, they create the ability to link thousands of locations simultaneously. You see this best in X.25 networks like CompuServe where people calling in from locations around the world communicate at the same time with the central database computers. Costs to the user are determined by the amount of time a user is connected to the third-party X.25 dial-up port and by the number of X.25 packets that the user sends and receives. Although various cost algorithms are used, in general you can expect that the more you use, the more you pay.

Another familiar example of an X.25 network application is the verification of credit card charges. The number dialed by the credit card reader next to a checkout counter's cash register is frequently the number for an X.25 network port. Packet switching permits these short messages (which include your account number, store identification, and amount to be charged)

PAD An X.25 PAD, or packet assembler/disassembler, allows non-X.25 users to access an X.25 network. CCITT Recommendations X.3, X.28 and X.29 define the PAD parameters, terminal-to-PAD interface, and PAD-to-X.25 host interface.

The CCITT X.3, X.28, and X.29 Recommendations do not specify synchronous non-X.25 interfaces. However, most PAD providers have implemented PADs that support a number of bit- and character-synchronous devices. For example, binary synchronous PADs are quite common.

PLP packet level procedures define protocols for the transfer of packets between an X.25 DTE and an X.25 DCE. X.25 PLP is a full-duplex protocol that supports data sequencing, flow control, accountability, and error detection and recovery.

RESET PACKET A reset packet clears error conditions on an existing SVC or PVC. However, the reset packet does not clear the session. Rather, it notifies the communicating X.25 DTEs of error conditions at a known point in the data packet transfer sequence.

RESTART PACKET A restart packet notifies X.25 DTEs that an irrecoverable error exists within the X.25 network. Restart packets clear all existing SVCs and resynchronize all existing PVCs between an X.25 DTE and X.25 DCE.

VC An X.25 VC, or virtual circuit, is a PLP logical connection between an X.25 DTE and an X.25 DCE. X.25 supports both switched VCs (SVCs) and permanent VCs (PVCs). SVCs are analogous to dial-up lines, that is, they allow a particular X.25 DTE to establish a connection with different X.25 DTEs on a per-call basis. In contrast, PVCs are analogous to leased lines because they always connect two particular X.25 DTEs.

BRIDGES AND ROUTERS

The terms *bridges* and *routers* often confuse people looking for ways to link LANs. Both these devices link LANs but differ mainly in the protocols and components they use. Routers are generally more active than bridges. They read the more complex network addressing information and may add information to help route the data through the network.

BRIDGE A bridge is an interconnection device, sometimes working within a PC and sometimes within a special-purpose computer, that can connect LANs using similar or dissimilar data links such as Ethernet, Token-Ring, and X.25.

Bridges link LANs at the Data Link layer of the OSI model. Modern bridges read and filter data packets and frames and pass traffic only if the address is on the same segement of the network cable as the originating station.

ROUTER Routers are interconnection devices that are similar to bridges but serve packets or frames containing certain protocols.

Routers link LANs at the Network layer of the OSI model. Modern routers handle multiple protocol stacks simultaneously and move packets or frames onto the right links to their destinations. For example, an X.25 router will wrap an Ethernet packet back into an Ethernet system. ■

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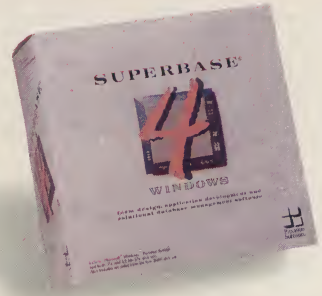

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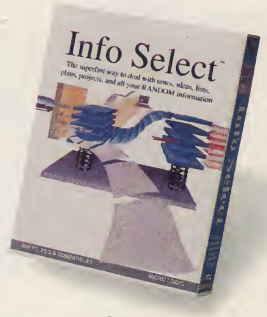

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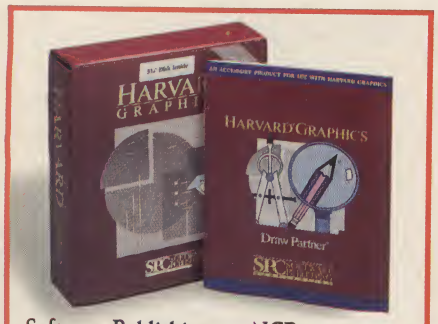

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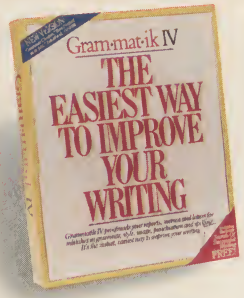

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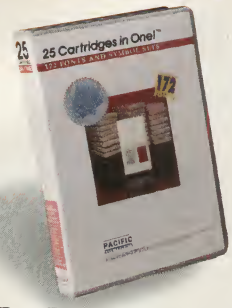

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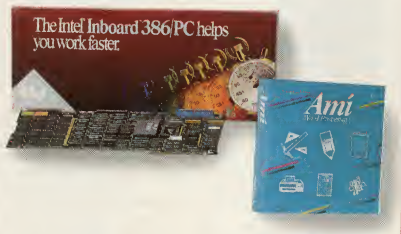

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to be sent to the proper bank and the proper information to be returned from the bank. The X.25 network allows this exchange to take place without the use of costly, dedicated connections from each store to the bank that issued the credit cards. When you use X.25 VANs to link LANs, you gain error-free simultaneous connections to multiple locations. This capability ought to make X.25 VANs perfect for LAN-to-LAN connections.

X.25 TO THE RESCUE?

Unfortunately, traditional management policies for public data networks lead to two problems: limited throughput and a "centralized connection" mentality.

In technical diagrams, X.25 networks are often depicted as a cloud (see the diagram "The X.25 Cloud"). The cloud obscures the complexity of the minicomputers inside the VAN and their myriad interconnections. Basically, there are two types of connections going into the "cloud." The first is a high-speed leased line able to carry 19.2, 56, or 64 kilobits per second, or even 1.544 megabits per second. These are expensive connections and are usually reserved for the busy "host" computer.

The second type of connection is a dial-

RATING X.25 PERFORMANCE: How We Tested

by Frank J. Derfler, Jr.

Each of the three products reviewed performed similarly, being limited by the throughput of the communications channel. Rather than running benchmarks on three similar products, we felt it was more important to assess the performance of X.25 VANs when pitted against other LAN-linking alternatives.

Our tests compared a variety of typical network functions to see how they ran on X.25 VAN and direct dial-up connections. We tested each task at a number of typical connection speeds. Direct dial-up links were tested at 2,400 and 9,600 bits per second; X.25 VAN links at 2.400, 9,600, and 64,000 bps.

We chose network functions that used the resources of the networks in different ways and determined if a particular type of connection was good enough for a particular task. The tasks included e-mail message exchange, remote control of a PC through the network, sending print jobs to a remote network, accessing a database using standard MS-DOS applications, and accessing a database using database server techniques.

The tasks have different characteristics. An exchange of e-mail messages between LANs is essentially a server-to-server file transfer, whereas a single manipulation of a database with a traditional program (we used *Paradox*) involves sending hundreds of packets across both networks and the links between.

There are some areas where X.25 should be especially appreciated. An X.25 VAN link automatically provides multipoint capabilities and error correction. We simulated these benefits by using an asynchronous communications server on the LAN to dial out to a PC under remote control on another network (see Building Workgroup Solutions: Asynchronous Communications Servers, *PC Magazine*, May 16, 1989), but the X.25 solution was cleaner.

A good example is that remote control of a PC on a distant network often requires the presence of a technical support person to monitor, troubleshoot, or oversee operations. If you direct-dial into a distant network, you use both a modem remote-control program to link to a distant PC and a LAN remote-control program to link to the problem PC on the distant LAN. With an X.25 link, you only need a LAN remote-control program, licensed for multiple LAN operation.

Running the LAN remote-control program over X.25 also lets you monitor the activities of (or broadcast to) multiple PCs on multiple networks at the same time.

For our remote-control task, we had to use a combination of the *Close-Up* modem program and *Close-Up/LAN* across the phone lines, but only *Close-Up LAN* over the X.25 link (see "The LAN's Helping Hand," *PC Magazine*, October 31, 1989).

The matrix included here rates the suitability of the various connection options against common network tasks. We didn't look only at speed and performance, but also at efficiency, ease of use, and economy.

For example, remote printing is very fast at 64 kbps, but unless you send huge graphics images, you'll pay for more speed than you need.

And, because e-mail messages *often* have multiple addressees on different LANs, you can't beat the multipoint capabilities of X.25 for LAN-to-LAN e-mail. Here, speed isn't nearly as important as multipoint capabilities.

In summary, if you can get 9.6-kbps service from an X.25 VAN, you can link LANs efficiently and effectively for almost all network tasks. If the VAN companies continue to drag their feet about providing V.32, the modem-signaling CCITT standard for 9,000-bps service, then establishing your own 9,600-bps LAN-to-LAN links is often a better alternative than using 2,400-bps VAN services. ■

X.25 VAN VS. LAN-TO-LAN DIAL-UP: TASK-SPECIFIC PERFORMANCE

	X.25 VAN			LAN–to–LAN dial-up	
Throughput rate (bps)	2,400	9,600	64,000	2,400	9,600
E-mail	3	3	3	2	2
Remote control	1	3	4	2	3
Remote printing	3	4	3	2	2
Database use	1	2	3	2	2
Database server	2	3	4	2	2

0 = No such capabilities offered
1 = Poorly suited overall
2 = Somewhat capable
3 = Well-suited
4 = Excellent

up telephone line, which is partially limited by throughput. Unfortunately, X.25 vendors haven't installed 9,600-bit-per-second error-correcting modems on many dial-access ports. They have few ports able to handle even 2,400 bps. You can barely make LAN virtual drive connections over 9,600-bps lines and it simply isn't worth trying at 2,400 bps. Unfortunately, several VAN managers couldn't explain why they haven't installed faster modems to take advantage of the LAN-to-LAN connection opportunities.

The limitation on connection speed is worsened by the double error-checking that takes place when Novell IPX packets travel over X.25. Since Novell designed IPX with the "Did you get what I sent?" concept in mind, both IPX and X.25 have built-in error correction. Therefore a lot of *IPX X.25 packets consist* of IPX confirmations to packets that X.25 has already confirmed, at least at the X.25 network level, so you need all the throughput you can get to carry the overhead.

Despite limitations on speed for connection options, X.25 networks are appropriate for many LAN-to-LAN applications.

Another glitch arises from the traditional use of VANs to make one-to-many connections. In the past, multiple clients used VANs to get to one host. The fee structure and programming of the networks reflect and perpetuate this scheme, but this isn't the best structure for LAN-to-LAN connections.

Technically, it's easy to route packets between any dial-in callers, but today these networks route packets only between dial-in callers and a "host" attached through a leased line. Providing connections between dial-in callers is a matter of company policy, pricing, and a few lines

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of code, but so far the VAN companies haven't implemented this capability. If you want to use X.25 VANs to link your LANs, you must have one LAN connected permanently as a "host" facility, which will require you to pay for a leased line to operate your X.25 network.

Despite the limitations on speed for connection options, X.25 networks are appropriate for many LAN-to-LAN applications. Pressures from users should force systems managers to implement more features for the LAN-to-LAN market.

OVER THE BRIDGE

When you use an X.25 VAN to link LANs, each LAN requires its own routing computer. This router is a PC acting as a special type of communications server, similar to a gateway; it includes a communications card and appropriate software. Since each of these products is what Novell terms "external *NetWare* bridges," the installation process uses a lot of code from Novell, including the bridge-generating, or "gening" program. Compiling and linking the necessary program components to form the executable program that initializes the router is handled automatically by the installation software. But setting up the hardware and creating the necessary directories for the router drivers is a tricky business; it includes both compiling and linking the necessary program components forming the executable program to start the router. This procedure is known as generating, or "gening" the bridge that the routers will use.

To link LANs with an X.25 VAN, each LAN requires its own routing computer that acts as a type of communications server, similar to a gateway.

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OUR TESTS

We conducted our tests by installing the routers on Novell's *NetWare* 2.15 and *NetWare/386* 3.0 networks. The X.25 connections between the networks were provided by the Computer Sciences Corp. (CSC) Network Systems Division on a special test network in the company's Herndon, Virginia facility; CSC also furnished technical assistance during testing.

Because of our testing at CSC we discovered that the communications channels available for X.25 network connections limit the capabilities of these systems so much that speed or throughput tests are meaningless. We measured no significant differences between the throughput of the products we tested—even at 64 kbps signaling speeds over direct connections with no X.25 network in between.

There isn't a lot of difference among the products available to you. The companies used three different adapter boards, but the board Novell supplied for review was also made by Eicon. Much of the software in the products is different, but each package uses a near-identical interface and nearly the same command structure.

What we compared was the suitability of various connection speeds and techniques for common network tasks. There are some things that you can do well, such as e-mail sending and receiving, via a 2,400-bps link from LAN to VAN. Other functions, like virtual disk drive access by a DBMS to database files, require speeds of 9,600 bps or greater. And until VAN managers add high-speed connections, linking your LANS through public data networks will proceed at a crawl.

Obviously, every organization won't think X.25 routers are the perfect way to connect their LANs. Making multiple dial-up calls between networks and using WAITS (see "Building Workgroup Solutions: Low-Cost LANs," *PC Magazine,*

OUR CONTRIBUTORS

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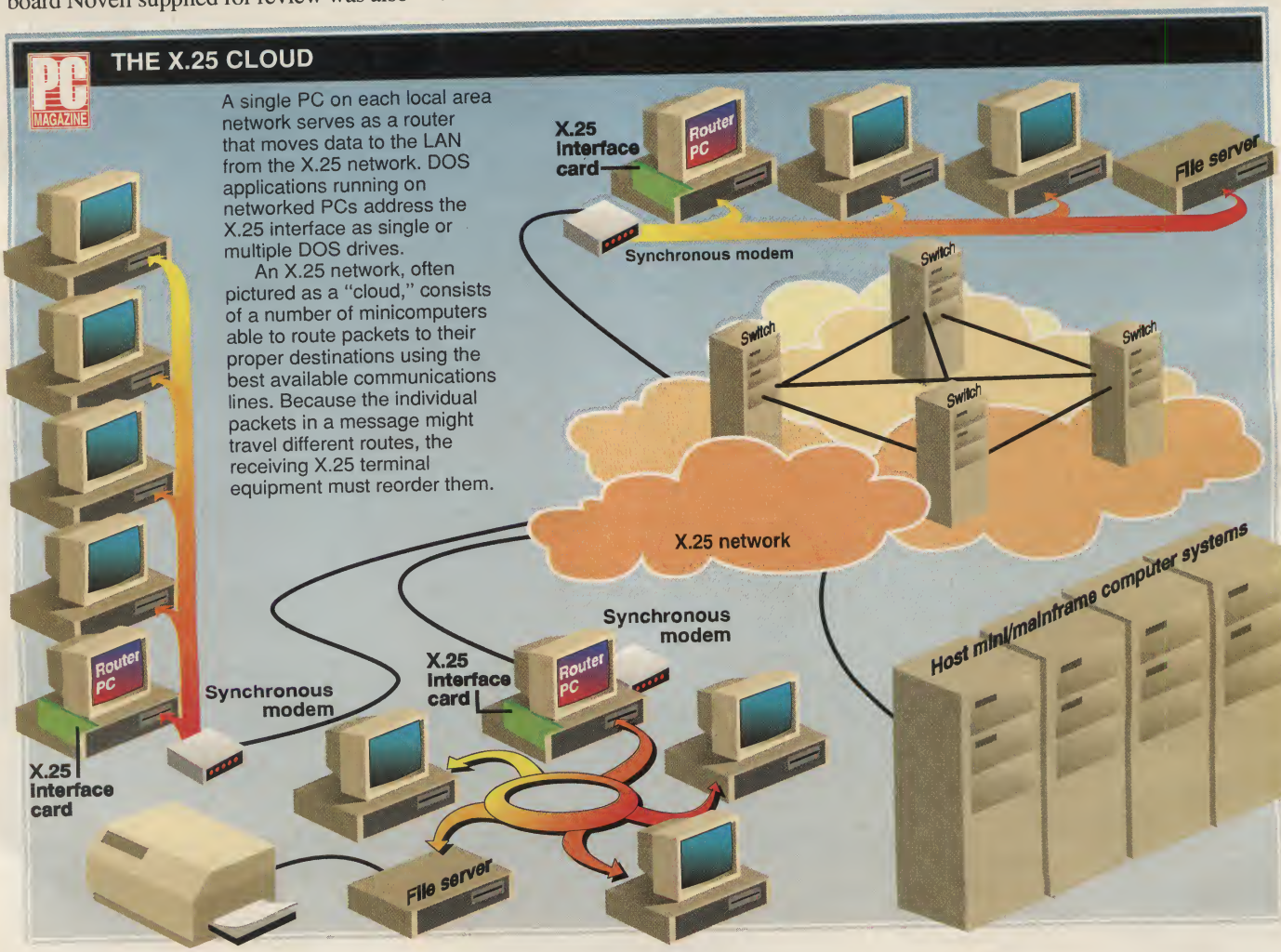

March 28, 1989) or modem remote-control software might work better for you. If you want multiple simultaneous connections between LANs, X.25 VANs furnish an exciting alternative.

EICON TECHNOLOGY CORP.
Access/X.25
All reviews by M. Keith Thompson

Looking for a complete X.25 solution for your company's LAN-to-LAN needs? Eicon Technology's $2,795 Access/X.25 network adapter package offers full X.25 routing capabilities at 64 kilobits per second, software for 32 virtual circuits, plus complete gateway and terminal emulation. This software and hardware combination serves as an effective X.25 LAN-to-LAN solution for Novell's *NetWare* and is the only board in our roundup that operates on NetBIOS networks.

Eicon's full-length, 8-bit network adapter is driven by a Motorola 68008 processor and sports 512K RAM. This coprocessing design allows multiple active communications sessions without interruption. The board's CPU manages the communications programs and runs them out of the card's RAM.

As with all X.25 products, installing Access/X.25 is no walk in the park. Once you make it through Novell's external bridge "gening" process—during which the installation program generates an executable bridge file based on your hardware configuration—you must negotiate Ac-

PC MAGAZINE FACT FILE
EDITOR'S CHOICE

Access/X.25
Eicon Technology Corp., 2196 32nd Ave., Montreal, Quebec, Canada H8T 3H7; (514) 631-2592.
List Price: $2,795 for *Netware* version; $3,195 for NetBIOS version.
Requires: 256K RAM (640K recommended); hard disk or network drive; DOS 3.0 or later; NetBIOS Network Operating System or Novell's *NetWare* 2.15 or later; synchronous full-duplex modem.
In Short: Eicon's X.25 router offers 32 simultaneous virtual circuits, full gateway and terminal emulation, and is the only LAN-to-LAN X.25 router in our group that operates under NetBIOS as well as *NetWare*.

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PC MAGAZINE EDITORS' CHOICE September 26, 1989 DataEase 4.0

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cess/X.25's simple, well-organized setup screens. These screens allow you to change the many necessary X.25 parameters and configure the hardware for the network adapter; then a simple batch file created automatically during installation starts the server software.

After installation and setup, it's smooth sailing—but you'd better like writing your own batch files. A program module called BRX25 controls most of the routing functions from the DOS command line, but you must append routing information to the BRX25 command. For example, a command such as "BRX25 ANSWER ATLANTA=*" answers any incoming call at the Atlanta router. Likewise, "BRX25 CALL DALLAS=123456789" calls the router with a DTE address of 123456789 and references it as DALLAS. With 32 virtual connections possible, you can see the value of letting batch files do much of the repetitive work for you.

Once your connection is made, communicating becomes simple and direct. *NetWare*'s SLIST command lists all connected servers. Then, LAN security permitting, all of the users on any of the LANs have access to shared LAN resources. Standard Novell commands MAP to remote drives and redirect printer output to other print queues.

Access/X.25 offers other functions as well. Included with Access/X.25 is the Interactive Terminal Interface (ITI), a communications protocol that emulates different terminal protocols and ensures error-free data transmission over an X.25 network. Access/X.25 also emulates the packet assembler/disassembler and two types of terminals: VT100 and CCITT X.3/X.28/X.29. With CCITT emulation, Access/X.25 avoids the overhead of protocol conversion and leads to simpler, faster, and more reliable operation.

With sophistication comes complexity, and Access/X.25 is no exception. This program's software has hundreds of different parameters and settings. Happily, Eicon has a technical support staff with the right information. Eicon's network of resellers handles the first-line technical support. But users unable to get their questions answered by their dealer can call the Canadian-based company directly.

During our testing, we had many questions regarding our configuration, and each time we called our problems were quickly resolved. Also, Eicon offers two X.25 classes in the company's Montreal offices geared toward sales support staff and large coporate accounts.

Eicon's competent technical support staff and well-designed product represent a strong solution for LAN-to-LAN connectivity, whether you're using a *NetWare*- or NetBIOS-based LAN. We recommend using a Novell specialist for installation, but your in-house support people can take it from there.

EDITOR'S CHOICE

•Access/X.25

Recommending one product out of three similar ones is a difficult task. Your choice should be determined as much by support available from local dealers or value added retailers (VARs) as by a long list of features. If you use a VAR to supply your X.25 service, it's best to let the VAR install the product they know.

If you're keen on installing the system yourself, we suggest selecting a product from Eicon Technology Corp. Eicon has a strong base of support for its products. In fact, Eicon serves as the supplier of X.25 adapters for Novell and other companies.

One unique feature of Eicon's Access/X.25 adapter is its ability to act as a router and as a gateway simultaneously. It also includes full terminal emulation facilities. Eicon offers similar products for both IPX/SPX and NetBIOS networks, so you are able to use the same products across different networks in an organization.

While Novell has an excellent reputation and a strong product—the only router reviewed here available for the PS/2 environment—its support system is just getting started. Neither Novell nor Gateway offers NetBIOS support.

GATEWAY COMMUNICATIONS INC.
G/Remote Bridge 64

Gateway's G/Remote Bridge 64 links Novell *NetWare* LANs, regardless of their topology, through an X.25 network. For $2,495, this combination hardware and software product handles 128 virtual circuits for multipoint connectivity; moreover, it comes from a company with wide experience in X.25 technology.

Gateway's 8-bit, full-length Wide Area Network Interface Module (WNIM-186) runs G/Remote Bridge 64 software. Gateway bases the WNIM-186 on an Intel 80186 microprocessor with 512K of dual-ported RAM—a design that enables the board to read and write to memory at the same time. This allows the router PC to do other work while the WNIM-186 runs the router software. The router's maximum throughput is 64 kilobits per second.

WNIM-186 can be installed even in crowded PCs because it has 13 possible I/O addresses and six possible IRQ settings, all selected via jumper settings.

As with the other products in this roundup, the installation procedure is definitely not for novices. Novell's "gening" program requires a complex directory structure, and if the directories aren't exactly right, the bridge will not install. After gening the bridge, setting up G/Remote Bridge 64 is simple—provided that you know all of the X.25 parameters from your data network.

Well-organized setup screens allow you to change the necessary X.25 parameters. Though the router PC will run in non-dedicated mode, there is only 310K of RAM left for other applications. You can use G/Remote Bridge 64's line status monitoring program in the remaining memory to view the current status of your X.25 connections.

Unlike the other products tested here that require you to call each destination individually or via batch files, G/Remote Bridge 64 automatically connects you to the DTE addresses specified in the config-

FACT FILE

G/Remote Bridge 64
Gateway Communications Inc., 2941 Alton Ave., Irvine, CA 92714; (714) 553-1555.
List Price: $2,495
Requires: 256K RAM; hard disk or network drive; DOS 3.0 or later; Novell's *NetWare* 2.0a or later; synchronous full-duplex modem.
In Short: A good solution for multipoint connectivity. G/Remote Bridge 64 handles 128 virtual circuits; and its flexibility allows it to integrate with almost any X.25 public data network. In addition, Gateway's broad experience with X.25 solutions is a plus at installation time.

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The Xircom approach has left the press full of praise: "The image of perfection—the way computers should be," wrote Steve Gibson in InfoWorld; "Incredibly easy to use...easy to install, easy to carry...a very clever device," according to Aaron Brenner at LAN Magazine.

You may think that all this "perfection" and convenience comes with a hefty price tag. It doesn't—in fact the Xircom family of LAN adapters costs about the same as the more traditional methods which it is quickly rendering obsolete.

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uration menus when you first connect to the data network. Once connected, users have no indication (other than slightly slower response time) that the other servers exist across the country. *NetWare*'s SLIST command displays the connected servers up to the external bridge's maximum of 11. At this point, users can log on to any of the servers and use standard Novell commands to MAP to remote drives and CAPTURE printer output to other print queues.

Gateway's dealers and VARs handle the front-line support for G/Remote Bridge 64. These resellers are trained to handle the most common questions people ask. If, however, the dealers or VARs cannot answer your questions, you can call Gateway on the company's toll-free support line. Gateway offers classes at its offices and on-site, which gives them an important edge over the competition.

G/Remote Bridge 64 offers a well-thought-out solution for multipoint connectivity. Gateway enjoys a reputation for technical excellence. Because of the complexity of *NetWare* external bridges, we recommend using a specialist for installation—preferably a Gateway dealer. Because Gateway remarkets *NetWare* under its own label, Gateway's dealers are familar with this process and can make the installation go more smoothly.

NOVELL INC., COMMUNICATIONS PRODUCTS DIVISION

NetWare Link/X.25

Along with its multitude of other connectivity products, Novell offers a complete line of LAN-to-LAN connectivity products. NetWare Link/X.25 works in conjunction with either of the two X.25 adapters Novell currently sells to effect transparent LAN-to-LAN connections. The 8-bit, full-length X.25 Interface Card costs $2,995, supports 64 virtual circuits, and sports a maximum throughput rate of 64 kilobits per second. The X.25 Extended Interface Card goes for $3,495 and allows 254 virtual circuits.

What Novell used to call a bridge it now refers to as an external router, but to avoid confusing many of you who are already familiar with the product, we will refer to it by its more widely known name, an external bridge. (See "X.25 at Work: Terms and Techniques.") NetWare Link/X.25 connects up to 11 LANs simultaneously over an X.25 network. Of these 11, up to four local LANs can be connected to one

While not measurably different from others in this roundup, Novell's experience in communications-routing hardware and software makes it a solid buy.

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Any interest?

router PC. This type of connection through a VAN is known as multipoint.

Installing a *NetWare* external bridge is only slightly less difficult than "gening" a *NetWare* server. After creating the maze of directories and subdirectories necessary for bridging drivers to generate the routers' bridge software, you run the BRGEN program. This menu-driven program allows you to pick the correct drivers for the network adapter and X.25 Interface Card. BRGEN then creates the executable BRIDGE.EXE program for use on the router PC. This sounds like a difficult procedure—and it is if you don't follow the directions exactly.

Configuring the Link/X.25 communications software is much easier. A series of menus prompts you for the X.25 configuration parameters. These values must match the parameters necessary to communicate with your data network. Novell claims the router PC operates in nondedicated mode, but like the other routers in our roundup, there is not much memory—a scant 310K—left for other programs.

There is good news and bad news about the workstation software. The workstations require only one file, called BRX25.EXE. However, BRX25.EXE is not menu driven and requires extensive command-line parameters. For example, the command "BRX25 ANSWER CONNECT01=2441* /PSECRET /2" answers the first two calls from DTE addresses starting with 2441 and specifying the password "SECRET". Likewise, "BRX25 CALL CHICAGO=311053010028;1,1" calls the router with a DTE address of 311053010028, references it as CHICAGO, and reverses the charges (designated by the 1,1). As a network administrator, you will certainly want to create batch files with the proper input for smooth integration into the daily routine.

Once the router is connected, *NetWare*'s SLIST command shows all connected servers. At this point, the MAP and CAPTURE commands connect to remote drives and redirect printer output to other print queues respectively.

Novell's network of resellers handles support for the communication products. Although Novell provides no formal support plan for its communications products, the company has an 800-number for any type of support questions. And Novell says it's currently developing a formal program for support and training.

While not measurably different in performance from the other products in this roundup, Novell's experience in communications routing hardware and software makes it a solid buy. ■

FACT FILE

PC MAGAZINE

NetWare Link/X.25
Novell Inc., Communication Products Division, 890 Ross Dr., Sunnyvale, CA 94089; (408) 747-4000.
List Price: X.25 Interface Card (64 virtual circuits), $2,995; X.25 Extended Interface Card (254 virtual circuits), $3,495.
Requires: 512K RAM (640K recommended); hard disk or network drive; DOS 3.0 or later; Novell's *NetWare* 2.12 or 2.15; synchronous full-duplex modem.
In Short: NetWare Link/X.25 has a maximum throughput rate of 64 kbps and supports 254 virtual circuits with the X.25 Extended Interface Card. This product is backed by Novell's long experience in connectivity and communications and is the only one of our three products that operates in the PS/2 environment.

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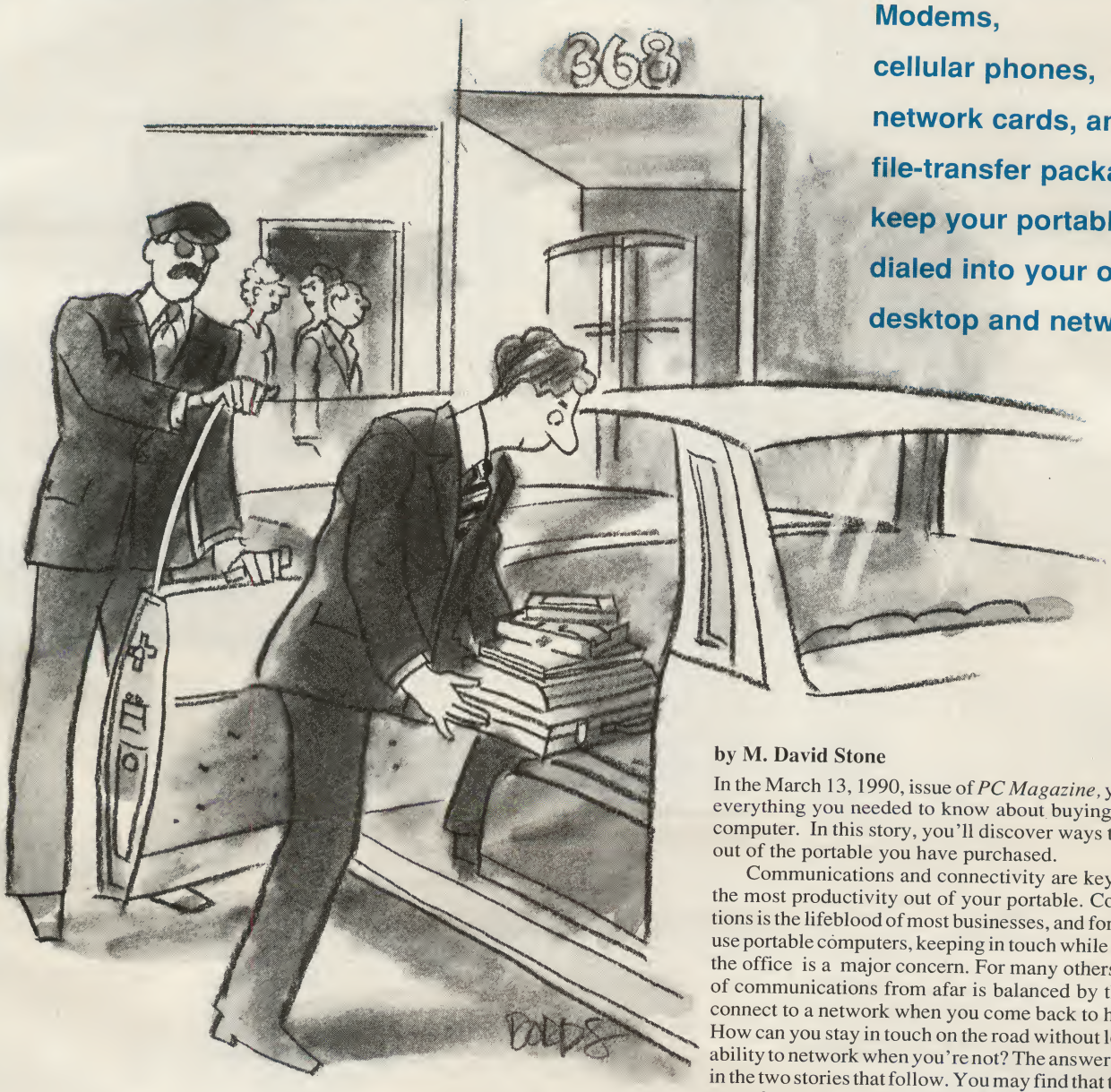

ILLUSTRATION: GLENN DODDS

by M. David Stone

In the March 13, 1990, issue of *PC Magazine*, you learned everything you needed to know about buying a portable computer. In this story, you'll discover ways to get more out of the portable you have purchased.

Communications and connectivity are key to getting the most productivity out of your portable. Communications is the lifeblood of most businesses, and for those who use portable computers, keeping in touch while away from the office is a major concern. For many others, the issue of communications from afar is balanced by the need to connect to a network when you come back to home base. How can you stay in touch on the road without losing your ability to network when you're not? The answers are given in the two stories that follow. You may find that the hardest part of your search will be to pick from the many choices.

If you're using a lunchbox portable with enough slots, issues of communications and network connectivity don't create any special problems. Simply plug in the same modems, fax boards, and network cards that you're already using on your desktop system. With portables that don't offer standard expansion slots—most notably laptops and notebook models with proprietary expansion interfaces—you'll have to scrutinize your needs more carefully.

Communications is the lifeblood of most businesses; for those who use portable computers, staying in touch while on the road is balanced by the need to connect to a network when returning to home base.

The most obvious problem with a non-standard interface is that you're limited to the boards made for that slot. If you want a fax package but no one makes one for your system, you'll have to find a different solution.

A second problem is limited expansion room. If you have a Toshiba portable, for example, you won't have any trouble finding a modem card or an Ethernet, ARCnet, or StarLAN card. However, with most Toshiba models, there's room for only one card. If you need both a modem and a network connection, you may have to carry one of the lightweight external modems, such as those from Touchbase Systems.

CHANGING STANDARDS

One added complication for those who wish to stay in touch while on the road is created by new protocols for telephone line communications. To pave your way through the choices, the key terms you need to understand are MNP 4, MNP 5, V.42, LAP-M, and V.42bis.

MNP 4 is an error-correction protocol; it can detect transmission errors and request a retransmission from the sending system. Unlike file-transfer protocols such as Xmodem or Ymodem, MNP 4 operates at all times—not just during file transfers. Such error correction is not too important at 1,200 bits per second, but at 2,400 bps and higher, it can often make the difference between establishing a usable communications link or not.

MNP 5 is a data-compression protocol. It may or may not be available on any given modem that supports MNP 4, so that when a modem claims MNP support, it's important to ask what levels. Indeed, there are other levels of MNP besides 4 and 5, though we're not focusing on them here. MNP 5 can double the throughput of a modem, so that a 2,400-bps modem with MNP 5 can transfer files at effective speeds of up to 4,800 bps. The actual data compression will vary with each file, but any significant level of data compression can obviously speed file transfers, save precious battery power, and cut your phone bills.

Both MNP 4 and MNP 5 have been around for some time and both are in reasonably widespread use. However, they are less than ubiquitous because the market leader, Hayes, has refused to support MNP until recently. Now that the international standards' battle is over, even Hayes supports MNP 4 and 5 in its modems.

V.42 is the relatively new CCITT standard for error correction—only about one year old as of this writing. The primary error-correction protocol on a V.42 modem is LAP-M, with MNP 2-4 included in the standard as an alternate protocol. A fully compliant V.42 modem will establish a LAP-M link with another V.42 modem, an MNP-link with an MNP modem, or a non-error-correcting link if neither error-correction protocol is available in the other modem.

Enough modem manufacturers have already announced support for V.42 to ensure that it will soon become the error-correction standard of choice. Built-in support for MNP 4 means that a V.42 modem will also provide error correction with the installed base of MNP 4 modems.

Not so incidentally, one thing to watch out for when buying a modem is the difference between V.42 compliant and V.42 compatible. A V.42-compliant modem will include both LAP-M and MNP 2-4. A V.42-compatible modem may simply be an MNP modem. Make sure you get an explicit statement of the error-correction protocols. You want V.42 compliant.

V.42bis is to MNP 5 what V.42 is to MNP 4—except that MNP 5 is not included as an alternate mode within V.42bis. The V.42bis data-compression feature offers a notable improvement on MNP 5 with up to 4 to 1 compression, rather than the 2 to 1 of MNP 5. (MNP 7, according to Microcom, the developers of MNP, offers comparable performance to V.42bis. But MNP 7 modems aren't as widespread as MNP 5 modems.)

The obvious throughput advantage of V.42bis over MNP 5 makes it the preferred choice in the long run. However, V.42bis was only endorsed by the CCITT in the fall of 1989, so it will be some time before the number of V.42bis modems overtakes the current installed base of MNP 5 modems.

Clearly then, the ideal modem right now should support both V.42bis and MNP 5, though MNP 5 will probably become less important over time. As of this writing, Hayes, UDS, Microcom, and others are promising modems that will support both protocols.

With a lunchbox portable, simply plug in the same communications hardware you're using on your desktop system. If your portable doesn't offer standard expansion slots, you'll have to scrutinize your needs carefully.

Alas, there is a last-minute legal problem with V.42bis. Most manufacturers who are poised to offer the new standard are waiting for three patent holders—British Telecom, IBM, and UNISYS—to come up with a workable licensing arrangement. There is a possibility that the problem will drag on and slow down the introduction of V.42bis modems. But with any luck, this legal problem will be solved by the time you read this.

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FINDING SOLUTIONS

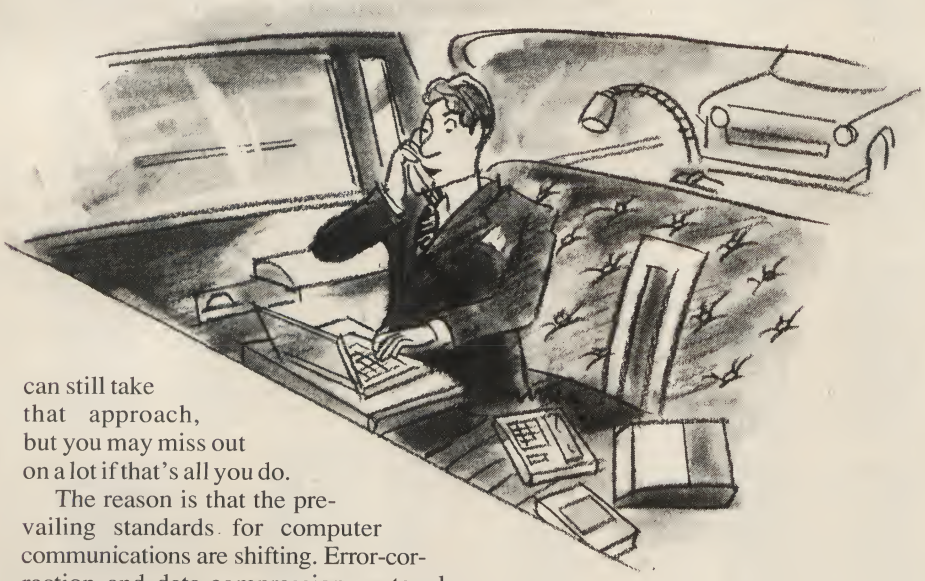
Armed with these definitions of the error-correction and data-compression protocols, we can turn back to the initial issue: How to stay in touch when you're on the road and how to plug into a network when you're not.

In "Keeping in Touch," you'll find an overview of products you can use on the road. In "Laptop to LAN Links," you'll find a summary of products to plug you back into your network when you return. Each overview explores some of the most common travel necessities for computer road warriors and each offers a variety of solutions. We're confident that you'll find the right mix to meet both your communications and connectivity needs.

KEEPING IN TOUCH

by M. David Stone

Until recently, the answer to your on-the-road communications needs was simple: Buy any modem that is compatible with your portable computer, any standard communications program, and learn how to tap into unfamiliar phone lines. You can still take that approach, but you may miss out on a lot if that's all you do.



The reason is that the prevailing standards for computer communications are shifting. Error-correction and data-compression protocols are gaining importance. So is the ability to send faxes directly from your portable, and for the more adventuresome, data communications by cellular phone is becoming increasingly practical.

With the rapidly changing basics of communications, it's important to be aware of what's available now and what is likely to be available in the immediate future. Here is a look at today's options in portable communications, along with some suggestions for extending the capabilities of equipment you may already have.

CHOOSING A MODEM

Certainly one of the most basic issues for portable communications is how to choose your modem. For most traveling PC users, an internal Hayes-compatible 2,400-bit-per-second modem that follows the V.22bis communications protocol will do the trick. Some companies—Toshiba to name one—still sell 1,200-bps modems, but these waste your battery's power because of their slower transmission times. They are rapidly disappearing from the marketplace and are best ignored.

As we discussed in the introduction to this section ("Portable Productivity: Communications and Connectivity"), the ideal modem would also support the new V.42 error-correcting standard (which includes MNP 2-4) and both V.42bis and MNP 5 data-compression protocols. However, if you're in a hurry to buy, you may have to settle for less. Such modems may not be available for most portables until at least the middle of 1990.

As of this writing, most of the key players in portable computers are lagging on error-correction and data-compression options in modems. Toshiba intends to support V.42, V.42bis, and MNP 5 for a forthcoming modem, but hasn't announced an actual product. Zenith intends to support V.42 and V.42bis, but has no current plans to support MNP 5. GRiD, to its credit, already offers a 2,400-bps modem with MNP 2-5 for $695 (GRiD Systems Corp., Fremont, California; (800) 222-GRID). However, the company declines to discuss forthcoming products. At this time, Compaq offers no modems with error correction or data compression.

Only NEC has actually announced a V.42 modem. Its Image Modem Plus, which fits in the NEC LTX slot, will also support MNP 1-5 and Group III Fax protocols. The $899 modem is currently promised for the first quarter of 1990. NEC expects to add V.42bis support at a later time. (NEC America, Wood Dale, Illinois; (708) 860-9500).

For the moment, third-party manufacturers may be better sources for modems with error-correcting and data-compression protocols. In particular, the Touchbase WorldPort line includes an external 2,400-bps modem that supports MNP levels 1 to 5. (Touchbase Systems, Northport, New York; (516) 261-0423). As of this writing, Touchbase also expects to introduce a V.42 modem in the first half of 1990. Current plans include support for V.42bis and MNP 5.

The one obvious drawback to the Touchbase modem is that because it's external, it counts as an extra piece that you have to carry around. However, the modem is highly portable; it measures only 1 by 2.75 by 4.80 inches (HWD) and weighs in at 7.5 ounces. Keep in mind that if you have only one slot in your portable, an external modem leaves that slot free—perhaps for a 3270 emulation card or a LAN card.

CHOOSING SOFTWARE

For most purposes, you can use the same communications software for your portable that you currently use in your desktop system. However, two situations may arise in which you might want to use special-purpose software.

First, if you already have a modem without error correction or data compression, you can add both features with MTE (MagicSoft, Lombard, Illinois; (708) 953-2374). MTE is a straightforward, full-functioning communications program that is best known for supporting MNP 4 and 5. This software-based version of MNP isn't as efficient as a modem-based version, but it will add error correction and data compression when communicating with another system that supports MNP 4 and 5. And it will let you use these features

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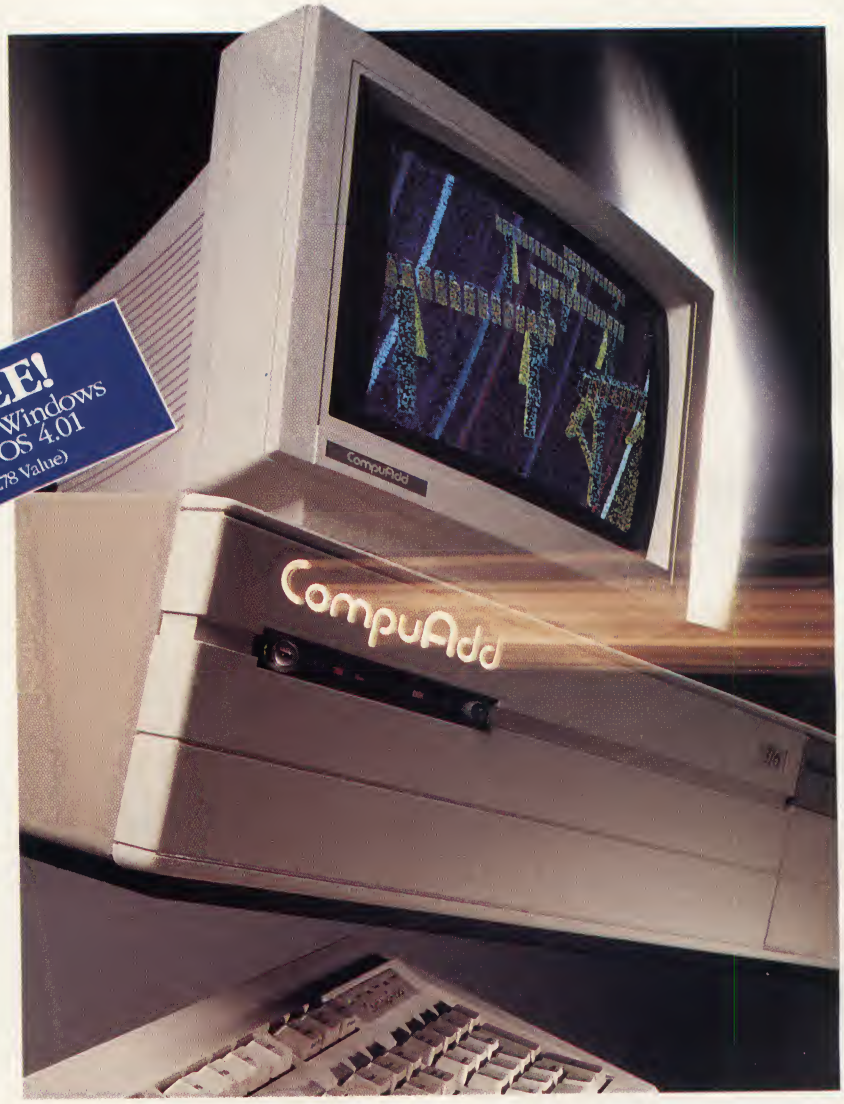
80MB (19ms)	$2425	$2655
110MB (19ms)	$2625	$2855
150MB (18ms)	$3075	$3305



80386 processor running at 16MHz • 0 wait state page-mode memory • 1MB RAM expandable to 10MB • LIM 4.0 and disk caching support in ROM • Built-in parallel port and two serial ports • Five available expansion slots • Math coprocessor socket • Choice of 5.25" 1.2MB or 3.5" 1.44MB diskette drive • *40MB hard drive preloaded with FREE Microsoft Windows and DOS 4.01* • Dual diskette drive controller with dual hard drive interface • Monochrome VGA monitor and 16-bit video adapter • 101-key enhanced keyboard • FREE one-year onsite service

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without having to buy a new modem.

Another kind of special-purpose program that may be of interest is a remote operations program, such as *Carbon Copy* (Microcom Software Division, Norwood, Massachusetts; (617) 551-1999), *Close-Up* (Norton-Lambert Corp., Santa Barbara, California; (805) 964-6767), or *pcAnywhereIII* (DMA, Huntington, New York; (516) 462-0440). Each of these programs will let you control a computer remotely. For example, you can run the host module on your desktop computer in the office and then call in from your portable with the terminal module. The portable becomes a remote terminal that controls the host.

You can gain full access to the host computer by running programs, executing the commands from the portable system's keyboard, and seeing the results on the portable's screen. Note that if you call into a host computer that's attached to a network, you can get on the network just as if you were using the host. Similarly, you can tie into a mini or mainframe if the host is connected to one. Be forewarned, however, that using a remote-control program can be frustratingly slow when you're working at 2,400 bps.

FAXING

Faxing has become so central to most businesses that you may be more concerned with fax communications while on the road than with standard data communications. Fortunately, fax packages are easy to find.

I've already mentioned the NEC Image Modem Plus, which will include Group III fax on the same board as a V.42 MNP 1-5 modem. Alas, you will find that most current fax add-ins come with a plain-vanilla modem.

If you plan to do much faxing, look for a 9,600-bps fax modem. This will be a little more expensive than an equivalent package with a 4,800-bps fax modem, but the faster modem translates into shorter calls, lower phone bills, and saves battery life. Touchbase offers an external 9,600-bps fax modem with a standard 2,400-bps data modem for a $699 list price.

An alternate approach to faxing is to go through an e-mail system, such as MCI Mail (MCI International Corp., Washington, D.C., (800) 444-6245), AT&T Mail (AT&T Corp., New Brunswick, New Jersey, (800) 367-7225), or EasyLink (Western Union Corp., Dallas, Texas, (800) 527-5184). All three of these systems will accept ASCII text from a standard modem, then send the message as a fax. (For further information see "E-Mail, the Global Handshake," *PC Magazine*, August 1989.)

An e-mail system may be your best choice for faxing in any case. Reading a fax on a portable's screen is clumsy under the best of circumstances. You can't get the whole page on screen at once, and scrolling a graphics image is time-consuming. Printing a hard copy of the fax image may be slow with a portable printer. (For more on portable printers see "Printers to Go," *PC Magazine*, March 13, 1990.)

Faxing is so central to most businesses that you may be more concerned with on-the-road communications than with standard data communications. Fortunately, fax packages are easy to find.

MAKING THE CONNECTION

A basic truth about communications is that it is a must to attach to the phone system. As you may have already discovered, this is not a trivial task. If you're an old hand at communications, you may have assembled a set of tools to help make the job easier. If not, take a look at the $100 Road Warrior Toolkit, sold by Computer Products Plus (Huntington Beach, California, (800) 274-4277).

The Road Warrior Toolkit includes such useful aids as a screwdriver, magnifying glass with built-in flashlight, and a phone cable with a modular phone plug on one end and alligator clips on the other. The deluxe version includes a device called the CP+ Connection, which is also available separately. This useful little device will let you use a modem with digital phone systems that ordinarily require special data jacks. This device, called MoFone, is available for $99 from Travel Tech (Bothell, Washington; (800) 343-8080).

Computer Products Plus and Travel Tech are both good sources for all sorts of portable-computing accessories and you should probably get a catalog from each company. Computer Products Plus specializes in products for Toshiba computers, but carries enough general purpose items that may be interesting to any portable computer user.

Another useful item that you'll find in one or both catalogs is Black Jack, an acoustic coupler. Black Jack replaces the mouthpiece on a standard phone handset and provides a connector for plugging into a modem. The acoustic coupler provides a last-ditch option for attaching to a phone by way of the microphone and speaker. This may be your only choice on a pay phone. Note that some acoustic couplers require a special connector on the modem; others are available with an RJ-11 connector.

CELLULAR PHONES

For those who are interested in connections via a cellular phone, the good news is that it can be done. The bad news is that you have to be a pioneer.

The first issue is choosing a modem. The cellular-phone environment is inherently more hostile to data communications than a land-line connection. With a cellular phone, there's more noise, more variability of signal quality, and actual loss of communications—for up to four seconds—during a handoff from one antenna to another. As a result, modems designed for land-line phones are only marginally useful over a cellular phone. And just as the protocols of choice are becoming clear for standard land-line connections, a new set of contending protocols is starting to appear for cellular phones.

There are at least three competing protocols designed for use with cellular phones. These include SPCL (on modems from Spectrum Information Technologies, Dallas, Texas; (800) 233-2119 or (214) 630-9825), MNP 10 (on modems from Microcom, Norwood, Massachusetts; (800) 822-8224), and a newly modified version of the PEP protocol in Telebit's high-speed Trailblazer modems (Telebit Corp., Sunnyvale, California; (408) 734-4333).

Alas, cellular-based data communi-

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cations is far too new for any clear winner to have emerged; MNP 10 was announced in November 1989 and the Telebit CellBlazer was announced in December 1989.

Unless you have an overriding need for cellular-based communications, our best advice is to avoid committing to any of these products until the dust settles. In the meantime, you may be able to manage with an MNP 5 modem or a V.42bis modem at 300 or 1,200 bps.

The second issue for cellular communications is connecting to the phone, since few cellular phones come with an RJ-11 jack to let you plug into a modem. Spectrum Information Technologies solves this problem by providing an interface with its modem. With others, however, you'll have to provide your own solution.

If you are willing to make connections manually, there are a number of interfaces on the market. However, if you want your modem to auto-dial on the cellular phone, take a look at CelJack, from Telular Inc. (Wilmette, Illinois; (708) 256-8000). The company manufactures versions for most cellular phones, and provides an RJ-11 jack, complete with dial tone and the ability to accept tone and pulse dialing from your modem. Motorola users can also get the same features with Motorola's Cellular Connection (Motorola Inc., Arlington Heights, Illinois; (800) 525-0035).

For maximum portability in cellular communications, you may want to look at Access 1 from systems integrator Vital Communications (Parsippany, New Jersey, (201) 334-2214). The company takes many of the pieces discussed here, adds a cellular phone, and bundles them together in a package that fits neatly into one carrying case along with your portable computer.

MORE CHOICES

One last category worth discussing is the availability of emulation cards that will let you use your portable system as a terminal for a mainframe. NEC, for example, has several 3270 emulation cards for its LTX slot, and Computer Products Plus carries similar cards for Toshiba models. For a more thorough discussion of laptop-to-LAN and laptop-to-mainframe connectivity, see "Laptop To LAN Links."

As you can see from the wide array of choices discussed above, there are enough communications options for portables so that you can just about fill any communications need. However, not all options are available for all computers. If you need anything more than a standard modem, and you haven't already bought your computer, be sure to consider your communications requirements when making your buying decision. Choosing the right package for your special communications needs means your telephone may never have to be more than a cable's length away.

LAPTOP TO LAN LINKS

by C.G. Milligan

Many laptops have processing power and storage capacity to rival desktop PCs, but they often lack the connectivity capabilities necessary to do the whole job. Laptop users who tire of flipping floppies may find themselves wishing for better ways to move data and share resources. And while laptop connectivity options are limited, mobile networkers should take heart: the laptop-connectivity puzzle is one that can be solved.

Because laptops are generally short on expansion capabilities, just finding a place to plug in the typical LAN card can be a puzzle. Yet hardware limitations can be bridged via a number of methods that range from making unique use of existing communications ports to adding outboard expansion boxes. Given this range of choices, the toughest question you'll face may not be "Can I connect?" but "What's the best way for me to do it?"

To pick the right solution you'll have to consider your laptop's expandability, which network system you'll connect to, what type of cable the network requires, how much weight you're willing to lug around, and how much all of this will cost.

ZERO-SLOT LAN PACKAGES

If your laptop has no PC-type expansion slot, you should first consider using its serial or parallel port to make a LAN connection. The simplest and least expensive connection is made by linking your laptop to a PC already on the network with zero-slot LAN packages such as *Brooklyn Bridge* from Fifth Generation Systems Inc. (Baton Rouge, Louisiana; (504) 291-7221), *LANLink 5X* from The Software Link Inc. (Norcross, Georgia; (404) 448-5465), *FastLynx* from Rupp Corp. (New York, New York; (800) 852-Rupp), and *LANtastic/Z* from Artisoft Inc.(Tucson, Arizona; (602) 293-6363) can all do the job for you.

These packages link two PCs through their serial or parallel ports and provide virtual drive services—that is, the disk drive on the host machine appears as a

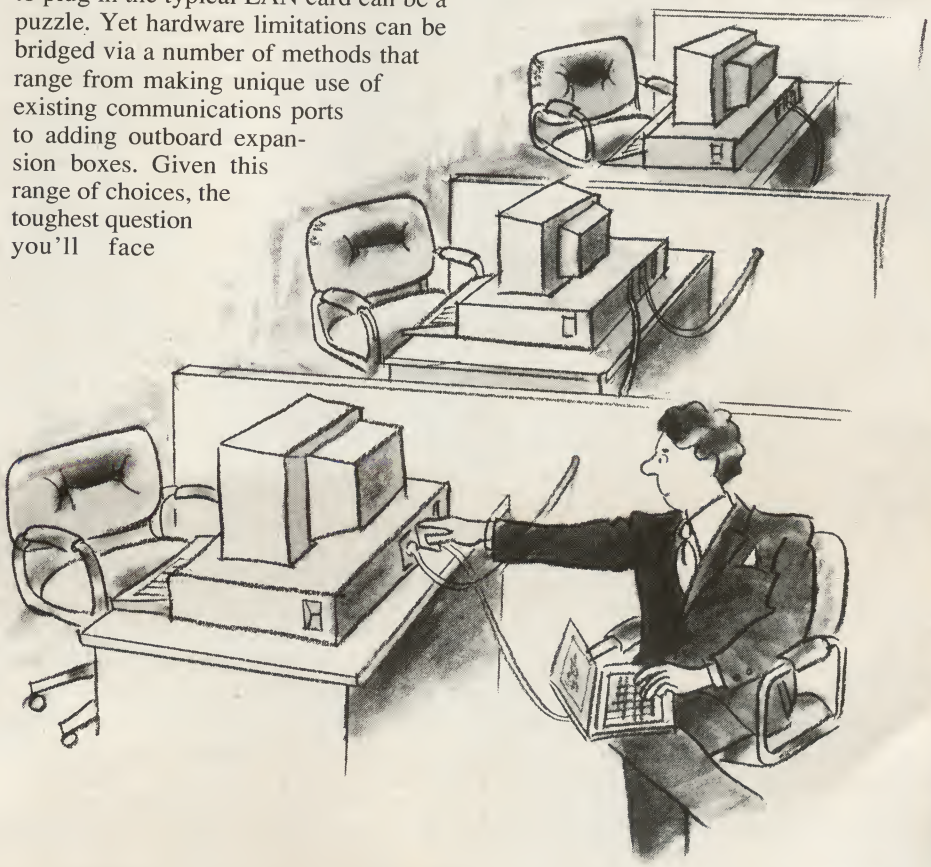

ILLUSTRATION: GLENN DODDS

drive letter on the laptop. The tricky part is in passing network drives through the host PC to the laptop. If a host PC already has drive letters assigned to a network server on a larger LAN, these network drives become available as virtual drives to the linked laptop through the zero-slot LAN. You can then effectively network through your laptop's zero-slot link to the host PC.

The appeal of linking to a larger LAN through the services of a host PC on a zero-slot LAN is that it's quick and efficient and it works with literally any network operating system and cabling scheme. But this method also has three distinct drawbacks.

First, the zero-slot connection's throughput is about 125 kilobits per second—less than one-third of the speed available from other LAN connection alternatives. While this pace poses no problem for activities such as small-file transfers and electronic mail, it isn't likely to be fast enough for frequent network database access or for transferring very large files. Additionally, zero-slot connections take precious RAM and processing power on the host PC as well as the laptop. Zero-slot LANs don't provide NetBIOS services for network applications, such as 3270 terminal emulation.

To help maximize host use, The Software Link offers an interesting twist on the client/host design. You can load its multiuser-multitasking operating system (PC-MOS) into a 386-based PC and attach up to 16 laptops by their serial ports to use its shared processing power as terminals. A special PC-MOS gateway option lets the multitasking host become a node on a Novell *NetWare* network and provides *NetWare* service to each laptop terminal.

Yet none of these solutions provides an answer to the problem of speedy data access or true networking capabilities for those on the road. If you need fast response time or NetBIOS services for applications like a 3270 terminal emulation, then you'll have to find a way to make your laptop connect as a true node on the network.

PARALLEL CONNECTIONS

Even if you don't have an expansion slot, the parallel port in your laptop can provide adequate connectivity—if you have the right laptop. You can connect special external adapters to the laptop's parallel port, load special driver software, and talk directly to the network using NetBIOS, IPX, and/or other services. To accomplish this, Xircom Inc. (Woodland Hills, California; (818) 884-8755) and IQ Technologies (Bellvue, Washington; (800) 227-2817 or (206) 451-0232) both market products that connect a laptop to a network through its parallel port.

Xircom markets several palm-sized devices that attach to a parallel port on one end and have a connector suitable for your network cabling scheme at the other. Adapters for Ethernet, ARCnet, 4 Mbps Token Ring and software drivers for *NetWare,* Sun PC-NFS (for Ethernet), Ethernet Packet (like TCP/IP), LANtastic, and other operating systems are available. But beware: the software doesn't work on every laptop. When we tested the Xircom Ethernet adapter in the *PC Magazine* LAN Labs, we found that while it has about half the throughput of an internal adapter, the connection is certainly fast enough for practical network operations.

In the long run, your laptop-to-LAN connection depends on a number of discrete variables; the most prominent is your laptop's internal card options.

The main drawback to using the Xircom adapter—aside from the speed loss—is that you lose your parallel printer port. IQ Technologies has a solution for laptoppers who want to be on the LAN and print locally at the same time. The company's parallel-port network adapter has a printer pass-through feature so you can use a local printer and network at the same time. IQ Technologies' ARCnet PLan adapter, an external unit that's about the size of a half-height external floppy disk drive case, has been Novell-certified. At the time we completed this story, the company had similar Ethernet and Token Ring LAN adapters scheduled for release in the first months of 1990.

THE DATA BUS ROUTE

If you need full-blown network power and speed, then your best bet is to install an adapter with full speed access to the data bus. If your laptop can handle standard PC or AT adapter cards, then you're on your way. But even if they lack an internal PC expansion slot, many laptops on the market support an optional expansion chassis. These expansion boxes are expensive, typically $1,000 or more, and you'll find they consist of little more than a cabinet, power supply, and a few standard-PC bus slots.

The expansion chassis connects to a special I/O port on the laptop. Some versions have room for external disk drives and some will support 16-bit AT-style expansion cards. Expansion chassis are generally designed to stay on your desktop while you carry the laptop away. Because this may present a problem for the traveler who needs to connect to local area networks in places other than the home or office, you might consider a somewhat less versatile, though much more portable, option.

A small, sleek expansion called the WunUnder Expansion Unit from Connect Computer (Eden Prairie, Minnesota; (612) 944-0181) has a single card slot in a case that fits under a Toshiba laptop. The whole package fits neatly into the Toshiba's carrying case. The $375 WunUnder connects to the Toshiba's modem port or expansion interface. Unfortunately, on the 1100 series and other machines with just the one expansion interface, you'll lose the use of your internal modem. But this device allows the laptop owner to use any 11-inch PC-compatible interface card. If you chose the WunUnder, you might want to pack extra cards in order to prepare for any connection opportunity.

If a suitcase full of network cards doesn't appeal to you, WunUnder makes a larger, two-slot external chassis for Epson, Mistubishi, Toshiba, and Zenith laptops. While not quite as sleek or portable as the one-slot attachment, these units offer two solid advantages: they are smaller and—priced between $450 and $500—are far more affordable than most full-size expansion boxes.

NETWORK ADAPTERS

Of all the laptop companies, Toshiba has taken the lead in providing laptop-to-LAN

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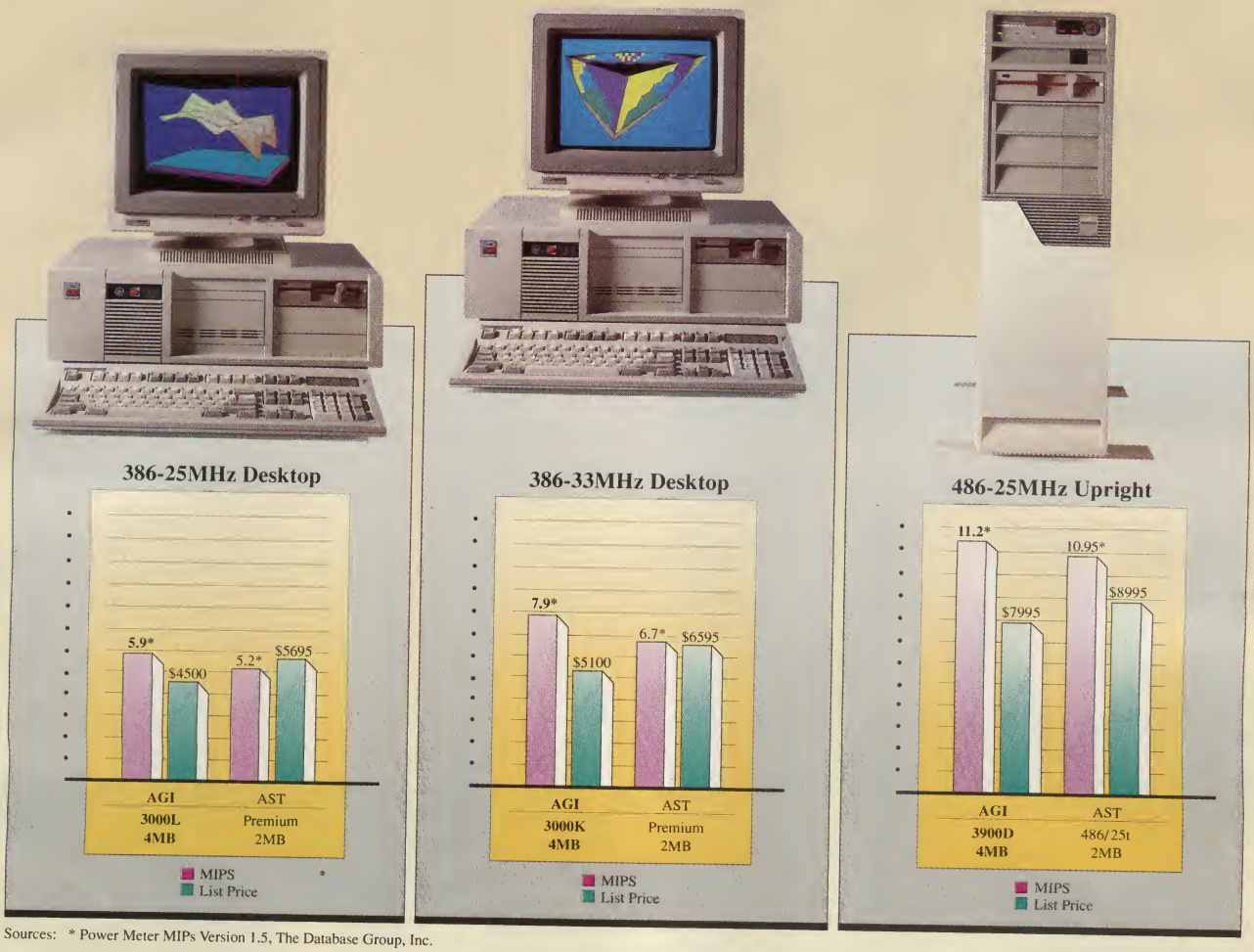

Sources: * Power Meter MIPs Version 1.5, The Database Group, Inc.

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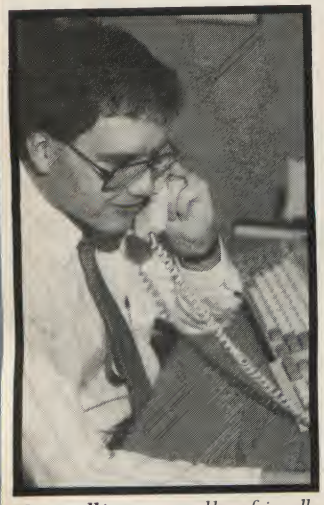

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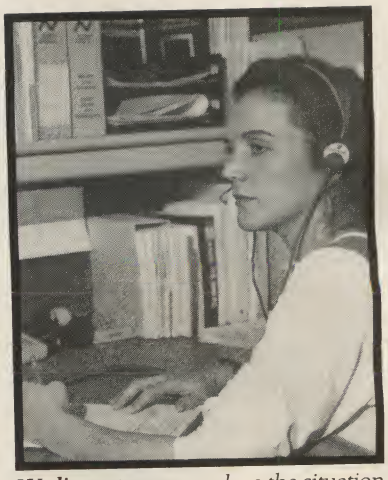

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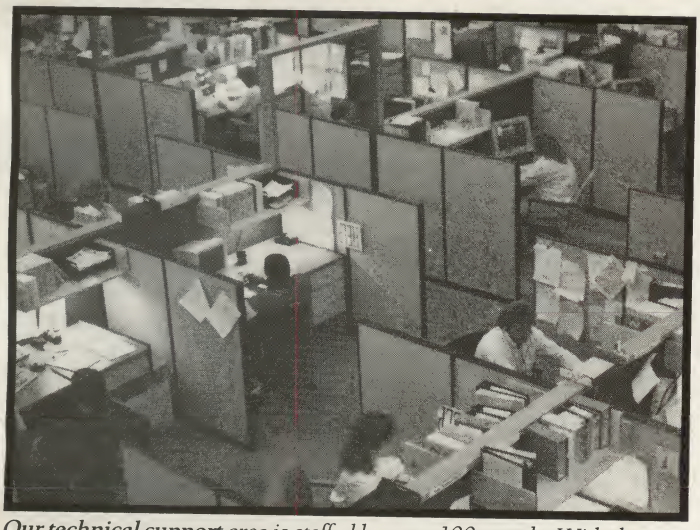

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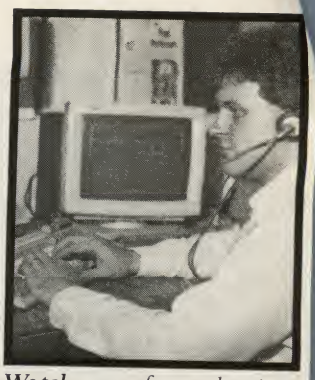

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links through customized network adapters. In mid-1989 Toshiba released a series of Toshiba-produced $699 Ethernet adapters for their portables, including an 8-bit and a 16-bit adapter equipped with its own external power supply and designed to fit into the expansion slot in the T1200, T1600, T3100, T3100/20, and T5100 portables. This arrangement still allows for installation of an internal modem. Users of T1000 and T1100 Toshiba portables, however, will have to look elsewhere for LAN connections.

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Aside from the loss of the modem slot in some smaller laptops, the major drawback to unique adapter cards connected through a special interface is their reliance on the adapter company for driver software. These companies only support a few LAN operating systems with drivers for specific cabling schemes—usually *NetWare* over Ethernet. If they do not support your particular combination of hardware and software, you need to research an alternative solution.

In the long run, your laptop-to-LAN connection depends on a number of discrete variables, but mostly on the laptop itself. If you own an NEC MultiSpeed, ProSpeed, or Toshiba, consider yourself in luck; you'll have several internal card options from which to choose. But keep in mind that whatever you plug into that internal slot will tie its usefulness to a single purpose. Owners of other laptop brands will have to employ external units for network connections, slower methods of direct I/O port connections, or even modems. External expansion chassis work well, but they are expensive and create extra weight on a trip. ■

M. David Stone is a contributing editor of PC Magazine. *Carnot G. Milligan is a Florida-based systems technician and computer consultant.*

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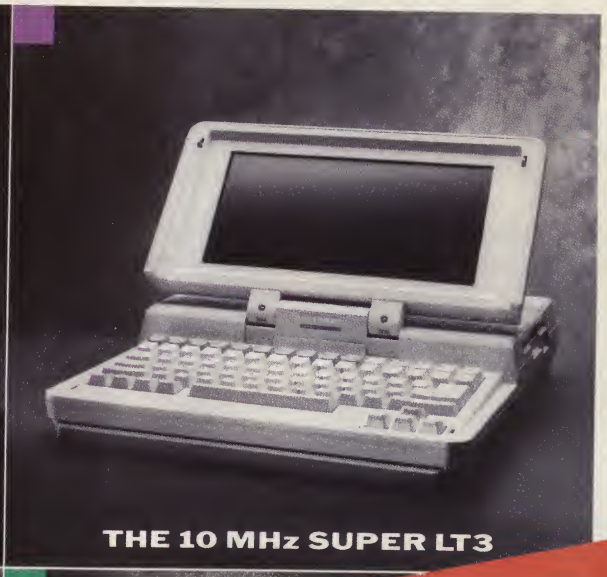

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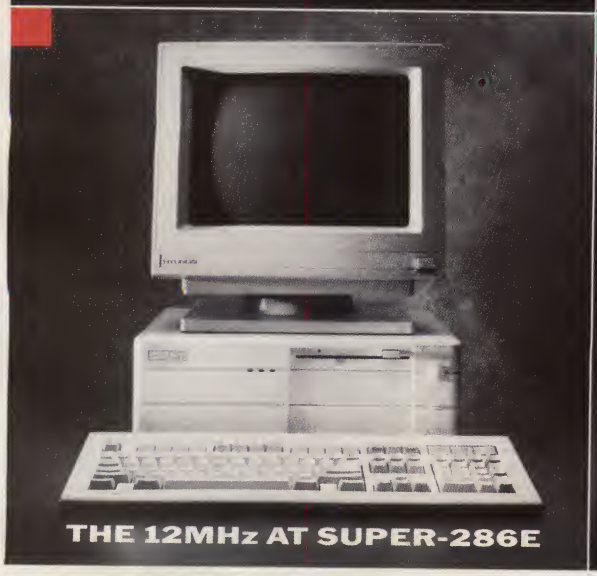

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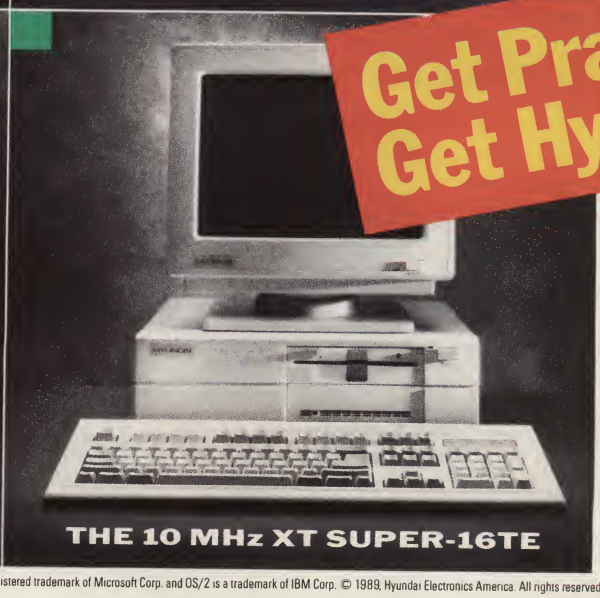

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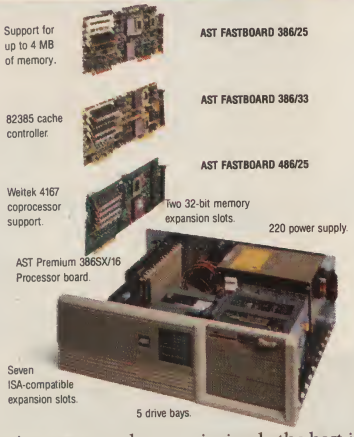

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CIRCLE 166 ON READER SERVICE CARD

by
William S. Hall

Windows

Exploring the Premier Graphical User Interface For Personal Computers

■ A brief history of Windows brings to life our new column.

With this issue, *PC Magazine* introduces a new column—one that will be devoted in its entirety to a topic that will take on considerable importance. I'm referring, of course, to the premier graphical user interface (GUI) for personal computers—the Microsoft *Windows* environment.

Similar to our other columns, productivity is the name of the game and our major focus. To accomplish this goal, I will view and explore *Windows* from a variety of angles. Although I will deal primarily with matters affecting end use, I won't hesitate to discuss technical issues or ignore the needs of those managing and developing *Windows* applications. Consequently, you'll be reading about a broad range of topics to help you to understand and use *Windows* more effectively.

Windows is not so much a program as it is an operating environment. Hence, software which runs under *Windows* is of substantial interest and I will report on a variety of such programs. These will include flagship products from major software houses as well as from the rapidly growing shareware and public domain collection of *Windows* utilities and programs.

Windows offers a complete, standardized, and fully supported user interface with rich graphics facilities. As a result, a number of companies are now developing specialized hardware with *Windows* as its controlling software. In addition, many firms are writing *Windows* programs to serve in-house corporate needs. You will be surprised at the range of such activities and I will try to keep you informed about these imaginative uses.

When *Windows* first appeared on the scene, its main target machines were XT and AT class computers with low- to medium-resolution displays and dot matrix printers. Little concern was expressed by hardware manufacturers to make special accommodations for the needs of *Windows*. Since then, however, hardware design has been influenced by *Windows*, especially in the realm of high performance and high-resolution displays. I'll try hard to keep you up to date on these and related developments—it's quite important to know what hardware solutions are best for optimizing how *Windows* is presented.

From the beginning, *Windows* has had its supporters and critics. Experienced MS-DOS users are often annoyed by the use of menus and dialog boxes to accomplish tasks that can be handled more quickly by a simple command line. Similarly, the lack of useful utilities also discouraged the use of *Windows* as a full-time command shell. We've all discovered that although *Windows* does provide some support for non-*Windows* applications, the relationship is not always a happy one. Others are more comfortable in *Windows* and so they almost never revert to the DOS prompt.

But even *Windows* enthusiasts have not been very pleased with its appearance and functionality. In particular, new shells have been written and new methods have been devised to customize *Windows* in certain ways. We'll keep close tabs on some of these innovations as they develop. In fact, I will also provide occasional utilities, similar to those found in our Utilities column, that will enhance the use of *Windows* in much the same way our regular utilities have enhanced the use of DOS.

Some people use only a restricted (runtime) version of *Windows* because they want to run only a particular program. Others have the standard *Windows* version installed, but run it for the same reasons and almost never use it as a command shell. Finally, a few run *Windows* almost exclusively. I hope you will share with us how you configure and use *Windows* along with your questions, concerns, complaints, and the topics you would like to see discussed.

Windows itself is under constant development and has undergone several changes since its beginning. Today's *Windows* combined with improved hardware has overcome many of its previous limitations—lack of useful software, low performance, high memory demands, and a tenuous existence with non-*Windows* applications. Soon *Windows* will take a major step forward by offering features that rival OS/2. The new decade promises an exciting period for *Windows* and I look forward to providing you with the latest in-depth information about this remarkable product.

Since this is a new column, I think it is useful to establish some common ground. So, before we take the plunge into actually working with *Windows*, let's begin by describing what *Windows* was and what it is today.

EARLY WINDOWS

Windows, Version 1.01, was released by Microsoft in November, 1985, after a development effort of some years. All together it was a remarkable technical achievement considering its many conflicting goals. The goals then were no dif-

ferent than they are now. Basically, *Windows* tries to provide you with a multitasking windowing system that works across a broad selection of machines and displays, by using a variety of keyboards and pointing devices for input, and by driving a representative group of printing machines while supporting both *Windows* and other standard applications.

Following this direction, a number of interesting design decisions were made. Many of these have continued to influence the appearance and the functionality of the product as well as the development of Presentation Manager for OS/2. For example, *Windows* will multitask *Windows* applications. However, the task switch is not carried out preemptively by a clock; instead, it depends on each application giving up control of the central processor in a timely fashion. Severely criticized by some, this non-preemptive architecture has proved to be much less troublesome than first thought. Even so, those programs which need to carry out an extended process require some care in design in order to be well behaved.

If there are several applications running at once, each one needs access to machine and operating system resources. In DOS the appropriate library routines are simply linked to the program when it is created. In *Windows* it was impractical for each application to contain all the routines necessary to access the hardware. To eliminate such redundancy, the idea of the dynamic link library (DLL) was introduced. *Windows* device drivers (those modules that control the hardware) are actually DLLs. So is the graphics device interface (GDI), as well as many other modules in *Windows*. A given application makes its final connections with these resources only at execution time. In this way, many tasks can share the same code and data.

Because several applications may be present in memory at once, *Windows* also needed a means of managing the available space in a transparent way. In DOS, programs requiring lots of memory are usually handled by overlays; their manipulation is the responsibility of the program itself. In *Windows*, the application writer divides the program into reasonably sized segments and specifies their properties. When the program runs, *Windows* takes on the responsibility of loading into memory only those segments required at that time. Others are discarded or moved about, if necessary, to optimize usage of the available space. Dynamically allocated global and local memory blocks are managed similarly. In a transparent way, *Windows* provides a virtual memory space much larger than the available real memory.

If *Windows* is to be useful, applications must be written to use its capabilities. Even before its first release, interested ISVs (independent software vendors) were provided with a development environment that included a special version of the Microsoft C compiler and libraries. And although the API (application programmer's interface) has greatly expanded, its core remains substantially unchanged today. Programs which were written carefully for *Windows* 1.0*x* still work more or less correctly today.

To eliminate redundancy, the dynamic link library (DLL) was introduced. *Windows* device drivers are actually DLLs.

In addition to providing support for ISVs, Microsoft also found it advantageous to assist hardware, peripheral, and computer manufacturers in order to extend the platforms available to *Windows*. At the time when *Windows* first appeared there were a number of MS-DOS computers on the market which were either not 100 percent IBM compatible or had quite different architectures. Many of these machines used superior video displays and faster CPUs, but occupied a smaller market. Similarly, there were simply too many different kinds of printing devices for Microsoft alone to support. Therefore Microsoft found it necessary to provide a separate OEM (Original Equipment Manufacturer) adaptation kit to facilitate the porting of *Windows* to additional hardware.

It was at this level that I first became acquainted with *Windows*. My first job in the personal computing industry was to use the rapidly changing and incomplete OEM kit to bring *Windows* up on the AT&T 6300 using the excellent 640- by 400-monochrome display developed by Olivetti. Later, I extended this effort to include a color display quite unlike the EGA, a keyboard mouse, a touch screen, and finally, a touch-screen and mouse combination (one that seemed to offer the best of both worlds). It was a testimony to the basic *Windows* architecture (a virtual machine connected to the hardware through device drivers) that such diverse means of getting input and displaying output worked so well together. An even more substantial accomplishment was made by Zenith Data Systems when they began to distribute *Windows* for their Z100, an S-100-based MS-DOS machine with little resemblance to the IBM PC.

Finally, let us mention an additional, important feature of *Windows*, which perhaps was not part of its original specification but appeared in its first release—support for standard DOS applications. For this task, *Windows* was designed to perform two jobs. If a DOS program is *well-behaved*, then a window is created for it and the program runs as if it were connected to an ANSI terminal. If, on the other hand, the program is less friendly to its environment, *Windows* becomes a means for context switching between itself and the program. It is even possible to have several different instances of such applications. Although if *Windows* itself is suspended, a degree of data exchange is possible. When all this works, the user has the best of possible environments. Alas, one soon runs out of memory and there is no protection between tasks. Acting as a DOS-control program has never been one of *Windows*' best features.

Of course, not all the concepts of *Windows* 1.0 have endured. For example, the most obvious characteristic was the use of tiled windows. Justified on the grounds that the machines and displays of those days lacked the necessary speed and resolution, tiling has since been replaced by the overlapping windows we see today. You cannot use a daisy wheel printer except as a generic device. Light pens are no longer supported as pointing devices (at least on the standard retail release) and, there is no longer a way to install *Windows* without a hard disk!

So, why was *Windows* 1.0 received with such mixed reviews? Performance was one issue. Despite some clever coding, especially in display drivers, the demands of *Windows* often exceeded the ca-

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pabilities of 4.77-MHz 8088 machines. The appearance, especially the tiled windows, made the product look somewhat toylike and the defaults chosen for color displays were less than subtle. Experienced DOS users, with or without mice or other pointing devices, found themselves handicapped by what was supposed to be a more intuitive approach.

Most of all, *Windows* lacked a broad base of software support. Large software houses did not rush to port their applications to *Windows* and it fell upon less well-known firms to begin the slow process of assembling the considerable offerings available today. Without basic software, there was little reason to use *Windows* except to access the desktop accessories or to run the excellent drawing programs from Micrografx. Of course, it was always possible to try *Windows* as a control program for DOS, but *Windows* itself might easily take nearly one-half of the available memory, making the execution of many old applications a doubtful prospect.

THE NEXT STEP

Almost two years after its first release, *Windows* 2.03 appeared sporting overlapping windows instead of tiled. Thus, *Windows* had gone from the the tidy to the untidy desktop motif. This is not a detrimental statement; rather it is a way of describing windows which may partially or completely obscure one another. The best analogy is a desk with papers scattered about and lying one upon the other. Just as the papers can be moved around, rearranged, and hidden, so can the windows be moved and made into icons.

Other noticeable changes included greatly expanded machine, printer, keyboard and display support, and improved installation, but with the same desktop offerings. Of course, software from other vendors had grown considerably and Aldus *Pagemaker* had been ported from the Macintosh to *Windows*. Internally, a number of changes had occurred. Expanded memory support, although with limitations, was added to facilitate the combined use of *Windows* and standard applications. It became possible to move data to and from old applications through the clipboard and dynamic data exchange (DDE).

To handle the increased workload, several changes were made to improve the display of graphical information on the screen. The major change was increased text-output speed, which required a change to the format of font files. Bit-block transfer and line drawing were also improved by the addition of special-case code. Naturally, the size of display drivers nearly doubled, but in compensation the drivers were segmented more carefully so that initialization and infrequently used code were not always present in memory. Finally, when the hardware could perform the task, new code was added to save and restore bitmaps overwritten by pop-up menus and dialog boxes.

A SIDE TRIP

At the same time that *Windows* 2.0 appeared, Microsoft released a special version, *Windows/386,* to take advantage of the 8086 emulation mode on the 80386 chip. The goal was to provide a better means of running *Windows* and standard applications together.

When *Windows/386* runs, a virtual 8086 machine is created and *Windows* is executed. At that point, you can execute a number of MS-DOS applications. Each application starts in its own virtual machine and each virtual machine runs concurrently and can be scheduled preemptively. The program may be run in a full-screen display or in a window. Thus, for the first time, *Windows* was operating in a protected-mode environment while taking advantage of all available memory. *Windows/386* provides an operating schema more akin to OS/2 and offers a choice of ways to manage the machine.

WINDOWS TODAY

During the summer of 1988, *Windows,* Version 2.10, appeared in two different forms—*Windows/286* and *Windows/386*. Although the implication is that *Windows* will run only on 80286 or 80386 processors, the 286 version can run on an 8086 machine. Similar to Version 2.03 in appearance, Version 2.10 provides a number of bug fixes, upgraded printer and display device support, and improvements in both extended and expanded memory utilization.

Microsoft *Windows* is certainly one of the best software bargains around. Retailing at slightly less than $100, it is often discounted to about $60. Quite often it is free with some other purchase or is bundled with hardware.

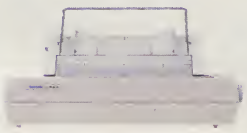
The package contains several disks containing nearly 200 files of various types: *Windows* control programs and dynamic link libraries, *Windows* desktop utilities, *Windows* device drivers, *Windows* printer drivers, fonts, DOS device drivers and utilities, and extensive documentation. The files support a wide range of displays, computers, keyboards, mice, and printers, and are available in several languages including English, German, French, Spanish, Italian, Swedish, Dutch, and Kanji.

Installation of *Windows* is straightforward. A few questions are asked about desired memory arrangement, printers, and country of use; displays and machines are usually detected by the installation program but can be easily overridden. Device drivers, system and OEM fonts, the Kernel, and the User and GDI libraries are assembled into a couple of large files—WIN200.BIN and WIN200.OVL. These files, along with the desktop utilities, some fonts, and a few miscellaneous files, are placed into the *Windows* directory and the program is ready to run. Unfortunately, you have to reinstall *Windows* if you want to change keyboard language, the display, or the mouse, unless you know some of the secrets supplied to OEMs and ISVs. Perhaps the next version of *Windows* will allow you a more flexible installation.

The desktop has scheduling activities (CALENDAR), a calculator (CALC), a game (REVERSI), a text editor (NOTEPAD), a clock (CLOCK), a file program (CARDFILE), a communications program (TERMINAL), a drawing program (PAINT), and a word processor (WRITE). The latter three programs represent a substantial development effort on the part of Microsoft.

A shell program (MSDOS) controls *Windows*. From it you can perform such operations as changing directories, formatting disks, creating new directories, and executing programs.

Whereas *Windows/386* provides its own expanded memory manager and requires only extended memory for operation, *Windows/286* comes with a number of device drivers for use with AST and Intel expanded memory boards. In addition, both contain a RAM disk driver (RAMDRIVE) and a caching program (SMARTDRV) for MS-DOS that are *Windows* aware. Finally, a device driver called HIMEM has been supplied which, among other things, allows *Windows* to use the first segment of extended memory, when available. Therefore, memory utilization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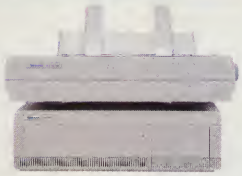
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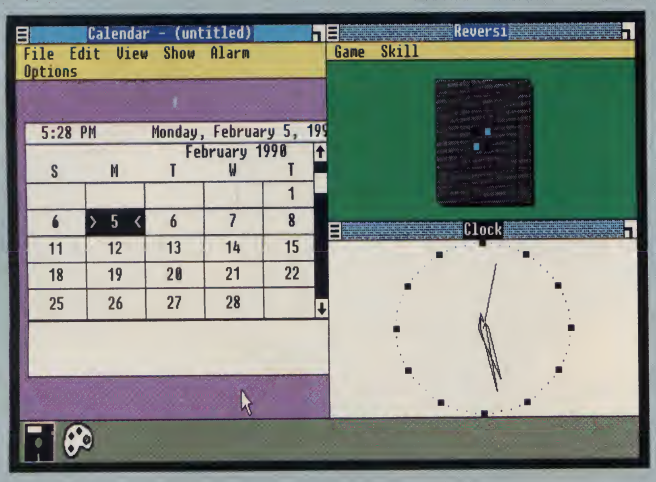


Figure 1: Not all of the concepts of *Windows* 1.*x* have endured. The tiled windows, which gave the product a somewhat toylike appearance, have been replaced by the overlapping windows used today.

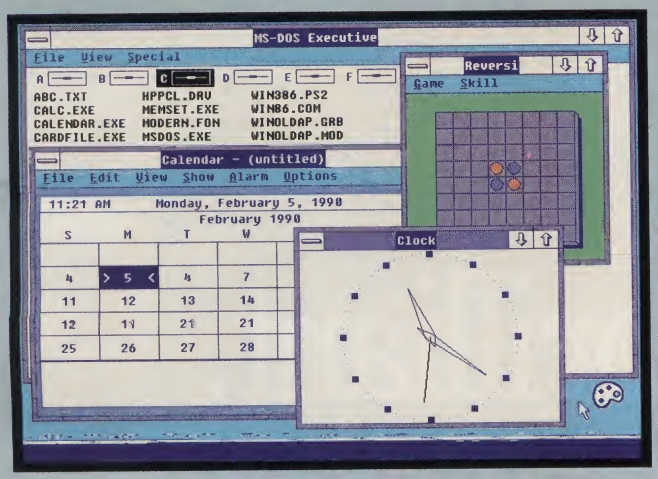


Figure 2: The *Windows* 2.*x* display is more appealing and more businesslike. Windows can be moved, resized, hidden, or made into icons to suit your needs.

Figure 3: It's not yet known just what future versions of *Windows* will look like, but it seems likely that they will resemble the OS/2 Presentation Manager, illustrated here.

is maximized without having to switch into protected mode.

Today, you gain considerable productivity from *Windows* for several reasons. First, there is an impressive range of professionally written software covering nearly every aspect of computer usage. Both DOS and *Windows* applications can be run concurrently, and most importantly, they can share data with each other through a variety of means ranging from manual transfers through the clipboard to automatic data updates using DDE. Performance on 80286 and 80386 machines is very good and the current crop of video boards provide high-resolution display in both color and monochrome. The quality of printed material is quite high and can be produced relatively fast. Memory utilization within the limits imposed by MS-DOS has been optimized.

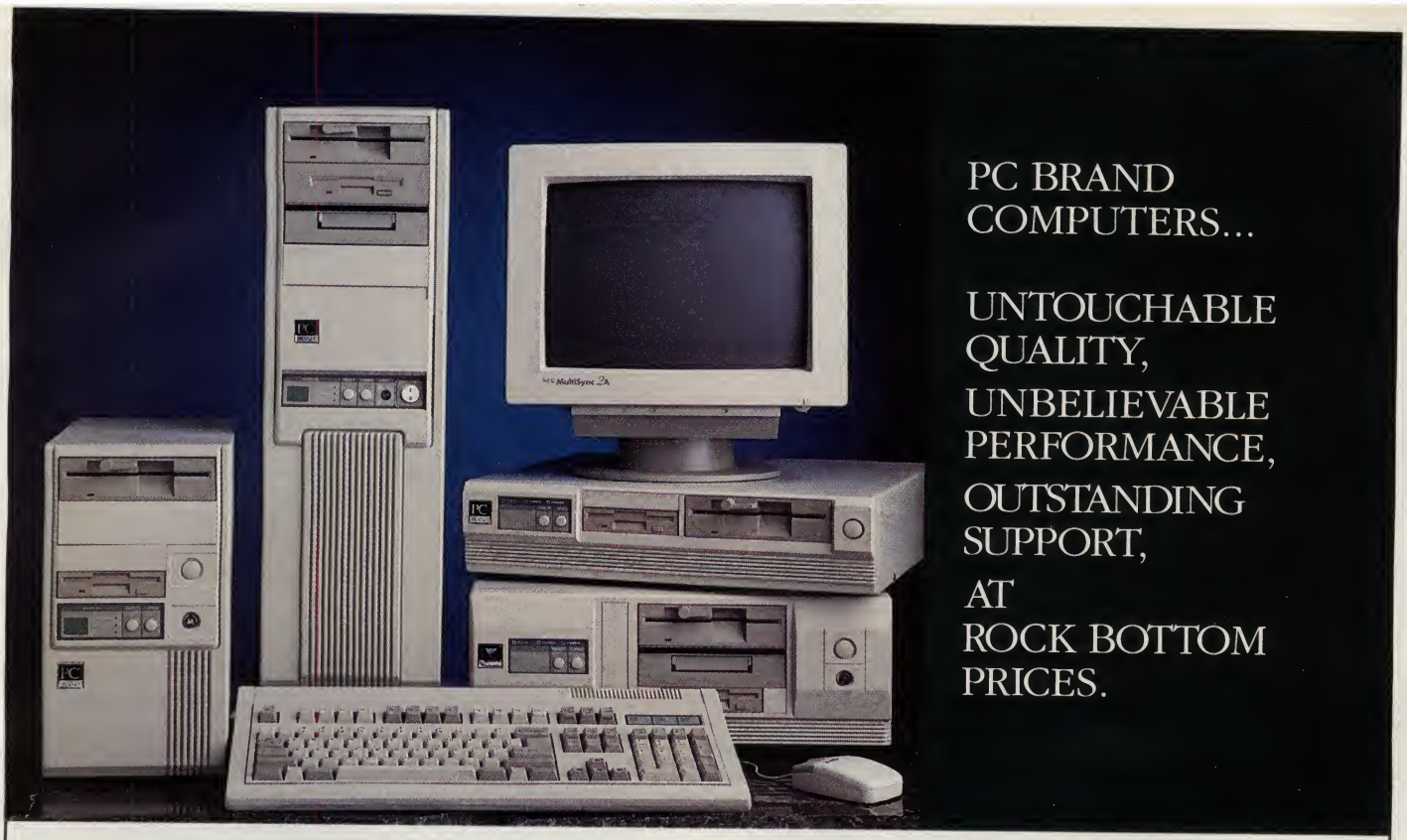
Yet, all of us who use *Windows* have felt that before *Windows* can reach its true potential the memory restrictions inherent in real-mode operation must be overcome. No improvement is more sorely needed in the next generation of *Windows*. Figure 1 shows what *Windows* used to look like (Version 1.*x*), while Figure 2 illustrates how it looks today (*Windows* 2.*x*). Figure 3 shows the Presentation Manager display—how the next version of *Windows* will probably look.

Well, that's it for a quick and dirty history. Next time I'll begin a detailed exploration of *Windows*.

Two things make a person more productive: knowledge of the environment, and the proper tools to get the job done. Providing you with the knowledge and the tools will be my job here. But remember that the lifeblood of any column is user feedback. The bottom line is that for this column to succeed I need for you to interact with me. It will be your job to send me your questions and share your tips—if you've developed a handy utility send it and maybe we will publish it. I look forward to hearing from you and sharing all things that are related to *Windows*.

OPENING WINDOWS

Share your experiences with the Windows environment. We'll pay you $50 for any tips we print. Please send your letter on a disk along with a printout. Mail your contributions to Windows, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see the "By Modem" sidebar in the Utilities column). ■



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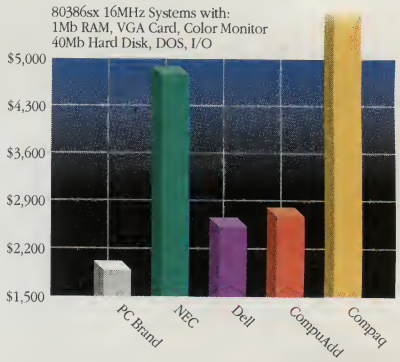

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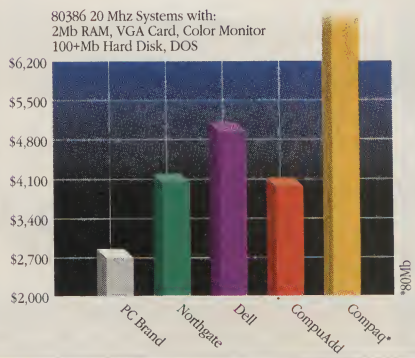

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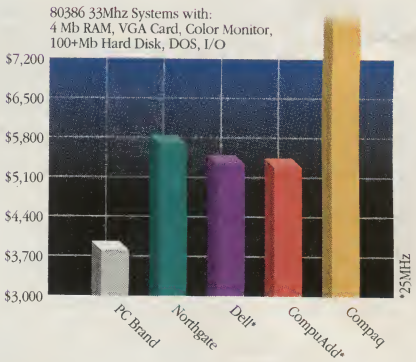

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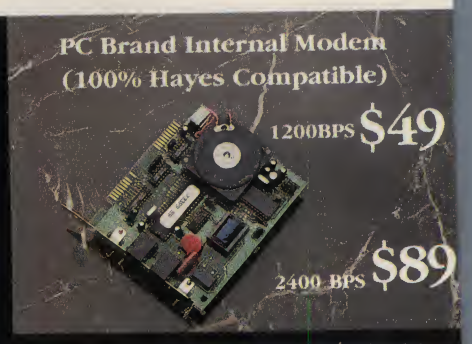

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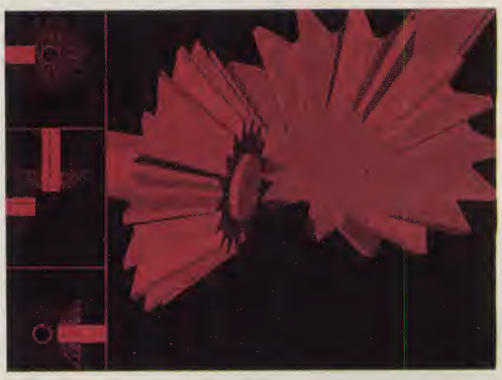

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by
Pete Maclean

Utilities

Introducing PAN.COM, the Program Animator

Would you like to be able to bring up *Lotus 1-2-3* with a menu that would offer you a choice among specific worksheets? Automate your CompuServe login? Modify DOS commands to customize their operation?

PAN.COM, this issue's utility, gives you the ability to accomplish these and any number of other tasks, from setting up program demonstrations and automating program start-ups to arranging for a backup or file transfer program that can run automatically and unattended in the middle of the night.

PAN is a Program ANimator, a utility designed to automate PC applications. You might think of it as a universal script language. For each job you want it to do, you must provide PAN with a command script. A few ready-made PAN scripts will be presented here, and others will be available from PC MagNet, but generally you'll have to write ("program") your own. Fortunately, anyone who has dabbled with BASIC, used the script language of a communications package, or worked with the macro language of a spreadsheet program will be able to put a PAN script together quite easily. With PAN, you simply write commands to load and run applications, to feed them simulated keyboard input, to write messages to the screen, and to take advantage of several other capabilities PAN provides.

The program and its source code is available for downloading from PC MagNet (see "PC Utilities by Modem" for instructions).

In recent months, the source code for the Utilities column hasn't appeared in the magazine so that we can publish more columns that provide tips to help you work smarter. This issue we've made room for the complete assembler listing that will create it. We'll print future programs whenever we can make room. Additional user-submitted PAN scripts and updated versions of PAN.COM itself will be available only via PC MagNet.

To create PAN.COM from the source code requires using a macro assembler (IBM or Microsoft, Version 2 or later) and the following commands:

■ With this versatile script language utility, you can add opening menus, schedule automatic operations, and customize your programs' operations.

```
MASM PAN;
LINK PAN;
EXE2BIN PAN PAN.COM
```

GETTING STARTED WITH PAN

As an introduction to PAN's command language, we'll start with the short sample script shown in Figure 1. This script, MORE.PAN, is designed to modify the operation of the DOS MORE program, which scrolls text directed into it onto the screen in 24-line batches. After displaying each 24-line group MORE.COM will post the prompt

```
-- More --
```

on the 25th line and waits for you to press a key. When you do, it scrolls out the next 24 lines.

Suppose you want to make the MORE program operate by paging rather than by scrolling. That is, before it displays each screenful of text, you want MORE to clear the screen and home the cursor instead of scroll up the new text from the bottom. Many people prefer this kind of display, as it's hard to read text that is being scrolled on a PC monitor.

To use the MORE.PAN script of Figure 1 to page through a file, you would simply enter

```
PAN MORE < FILE
```

The standard filename extension for scripts is .PAN, so if no extension is included in the command, that default is assumed. Now let's look at how the script works.

PAN commands are written one per line. Each starts with a keyword such as Load, Output and Label, and may be followed by arguments of various kinds. Blank lines are ignored, as are comment lines, which are identified by an initial asterisk. A complete list of commands with hints for how to use them is given in the

MORE.PAN COMPLETE LISTING

```
Load "c:\dos\more.com"
Go
Label loop
     WaitScreen 24 0 "-- More --"
     GetKey
     Wipe
     Cursor -1 0
     Key " "
Jump loop
```

Figure 1: A simple PAN script file that enhances the DOS MORE command so that it pages text instead of scrolling it.

sidebar, "The PAN Command Set."

The first line in the MORE script in Figure 1 contains a Load command. This tells PAN to load the MORE program from your DOS directory. (You'll need to change the pathname for MORE if you keep that program in a different directory or drive.) MORE is then loaded into memory above PAN itself. Execution of MORE commences only after the next PAN command, Go, is performed. Once MORE is started, PAN continues to operate in the background and can exert limited control over the program's progress.

The next line in the script defines a label that is used further on as the object of a Jump command. The WaitScreen command tells PAN to wait for MORE's prompt to appear. The first two arguments to WaitScreen indicate where on the screen the given text is expected to be displayed. Since rows and columns are counted from zero, the 24 0 indicates the start of the bottom line.

MORE.PAN uses the PAN command language to modify the DOS MORE program.

GetKey waits for and reads a keypress which, in MORE's case, signifies that the user wants to proceed to the next page of text. GetKey enables PAN to intercept the keypress that would normally go to MORE. This gives PAN a way to test *which* key is pressed, though in this case that ability is not needed—any key will serve the purpose. The Wipe command clears the screen and moves the cursor to the home position (row 0, column 0). The Cursor command moves the cursor again, effectively to row -1. This cursor position adjustment is needed, because after receiving a keypress from the user, MORE issues a carriage return and line feed. Try the script with `Cursor -1 0` omitted and you'll get an irritating one-line bounce as each screenful is displayed.

The Key command is used to simulate a user typing at the keyboard. In Figure 1, it issues a single space that prompts MORE to write out another 24 lines to the screen. Finally, the Jump command returns control to the command following the label `loop`. I have indented the commands within the loop simply for readability; PAN does not require it.

THE PAN COMMAND SET

by Pete Maclean

PAN script commands are entered one per line, and any amount of "white space" (blanks and tabs) may be inserted before and between fields. Each command begins with a keyword, such as Output or Label. Keywords may be entered in any combination of upper- and lower-case. String arguments may be delimited by any character, though double quotes (as used below and in the figures) are suggested for the sake of readability.

Note that PAN does little error checking. If a script does not do what you expect, consider the possibility that there is some error—a missing EndIf perhaps—that a compiler or other typical language processor would catch but that PAN does not.

In the syntax shown below, italics are used to denote user-entered variables, for example *row* for a row number. Decimal numbers are used unless otherwise indicated. The virgule (|) indicates a choice between or among parameters.

SCRIPT COMMANDS

`Break on | off` determines how PAN handles a Ctrl-C. If the GetKey command retrieves a Ctrl-C when Break is set on, PAN treats it as an abort and terminates (if no program is running). If Break is set off, then a Ctrl-C is handled as any other character. (Note: Ctrl-Break receives no special handling in the original version of PAN, but this may be changed in future versions available on PC MagNet.)

`Cursor` *row column* positions the cursor at a location on (or off) the screen. As with all PAN commands that refer to screen coordinates, the *row* and *column* arguments are entered as decimal integers numbered from zero, with the top left corner of the screen being row 0, column 0. No check for legal values is made, and no error indication is given. If an argument is omitted or invalid (that is, nonnumeric), a default value of zero is used. Note: the cursor can be made to disappear by moving it to a location beyond the limits of the screen, for example, by entering the command:

```
Cursor 25 0
```

`Else` reverses conditional execution inside an If . . . EndIf command group.

`EndIf` terminates the effect of an IfKey or IfLoad command. Every If command should have a matching EndIf, but PAN does not check for this.

`Flush` flushes the keyboard holding buffer. This command is generally used in association with the GetKey command to discard any accumulated keycodes before soliciting a keypress.

`GetKey` waits for the user to enter a keystroke, which then becomes available for testing with the IfKey command.

`Go "`*argument(s)*`"` initiates execution of a program that has been loaded with the Load command. The program is run as if it had been started from the DOS prompt with the given *argument* string.

`IfKey "`*list*`"` tests whether the last keypress (that is, that captured by a GetKey command) matches one of those in the given *list*. If there is a match, the subsequent commands are executed. If the match fails, then command execution is inhibited until a matching Else or EndIf command is encountered. For example, the command

```
IfKey "1234567890"
```

would result in a match if any digit were pressed.

`IfLoad "`*file*`"` attempts to load a program into memory for subsequent execution. The filename of the program must end in .EXE or .COM, and the ex-

Using this enhanced version of MORE can be made even easier by taking advantage of the ALIAS utility presented in our December 26, 1989, issue. If you set up an alias, for example

```
ALIAS MORE C:\UTILITY\PAN
 C:\UTILITY\MORE
```

then whenever you type MORE at the DOS prompt, the full

```
C:\UTILITY\PAN C:\UTILITY\MORE
```

will be substituted. (This assumes that you keep PAN and its scripts in a directory called C:\UTILITY.)

You'll find other useful ways of playing around with MORE. You might, for example, replace the

```
GetKey
```

with a command such as

```
Pause 10 seconds
```

This tells PAN to wait for 10 seconds after each page of text, and then it automatically proceeds to the next page.

SAFER FORMATTING

Figure 2 shows a PAN script designed to eliminate the danger of accidentally destroying the contents of a hard disk with the DOS FORMAT program. The idea of this script is to provide an interface to the FORMAT utility that restricts user formatting to floppy disk drives A: and B:. While the same restriction could be implemented with a DOS batch file, FORMAT.PAN gives us an opportunity to introduce and explain additional script commands provided by the PAN command set.

The first line in this example again uses PAN's Load command. The Output command on the second line prompts the user to enter A or B to identify the drive containing the disk to be formatted. The third line defines a label that is referenced by a Jump instruction further on. The GetKey command waits for the user to press a key, then stores that key within PAN for later testing by the IfKey command.

The next section consists of a series of tests on the key struck by the user. The first IfKey command tests whether the key was `A` or `a`. If so, the commands between IfKey and EndIf are executed. (Again, these commands are indented here only for readability.) The Output command echoes the character typed at the keyboard by the user and issues a new line. The Go command transfers control to the loaded program with "A:" as a command line. Thus, a

tension must be included as part of the *file*. Execution of the loaded program does not start until a Go command in the script is encountered. The commands following the IfLoad are performed if the load is successful; if it fails, the commands following an Else or EndIf are performed. For example:

```
IfLoad "c:\program.com"
   Output "The program has been
    loaded succesfully!^M^J"
   Go
   Quit
Else
   Output "The program could
    not be loaded!^M^J"
   Quit
EndIf
```

Jump *label* transfers control to the given *label* (see the Label command).

Key "*string*" feeds the characters that make up *string* to the running program by entering them, one by one, into the keyboard holding buffer. This simulates user keyboard input. Thus, for example, the command

```
Key "Yes[Enter]"
```

produces an effect which is equivalent to that of a user typing Yes and then pressing the Enter key. Note: the Key command is valid only when PAN is actually running a program.

Label *label* defines a *label* that can be used as the object of a Jump command. This command is in most respects a no-operation.

Load "*file*" loads a program (*file*) into memory for subsequent execution. As with IfLoad (above), the .EXE or .COM extension must be included, and program execution does not begin until a Go command in the script is processed. Should the load fail for any reason, PAN provides a suitable diagnostic message and terminates. If the user wishes PAN to maintain control after a failed load, the IfLoad command should be used instead.

Output "*string*" displays a *string* on the screen at the current cursor location. The cursor is updated in the process. The Output command should be used when using PAN to animate applications (like DOS utilities) that simply scroll the screen. (The Screen command, by contrast, should be used with screen-oriented applications.) Because Output invokes a DOS service to write to the screen, it cannot be used while PAN is running a program. Here is an example:

```
Output "This string scrolls
 onto the screen.^M^J"
```

(Note: ^M^J stand for a carriage return plus a linefeed.)

Pause *n* T | S | M pauses for a specified period. Permissible values of *n* are 1 to 255 for T (ticks) or S (seconds), or 1 to 60 for M (minutes). (The timer ticks on a standard PC occur at a rate of 18.2 per second.) You could invoke a delay of 2.5 minutes by entering:

```
Pause 2 minutes
Pause 30 seconds
```

PAN interprets only the first letter of the units field, that is, T, S or M. If the units field is omitted, PAN assumes seconds.

Quit terminates PAN. If PAN is not running a program, it quits immediately. If PAN is running a program, then it quits only when that program ends.

Screen *row column* "*string*" writes a *string* of characters to the screen, starting at the character position defined by the *row* and *column* numbers (0 to 24 and 0 to 79, respectively). Thus, for example:

```
Screen 10 40 "This appears on
 line 10 starting at column 40"
```

The operation uses a direct write to the video buffer. The video attribute used is that set by the last Video command.

TypeRate *ticks* controls the rate

CONTINUES

combination of the PAN commands

```
Load "c:\dos\format.com"
Go "A:"
```

is equivalent to entering

```
format A:
```

at the DOS prompt. Note, however, that PAN's Load command does require that the filename be fully qualified, including the .COM (or .EXE) extension.

The second IfKey clause is just like the first except that it handles disks in the B: drive. The third IfKey section handles any other keypresses. If the user presses the Esc key or Ctrl-C (represented by ^C), then PAN just ends and FORMAT never gets started. For all other keypresses the Else clause is performed: PAN outputs a beep (an ASCII Control-G) and returns to the `try_again` label near the top to await another keypress.

Once the FORMAT program has been started, a Jump command causes PAN to continue processing at the label waiter near the end of the script. The WaitChild command instructs PAN to sit back and wait for the FORMAT program (its "child" in operating-system parlance) to terminate. When FORMAT completes, PAN regains control and performs the Quit command.

To use the FORMAT.PAN script file you would issue the command

```
PAN FORMAT
```

at the DOS prompt. By putting this command into a batch file called FORMAT .BAT or by setting up an alias and then hiding FORMAT.COM from the directo-

FORMAT.PAN COMPLETE LISTING

```
Load "c:\dos\format.com"
Output "Enter drive, A: or B: "
Label try_again
GetKey
IfKey "Aa"
     Output "A^M^J"
     Go "A:"
     Jump waiter
EndIf
IfKey "Bb"
     Output "B^M^J"
     Go "B:"
     Jump waiter
EndIf
IfKey "[Esc]^C"
     Quit
Else
     Output "^G"
     Jump try_again
EndIf
Label waiter
WaitChild
Quit
```

AVAILABLE ON PC MAGNET

Figure 2: This script file adds safety features to the DOS FORMAT command, in this case to prevent formatting hard disks.

PAN COMMAND SET CONTINUED

at which characters are fed by the Key command into the keyboard holding buffer. The number to be entered represents the count of the 18.2-to-a-second *ticks* to be skipped between each pair of keyed characters. In most situations, setting TypeRate to zero is the best choice; the keys are then fed to the animated program as quickly as it will accept them. However, if you want the user to clearly see what is being "typed," a TypeRate between 2 and 9 is suggested.

`Video` *`attribute`* sets a video attribute for writes by subsequent Screen commands. Note: the number entered for *attribute* is in hexadecimal notation. The default screen attribute (70h) sets a white foreground and black background.

`WaitChild` suspends PAN activity until the animated program terminates.

`WaitScreen` *`row column`* `''`*`string`*`''` waits for the specified *string* to appear on-screen, starting at the position indicated by the *row* and *column* numbers. PAN continually searches for the string in the video buffer. Note: use this command with care: PAN will wait forever if necessary, for the string to appear, and you may be left with no way to interrupt the wait other than to press Ctrl-Alt-Del.

`WaitUntil` *HH:MM* suspends activity until the specified time of day, expressed in 24-hour notation. For example, to wait until 10:15 P.M., your script would contain the line

```
WaitUntil 22:15
```

`Wipe` clears the screen. (This command uses a BIOS function.)

(Note: Additional commands may have been added to PAN since this was written. Please check documentation files when you download the program.)

KEY STRINGS

A string provided as an argument to the Key or IfKey command contains symbols that identify keys on the standard IBM keyboard. With the IfKey command, the string expresses a list of keys to be matched to the last keypress; the order in which the keys are expressed is immaterial.

The rules for naming keys are as follows:

- Any printable character *except* ^ or [directly represents the key that generates it. The caret (^) and the open square bracket ([) are used as escape characters and must be doubled if intended to stand for themselves. Thus ^^ signifies a caret and [[a bracket.
- A named key is represented by putting its name in square brackets, for example, [Esc], [Home], [End], [Enter], [Ins], [Del], [PgUp], and [PgDn], and [F1], [F2], [F3], [F4], [F5], [F6], [F7], [F8], [F9], and [F10]. Arrow keys are identified as [Up], [Down], [Left], and [Right].
- Either a regular ASCII or an extended-ASCII code, equivalent to that produced by holding down the Alt key and entering a decimal code on the numeric keypad, can be indicated by putting the appropriate number in square brackets. Thus, for example, as part of an IfKey or Key command, you might enter

```
"[227] generates the pi symbol."
```

- Any character may be prefaced by one or more shift indicators: [Alt], [Ctrl], or [Shift]. Note: the caret may be

The WaitUntil command makes PAN pause until a specified time.

ry listing process, you could provide a fair measure of protection against accidental formatting of a hard drive.

INITIAL MENUS

The 123.PAN script shown in Figure 3 adds an opening menu to *Lotus 1-2-3*. I need not discuss this script line by line, but will instead comment only on previously unmentioned PAN features.

WaitScreen tells PAN to wait for a given string to appear on-screen. In this case it is used to detect the point at which *1-2-3* has completed its initialization. The Screen command then writes a string on the screen starting at a specified character position, using the video attribute that was set by the Video command.

When presented with the menu, the user presses 1, 2, or 3 to select the corresponding spreadsheet. PAN then feeds *1-2-3* the command to retrieve that spreadsheet and PAN's job is done. By pressing the Esc key while at the menu, the user can start working with *1-2-3* in the usual way; any other keypress produces a beep to indicate an invalid entry. Please note that this PAN script has been tested only with Release 2.01 of *1-2-3*.

Looking at Figure 3, you can see that it is possible to use PAN to set up much fancier menus—replete with moving cursor bars and submenus, if you wish. Scripts for such menus tend to get rather lengthy, however, so none are listed here. When you download PAN from PC MagNet, you'll find additional sample scripts, some of which do much fancier jobs than those just described.

You may be able to put PAN to work right away, using some of the scripts in the figures here. Others will require some simple customization. Even if you have no direct use for these specific scripts, they will serve as good models for developing scripts of your own, and additional hints are contained in the sidebar "Tips for Creating PAN Scripts." Users are invited to contribute new scripts, which will be posted in the PC MagNet libraries for general distribution.

123.PAN — **COMPLETE LISTING**

```
Load "c:\123\123.exe"
Go ""

* Wait for Lotus 1-2-3 to initialize

WaitScreen 0 75 "READY"

* Draw the menu in reverse video

Video 70
Screen 07 30 /                          /
Screen 08 30 /  Select a spreadsheet:   /
Screen 09 30 /        1. Expenses       /
Screen 10 30 /        2. Income         /
Screen 11 30 /        3. Budget         /
Screen 12 30 /                          /

* Get and interpret a keypress

Video 07
Label try_again
Flush
GetKey
IfKey "1"
     * Select File Retrieve <name>
     Key "/frexpenses[Enter]"
     Jump out
EndIf
IfKey "2"
     Key "/frincome[Enter]"
     Jump out
EndIf
IfKey "3"
     Key "/frbudget[Enter]"
     Jump out
EndIf
IfKey "[Esc]"
     * Select: Worksheet Erase Yes to clear the menu
     Key "/wey"
     Jump out
EndIf
Output "^G"
Jump try_again

* Out

Label out
WaitChild
Quit
```

Figure 3: This script adds a customized menu start-up feature to *Lotus 1-2-3*.

HOW PAN WORKS

At least a general understanding of PAN's internal operations will simplify your creation of effective scripts.

The program starts by looking for a command-line argument that names a script file to be used. PAN reads the entire script into memory, compressing it and checking for gross errors (such as invalid commands) in the process. In its internal, compressed form, a script can occupy up to about 60K. This translates roughly into a maximum plain text .PAN script of per-

used as an alternative to [Ctrl].

■ Literal control characters should not be included in strings; any that are present will be ignored. So use the ^[*key*] or [Ctrl][*key*] notation instead.

Below are some examples of key names:

[Alt][F10]	Alt-F10
[Shift]2	@
[Esc]	Esc
^[[	Esc
[Ctrl][Enter]	Ctrl-Enter
[3]	Ctrl-C
^2	Null

This scheme for naming characters makes no pretense of being complete. You cannot enter F11 or F12, for example, or distinguish between the two Enter keys.

OTHER STRINGS

Strings supplied as arguments to commands such as Screen and Output may contain printable characters (those that directly represent themselves) and control characters that are expressed in the common keyboard-equivalent notation. Thus, for any suitable *X*, Ctrl-*X* is indicated by a caret followed by an *X*, that is, by ^*X*. In this notation, a carriage return is ^M and a linefeed is ^J. A literal caret is expressed by doubling the character, that is, by typing ^^. ■

TIPS FOR CREATING PAN SCRIPTS

by Pete Maclean

Use the Cursor and Output commands with programs, such as DOS utilities, that write their screen output in scrolling (teletype) fashion. Use the Screen command with programs that do full-screen output.

Don't be confused by the differences between *key strings* (used with Key and IfKey) and *character strings* (used with other commands). The latter string style is a standard in programming, but a key string will be new to many people. Remember that a key string identifies a sequence of codes generated by keys on a keyboard, including many for which there are no equivalent characters. In a key string, for example, [Home] serves to identify a single, specific key, while in a character string it represents a six-character sequence of keystrokes.

PAN can be used to run a sequence of programs or one program repeatedly. After one program terminates and PAN regains control with a WaitChild command, another Load and Go can be issued.

If you are animating a large program, you may need to watch the length of your PAN script. The presence of comment lines never hurts, because they are stripped off as the script is loaded. In addition it never costs to indent commands for readability, because leading white space on a line is also removed.

Ways of reducing memory requirements for a script include keeping labels short (say to two characters) and limiting each field separator to a single character. ■

haps 80K, which is surely longer than anyone will require. After loading its script file, PAN begins interpreting the script commands.

When a Load command is encountered, PAN loads the target program into memory above itself. When a Go is issued, PAN relinquishes primary control to the target program, but because it hooks into the timer interrupt, PAN is brought into play 18.2 times each second. Each time PAN kicks in, it performs any pending script commands until it finds one that occasions a delay (such as a Pause command), or until it hits a WaitChild or Quit command. In these latter cases PAN cancels its timer intercept, giving up all control until the target program ends.

It is important for you to understand the difference between the two phases of PAN's operation. In the primary or setup phase—before it has started a target program running—PAN is the program in control of the PC and can perform any command. In the secondary, or background phase, the program that PAN has loaded is in control. In this phase, like a back-seat driver, PAN cannot perform certain commands.

Specifically, since it gains control only during timer interrupts, PAN cannot safely invoke DOS functions. The commands in question are: Go, Load, Output and WaitUntil. If PAN reaches such a command in its background phase, it clears the screen, posts a diagnostic message, and solicits a keypress to reboot the system. This error handling is harsh, but there is no simple alternative.

If PAN reaches a Quit command while in its background mode, it holds that command in abeyance until the program terminates. This means that the WaitChild command in Figure 3 is, strictly speaking, not necessary. You need a WaitChild only when PAN is to perform other duties between target-program termination and the point at which PAN itself quits.

PAN and the target program that it has loaded share control of the PC.

There is one command, Key, that has no obvious use in PAN's primary phase, since there is no program (except possibly PAN itself) loaded to read the simulated keyboard input. Nevertheless, there is no prohibition on the use of Key.

MODIFICATIONS

It would have been possible, of course, to design PAN so that it could execute DOS

PROGRAMMING NOTES: EXTENDING PAN

by Pete Maclean

The following are guidelines for adding new commands to PAN:

Implementing a new command requires adding the command keyword to the COMMAND_KEYS table and the name of the associated procedure to the list labeled C_TABLE in the source code. Conditional commands (Ifs, Elses, and so on) must be placed in their own sections at the ends of the two tables.

The procedure that processes a command must return with AX holding a count of the number ticks to be used for a delay or time-out. If AX is zero (the usual case), PAN processes the next command immediately. If AX is nonzero, then BX must contain a recall address. PAN delays for the designated period and then executes a call to that recall address. If the recall code needs to institute a further delay, *it must* explicitly store a tick count in the word called TIMEOUT. For an example, study the code for the WaitUntil command (procedure C_WAITUNTIL).

If a command procedure needs to invoke a DOS function, it should be prohibited from executing while PAN is in background mode. The variable PAN_STATE should be tested to determine PAN's current mode. See C_OUTPUT for an example. If you need a fatal-error escape from a command procedure, code a jump to COMMAND_ERROR with SI holding the address of a suitable diagnostic message. ■

PC UTILITIES BY MODEM

The programs published in *PC Magazine* are available by modem from PC MagNet.

To join PC MagNet, set your communications software for either 300 or 1,200 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest your dialing exchange, dial (800) 346-3247. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

After you have found the phone number nearest you, hang up and redial using that number. When you connect with PC MagNet, press Ctrl-C. At the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and Z10D9009 at the ENTER AGREEMENT NUMBER prompt. For customer service, call (800) 848-8990; outside the United States, call (614) 457-8650.

To download PAN.COM and its assembly or BASIC listings, log on to PC MagNet. Enter GO UTILITIES or choose PC MAGAZINE UTILITIES from the top menu, then DIRECT UTILITY DOWNLOAD from the next menu. Enter the filename, then select the file you want to download from those presented. Answer yes (Y) to DO YOU WISH TO DOWNLOAD? Press Enter to see the transfer protocols. Choose a protocol and download the file.

You don't have to be a member of CompuServe to access PC MagNet. It costs $12.80 an hour for 1,200/2,400-bps service and $6.30 for 300-bps, via MasterCard, VISA, or American Express. These programs can be copied but are copyrighted and are made available only for noncommercial use. You may make copies for others as long as no charge is involved, but making copies for any commercial purpose is prohibited.

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. The only way to obtain the modified versions is to download them from PC MagNet. Here is a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ANSI.COM, Version 1.3
BEN51.EXE (Benchmark Tests, Version 5.1)
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.2 (now works with volumes greater than 32MB)
DIRMATCH.COM, Version 1.1
EMS40.SYS, Version 1.1 (fixes a problem with *Lotus 1-2-3*)
LITES.COM, Version 1.1
LOG.COM, Version 1.1
PCMANAGE.EXE, Version 1.1
RN.COM, Version 2.0 (now works under DOS 4.*x*).
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
ZCOPY.COM, Version 1.2

For a complete list of all the programs available from the PC MagNet Utilities Database, download UDCAT .ARC.

A downloadable index to *PC Magazine*'s product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine* Reviews Index for January 1988 to June 1989. This easy-to-use database is a subset of the *Computer Library* Periodicals Database, which is available on CD-ROM and on PC MagNet. It requires the search files in PCSRCH.EXE.

PCSRCH.EXE is a self-extracting archive containing the software used to retrieve citations from the *PC Magazine* Reviews Index. Please read the information file PCM.INF before you download any of these files. ■

calls while running in the background. That would have made the program more powerful, but it would also have made it much larger—unsuitably large for this column. Even within this restriction, PAN could be beefed up with many more commands, and it took some self discipline for me to stop adding to PAN's capabilities. It started as a very open-ended project, and adventurous users may choose to extend it for their own purposes.

I do advise considerable caution in doing so, however. In particular, be very careful about what you allow PAN to do inside the timer interrupts. The sidebar "Programming Notes: Extending PAN," provides some further tips for the intrepid souls who want to add extensions.

PAN exhibits some additional limitations imposed by the need to keep it a manageably small project. It is intended for automating text-mode applications and has no facilities for working with graphics. It uses names for keys as they appear on IBM keyboards; some other vendors' keyboards name keys differently. On a few keyboards, for example, the key normally inscribed with *Enter* is labeled *Carriage Return*. Also, some cursor keypads have keys marked Page Up and Page Down, but PAN understands only PgUp and PgDn. I have not included support for the F11 and F12 keys, both because they are not widely used and because their inclusion would add disproportionately to the size of the program. A complete list of valid key names is given in the "PAN Command Set" sidebar.

One final note: PAN uses an undocumented option of the DOS Execute-A-Program function (interrupt 21, function 4B) to load a program without executing it. I wish to thank Kjeld Jacobsen, of Denmark, for sharing his knowledge of this function with me. ■

Pete Maclean, a Scotsman living in San Francisco, is a consultant who specializes in software development training and troubleshooting for computer networks.

Editor's Note: Remember to post your script contributions on PC MagNet so that other readers can take advantage of them. We would also appreciate hearing from anyone who makes any additions or modifications to PAN.—Tony Rizzo

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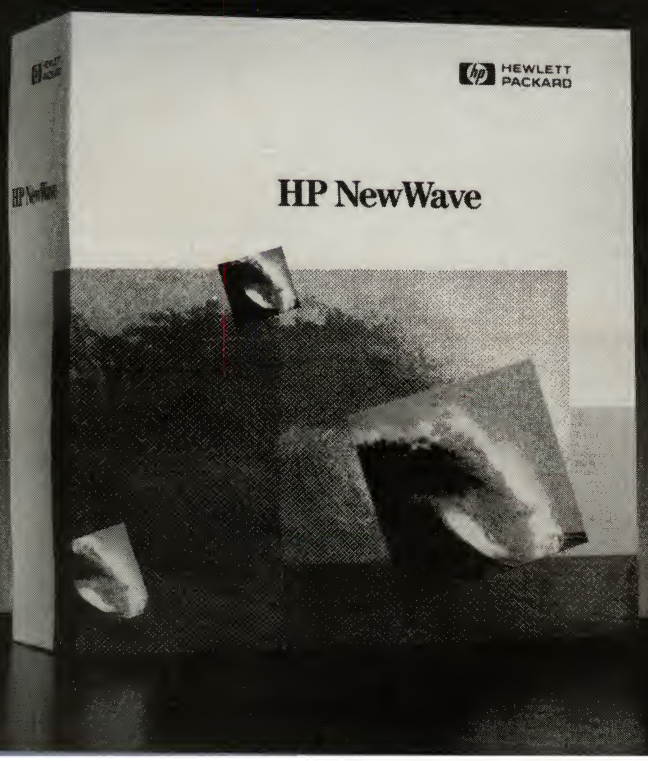

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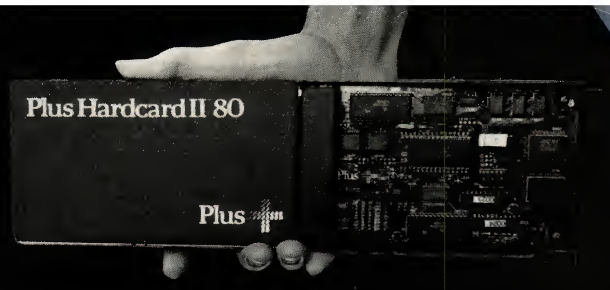
PAN.ASM 1 of 10

```
        title       'PAN:  Program ANimator by Pete Maclean'

        include     pan.hdr

; Symbol definitions

CR                  =       13      ; ASCII carriage return
LF                  =       10      ; ASCII linefeed
TAB                 =       9       ; ASCII Tab

; BIOS Keyboard Buffer definitions

KBB_SEGADD          =       40h     ; segment address of buffer
KBB_HEAD            =       1Ah     ; offset to head pointer
KBB_TAIL            =       1Ch     ; offset to tail pointer
KBB_START           =       80h     ; offset to start pointer
KBB_END             =       82h     ; offset to end pointer

; PAN States

PS_INITIAL          =       0       ; initial state - no target program loaded
PS_LOADED           =       1       ; target program loaded
PS_RUNNING          =       2       ; target program running
PS_OBIT             =       3       ; waiting for target program to die
PS_QUIT             =       4       ; QUIT pending when target program dies

code        segment     para public 'code'
            assume      cs:code, ds:code
            org         100h
start:      jmp         main                    ; entry point

; Messages

initmsg             db          'PAN 1.0 (C) 1990 Ziff Communications Co.',CR,LF
                    db          'PC Magazine ',254,' Pete Maclean',CR,LF,'$'

crlfz               db          CR,LF,0

; Definition for command-table entry

COMMAND             STRUC
PC_KEY              dw          ?       ; (offset) address of command key
PC_PROC             dw          ?       ; (offset) address of command processor
PC_TYPE             db          ?       ; coded command type
COMMAND             ENDS

command_entry_size  db          SIZE COMMAND

; Command types

PCT_REG             =           0       ; regular command
PCT_IF              =           2       ; If command
PCT_ELSE            =           4       ; Else command
PCT_FI              =           6       ; EndIf command

; Command table

command_table       LABEL       COMMAND
                    COMMAND     <k_Break,       c_Break,        PCT_REG>
                    COMMAND     <k_Cursor,      c_Cursor,       PCT_REG>
                    COMMAND     <k_Else,        c_Else,         PCT_ELSE>
                    COMMAND     <k_EndIf,       c_EndIf,        PCT_FI>
                    COMMAND     <k_Flush,       c_Flush,        PCT_REG>
                    COMMAND     <k_GetKey,      c_GetKey,       PCT_REG>
                    COMMAND     <k_Go,          c_Go,           PCT_REG>
                    COMMAND     <k_IfKey,       c_IfKey,        PCT_IF>
                    COMMAND     <k_IfLoad,      c_IfLoad,       PCT_IF>
                    COMMAND     <k_IfScreen,    c_IfScreen,     PCT_IF>
jump_command        COMMAND     <k_Jump,        c_Jump,         PCT_REG>
                    COMMAND     <k_Key,         c_Key,          PCT_REG>
label_command       COMMAND     <k_Label,       c_Label,        PCT_REG>
                    COMMAND     <k_Load,        c_Load,         PCT_REG>
                    COMMAND     <k_Lock,        c_Lock,         PCT_REG>
                    COMMAND     <k_Mode,        c_Mode,         PCT_REG>
                    COMMAND     <k_Pause,       c_Pause,        PCT_REG>
                    COMMAND     <k_Output,      c_Output,       PCT_REG>
                    COMMAND     <k_Quit,        c_Quit,         PCT_REG>
                    COMMAND     <k_Screen,      c_Screen,       PCT_REG>
setif_command       COMMAND     <k_SetIf,       c_SetIf,        PCT_REG>
                    COMMAND     <k_TypeRate,    c_TypeRate,     PCT_REG>
                    COMMAND     <k_Unlock,      c_Unlock,       PCT_REG>
                    COMMAND     <k_Video,       c_Video,        PCT_REG>
                    COMMAND     <k_WaitChild,   c_WaitChild,    PCT_REG>
                    COMMAND     <k_WaitScreen,  c_WaitScreen,   PCT_REG>
                    COMMAND     <k_WaitUntil,   c_WaitUntil,    PCT_REG>
                    COMMAND     <k_Wipe,        c_Wipe,         PCT_REG>

JUMP_INDEX          =           (jump_command - command_table) / SIZE COMMAND
LABEL_INDEX         =           (label_command - command_table) / SIZE COMMAND
SETIF_INDEX         =           (setif_command - command_table) / SIZE COMMAND

; Command keywords

command_keys        LABEL       BYTE

k_Break             db          "Break",0
k_Cursor            db          "Cursor",0
k_Else              db          "Else",0
k_EndIf             db          "EndIf",0
k_Flush             db          "Flush",0
k_GetKey            db          "GetKey",0
k_Go                db          "Go",0
k_IfKey             db          "IfKey",0
k_IfLoad            db          "IfLoad",0
k_IfScreen          db          "IfScreen",0
k_Jump              db          "Jump",0
k_Key               db          "Key",0
k_Label             db          "Label",0
k_Load              db          "Load",0
k_Lock              db          "Lock",0
k_Mode              db          "Mode",0
k_Pause             db          "Pause",0
k_Output            db          "Output",0
k_Quit              db          "Quit",0
k_Screen            db          "Screen",0
k_SetIf             db          " SetIf",0              ; cannot be written
k_TypeRate          db          "TypeRate",0
k_Unlock            db          "Unlock",0
k_Video             db          "Video",0
k_WaitChild         db          "WaitChild",0
k_WaitScreen        db          "WaitScreen",0
k_WaitUntil         db          "WaitUntil",0
k_Wipe              db          "Wipe",0
                    db          0                       ; end of table marker

; Key table for "On"/"Off" arguments:

on_off              db          'OFF',0,'ON',0,0        ; Off is 0, On is 1

; Dispatch table for preprocessing commands by type

preprocessing_table LABEL       WORD
                    dw          pp_regular, pp_If, pp_Else, pp_EndIf

; Extra dispatch table for conditional commands

n_table             dw          n_Nop, n_If, c_Else, c_EndIf

; Miscellaneous stuff

pan_extension       db      '.PAN',0  ; Standard extension for Pan scripts
pan_sp              dw      0  ; SP on transferring to a child program
break_condition     db      0  ; ? break on or off
command_ptr         dw      script_buffer
current_command     dw      0  ; pointer to current command in script_buffer
file_handle         dw      ?  ; handle for command file
if_condition        db      0  ; IF condition
if_effect_level     db      0  ; Level at which last If was TRUE
if_nest_level       db      0  ; IF condition level
in_pan_flag         db      0  ; set non-zero when in Pan timer intercept
keyboard_feed       db      0  ; set when PAN needs exclusive access
                               ; to the keyboard
keyboard_state      db      0  ; 0 => unlocked, 1 => locked
kbb_segment         dw      KBB_SEGADD; memory segment of keyboard buffer
line_buffer         db      128 dup (?); buffer for reading text through
pan_state           db      PS_INITIAL; see list of PS_xxxx states above
screen_columns      db      0  ; number of cols displayed in current video mode
recall_address      dw      0  ; address to recall after timer expiry
time_out            dw      0  ; time_out counter (ticks)
type_rate           dw      0  ; simulation rate for typing
va                  db      70h  ; video attribute, default like DOS MDA
video_segment       dw      0  ; memory segment address of video buffer

; Saved BIOS-keyboard interrupt vector

i_BIOS_kb  LABEL    dword
x_bk_offset         dw          0
x_bk_segment        dw          0

; Saved timer interrupt vector

i_timer             LABEL       dword
x_timer_offset      dw          0
x_timer_segment     dw          0

; Saved keyboard interrupt vector

i_keyboard LABEL    dword
x_key_offset        dw          0
x_key_segment       dw          0

; Saved Ctrl-Break interrupt vector

i_ctrl_break        LABEL       dwORD
x_break_offset      dw          0
x_break_segment     dw          0

; Stack pointer from intercept

callers_sp dw       0
callers_ss dw       0

; Last keypress obtained by a GetKey command
```

PAN.ASM: The assembly listing for PAN.COM, a Program Animation that lets you create your own user interface and automate repetitive tasks such as back-up and file transfer, plus a host of other things.



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```
keypress   LABEL      WORD
key_ASCII  db         0
key_scan   db         0

; Screen position

screen_position       LABEL      word
n_col                 db         0          ; column number
n_row                 db         0          ; row number

; "Keyboard" Input Queue pointers

kiq_first dw          0          ; pointer to first/next character

; Hour and minute for WaitUntil command

until_time LABEL      WORD
minute                db         0          ; minute to wait for (0 - 60)
hour                  db         0          ; hour to wait for (0 - 24)

; Parameter block for DOS program-load function

parameter_block       LABEL      WORD
env_seg               dw         0          ; segment of environment string
p_command_line        LABEL      dwORD      ; pointer to command line
command_offset        dw         0
command_segment       dw         0
FCB1                  LABEL      dwORD      ; FCB pointers
FCB1_O                dw         0
FCB1_S                dw         0
FCB2                  LABEL      dwORD
FCB2_O                dw         0
FCB2_S                dw         0
child_sp              dw         0          ; child's SP
child_ss              dw         0          ; child's SS
child_ip              dw         0          ; child's IP
child_cs              dw         0          ; child's CS

; Other information about the child process

child_psp dw          0          ; segment of child's PSP
child_size dw         0          ; size in paragraphs

; Video mode table

vseg_table LABEL      BYTE                                  ; Mode    Type
                      db         0B8h                       ; 0:  CGA 40x25 b/w
                      db         0B8h                       ; 1:  CGA 40x25 16 colors
                      db         0B8h                       ; 2:  CGA 80x25 b/w
                      db         0B8h                       ; 3:  CGA 80x25 16 colors
                      db         0                          ; 4:  CGA graphics mode
                      db         0                          ; 5:  CGA graphics mode
                      db         0                          ; 6:  CGA graphics mode
                      db         0B0h                       ; 7:  MDA 80x25 b/w

; Translation table:  ASCII codes into keyboard scan codes

scan  db   03, 30, 48, 46, 32, 18, 33, 34, 35, 23, 36, 37, 38, 50, 49, 24
;         Nul  ^A  ^B  ^C  ^D  ^E  ^F  ^G  ^H  ^I  ^J  ^K  ^L  ^M  ^N  ^O
      db   25, 16, 19, 31, 20, 22, 47, 17, 45, 21, 44, 01, 26, 53, 27, 12
;          ^P  ^Q  ^R  ^S  ^T  ^U  ^V  ^W  ^X  ^Y  ^Z Esc  FS  GS  RS  US
      db   57, 02, 40, 04, 05, 06, 08, 40, 10, 11, 09, 13, 51, 12, 52, 53
;          sp   !   "   #   $   %   &   '   (   )   *   +   ,   -   .   /
      db   11, 02, 03, 04, 05, 06, 07, 08, 09, 10, 39, 39, 51, 13, 52, 53
;           0   1   2   3   4   5   6   7   8   9   :   ;   <   =   >   ?
      db   03, 30, 48, 46, 32, 18, 33, 34, 35, 23, 36, 37, 38, 50, 49, 24
;           @   A   B   C   D   E   F   G   H   I   J   K   L   M   N   O
      db   25, 16, 19, 31, 20, 22, 47, 17, 45, 21, 44, 26, 43, 27, 07, 12
;           P   Q   R   S   T   U   V   W   X   Y   Z   [   \   ]   ^   _
      db   41, 30, 48, 46, 32, 18, 33, 34, 35, 23, 36, 37, 38, 50, 49, 24
;           `   a   b   c   d   e   f   g   h   i   j   k   l   m   n   o
      db   25, 16, 19, 31, 20, 22, 47, 17, 45, 21, 44, 26, 43, 27, 41, 14
;           p   q   r   s   t   u   v   w   x   y   z   {   |   }   ~ Del

; Translation table for special keys

keyname_list   LABEL    BYTE
     db      'ESC',0,'TAB',0,'ENTER',0
     db      'F1',0,'F2',0,'F3',0,'F4',0,'F5',0,'F6',0,'F7',0,'F8',0,'F9',0
     db      'F10',0
     db      'HOME',0,'UP',0,'PGUP',0,'LEFT',0
     db      'RIGHT',0,'END',0,'DOWN',0,'PGDN',0,'INS',0,'DEL',0
     db      0

shiftname_list        LABEL      BYTE
          db          'ALT',0,'CTRL',0,'SHIFT',0,0

shiftbits  LABEL      BYTE
           db         08h, 04h, 02h

key_scans  LABEL      BYTE
           db         1          ; Escape
           db         15         ; Tab
           db         28         ; Enter
           db         59,60,61,62,63,64,65,66,67,68  ; F1 - F10
           db         71         ; Home
           db         72         ; Up Arrow
           db         73         ; Page Up
           db         75         ; Left Arrow
           db         77         ; Right Arrow
           db         79         ; End
           db         80         ; Down Arrow
           db         81         ; Page Down
           db         82         ; Insert
           db         83         ; Delete

; Shift tables

No_shift   LABEL      WORD
           dw         0000h, 011Bh, 0231h, 0332h, 0433h, 0534h, 0635h, 0736h
           dw         0837h, 0938h, 0A39h, 0B30h, 0C2Dh, 0D3Dh, 0E08h, 0F09h
           dw         1071h, 1177h, 1265h, 1372h, 1474h, 1579h, 1675h, 1769h
           dw         186Fh, 1970h, 1A5Bh, 1B5Dh, 1C0Dh, 0000h, 1E61h, 1F73h
           dw         2064h, 2166h, 2267h, 2368h, 246Ah, 256Bh, 266Ch, 273Bh
           dw         2827h, 2960h, 0000h, 2B5Ch, 2C7Ah, 2D78h, 2E63h, 2F76h
           dw         3062h, 316Eh, 326Dh, 332Ch, 342Eh, 352Fh, 0000h, 372Ah
           dw         0000h, 3920h, 0000h, 3B00h, 3C00h, 3D00h, 3E00h, 3F00h
           dw         4000h, 4100h, 4200h, 4300h, 4400h, 0000h, 0000h, 4700h
           dw         4800h, 4900h, 4A2Dh, 4B00h, 0000h, 4D00h, 4E2Bh, 4F00h
           dw         5000h, 5100h, 5200h, 5300h

Shift_shift           LABEL      WORD
           dw         0000h, 011Bh, 0221h, 0340h, 0423h, 0524h, 0625h, 075Eh
           dw         0826h, 092Ah, 0A28h, 0B29h, 0C5Fh, 0D2Bh, 0E08h, 0F00h
           dw         1051h, 1157h, 1245h, 1352h, 1454h, 1559h, 1655h, 1749h
           dw         184Fh, 1950h, 1A7Bh, 1B7Dh, 1C0Dh, 0000h, 1E41h, 1F53h
           dw         2044h, 2146h, 2247h, 2348h, 244Ah, 254Bh, 264Ch, 273Ah
           dw         2822h, 297Eh, 0000h, 2B7Ch, 2C5Ah, 2D58h, 2E43h, 2F56h
           dw         3042h, 314Eh, 324Dh, 333Ch, 343Eh, 353Fh, 0000h, 0000h
           dw         0000h, 3920h, 0000h, 5400h, 5500h, 5600h, 5700h, 5800h
           dw         5900h, 5A00h, 5B00h, 5C00h, 5D00h, 0000h, 0000h, 4737h
           dw         4838h, 4939h, 4A2Dh, 4B34h, 4C35h, 4D36h, 4E2Bh, 4F31h
           dw         5032h, 5133h, 5230h, 532Eh

Ctrl_shift LABEL      WORD
           dw         0000h, 011Bh, 0000h, 0300h, 0000h, 0000h, 0000h, 071Eh
           dw         0000h, 0000h, 0000h, 0000h, 0C1Fh, 0000h, 0E7Fh, 0000h
           dw         1011h, 1117h, 1205h, 1312h, 1414h, 1519h, 1615h, 1709h
           dw         180Fh, 1910h, 1A1Bh, 1B1Dh, 1C0Ah, 0000h, 1E01h, 1F13h
           dw         2004h, 2106h, 2207h, 2308h, 240Ah, 250Bh, 260Ch, 0000h
           dw         0000h, 0000h, 0000h, 2B1Ch, 2C1Ah, 2D18h, 2E03h, 2F16h
           dw         3002h, 310Eh, 320Dh, 0000h, 0000h, 0000h, 0000h, 3710h
           dw         0000h, 3920h, 0000h, 5E00h, 5F00h, 6000h, 6100h, 6200h
           dw         6300h, 6400h, 6500h, 6600h, 6700h, 0000h, 0000h, 7700h
           dw         0000h, 8400h, 0000h, 7300h, 0000h, 7400h, 0000h, 7500h
           dw         0000h, 7600h, 0000h, 0000h

Alt_shift  LABEL      WORD
           dw         0000h, 0000h, 7800h, 7900h, 7A00h, 7B00h, 7C00h, 7D00h
           dw         7E00h, 7F00h, 8000h, 8100h, 8200h, 8300h, 0000h, 0000h
           dw         1000h, 1100h, 1200h, 1300h, 1400h, 1500h, 1600h, 1700h
           dw         1800h, 1900h, 0000h, 0000h, 0000h, 0000h, 1E00h, 1F00h
           dw         2000h, 2100h, 2200h, 2300h, 2400h, 2500h, 2600h, 0000h
           dw         0000h, 0000h, 0000h, 0000h, 2C00h, 2D00h, 2E00h, 2F00h
           dw         3000h, 3100h, 3200h, 0000h, 0000h, 0000h, 0000h, 0000h
           dw         0000h, 3920h, 0000h, 6800h, 6900h, 6A00h, 6B00h, 6C00h
           dw         6D00h, 6E00h, 6F00h, 7000h, 7100h, 0000h, 0000h, 0000h
           dw         0000h, 0000h, 0000h, 0000h, 0000h, 0000h, 0000h, 0000h
           dw         0000h, 0000h, 0000h, 0000h

;*****************************************************************************
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*                    Interrupt-Intercept Procedures                         *
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*****************************************************************************

;          timer-interrupt intercept

timer_intercept       proc       far
           pushf                            ; simulate another interrupt
           call       cs:i_timer            ;    to let timer do its thing
           push       ax
           mov        al,1
           xchg       al,cs:in_pan_flag     ; check we're not already here
           or         al,al
           jnz        .tim4                 ; exit immediately if so

           mov        ax,sp                 ; switch stacks
           mov        cs:callers_sp,sp
           mov        ax,ss
           mov        cs:callers_ss,ax
           mov        ax,cs
           mov        ss,ax
           mov        sp,OFFSET interrupt_stack
           sti                              ; allow interrupts

           push       bx                    ; save all registers
           push       cx
           push       dx
           push       si
           push       di
           push       ds
           push       es
           push       bp
           mov        ax,cs                 ; set DS and ES to PAN segment
           mov        ds,ax
           mov        es,ax
           cld

           mov        ax,time_out           ; AX = number of ticks to timeout
           test       ax,ax                 ; are we in a waiting period?
           jz         .tim2                 ; if no waiting
           dec        time_out              ; else count down the ticks
           jnz        .tim3                 ; if more to go
           call       [recall_address]; recall processor for current command
           jmp        SHORT .tim3

.tim2:     call       interpret             ; process a new command
           cmp        time_out,0            ; check number of ticks to timeout
           je         .tim2                 ; if no wait then do another

.tim3:     pop        bp                    ; restore state
           pop        es
           pop        ds
           pop        di
           pop        si
           pop        dx
           pop        cx
           pop        bx

           cli                              ; turn off interrupts
```

PAN.ASM 3 of 10

```
            mov         ax,cs:callers_sp      ; restore the interruptee's stack
            mov         sp,ax
            mov         ax,cs:callers_ss
            mov         ss,ax
            mov         cs:in_pan_flag,0      ; and reset in-Pan flag

.tim4:      pop         ax
            iret
timer_intercept         endp

;           Keyboard interrupt intercept.  Every time a keyboard interrupt
;           occurs we mess with the pointers to make it seem that the BIOS
;           keyboard-input queue is full.  This allows a Ctrl-Alt-Del to
;           take effect but for all normal keypresses the user will get a
;           beep.

keyboard_intercept      proc        far
            push        ax
            push        ds
            mov         ds,cs:kbb_segment     ; DS = keyboard-buffer segment
            mov         ax,ds:[KBB_TAIL]      ; get tail
            inc         ax                    ; bump tail pointer
            inc         ax
            cmp         ax,ds:[KBB_END]
            jne         .ki1
            mov         ax,ds:[KBB_START]     ; if wrapped around

.ki1:       xchg        ax,ds:[KBB_HEAD]      ; make it look like there's no room
            pushf                             ; fake interrupt to real handler
            call        cs:i_keyboard
            xchg        ax,ds:[KBB_HEAD]      ; replace "real" head of queue
            pop         ds
            pop         ax
            iret                              ; disconnects the keyboard
keyboard_intercept      endp

;           BIOS-keyboard interrupt intercept

BIOS_kb_intercept       proc        far
            pushf
            cmp         ah,01h                ; Function 0 or 1?
            ja          .kbi2                 ; no, let BIOS handle it
            sti                               ; ensure interrupts can happen
            je          .kbi1

; Handle function 00h:  Read Character from Keyboard.  If PAN has locked the
; keyboard then we delay the process until the lock is released.  If PAN has
; not locked the keyboard then we check if a character is available; if it is
; then we let the BIOS complete the request, else keep waiting in case PAN
; locks the keyboard.

.kbi0:      test        cs:keyboard_feed,0FFh; has PAN reserved the keyboard?
            jnz         .kbi0

            mov         ah,01h                ; BIOS Get Keyboard Status
            pushf
            call        cs:[i_BIOS_kb]
            jz          .kbi0
            mov         ah,00h
            jmp         SHORT .kbi2

; Handle function 01h:  Get Keyboard Status.  If PAN has locked the keyboard
; then we return a no-character-waiting indication to the process.  If PAN
; has not locked the keyboard then we let the BIOS handle the request.

.kbi1:      test        cs:keyboard_feed,0FFh; has PAN reserved the keyboard?
            jz          .kbi2                 ; no, go to BIOS
            popf
            xor         ax,ax                 ; yes, return with no input indication
            retf        2

.kbi2:      popf
            jmp         cs:[i_BIOS_kb]
BIOS_kb_intercept       endp

; Ctrl-Break intercept

ctrl_break_intercept proc       far
            iret
ctrl_break_intercept endp

;*****************************************************************************
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*                              Entry Code                                   *
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*****************************************************************************

            assume      ds:code
main        proc        near
            cld
            mov         sp,100h               ; set internal stack

            mov         dx,OFFSET initmsg     ; announce program
            mov         ah,9h
            int         21h
            call        c_Mode                ; determine video mode
            push        es
            mov         ax,3516h              ; get interrupt vector for BIOS kb
            int         21h                   ; ES:BX -> BIOS kb service
            mov         x_bk_offset,bx        ; save this for internal use
            mov         ax,es
            mov         x_bk_segment,ax
            pop         es

            call        get_script            ; load the command file
            jc          .mai3
            mov         bx,OFFSET script_buffer         ; calculate paragraphs used
            add         bx,ax                 ; AX = size of script as loaded
            add         bx,15                 ; round up to a paragraph boundary
            mov         cx,4
            shr         bx,cl                 ; convert to paragraphs
            mov         ah,4Ah                ; DOS modify allocated memory blocks
            int         21h

            call        resolve_jumps         ; prepare the script
            jc          .mai3                 ; if an error was detected
            mov         ax,OFFSET script_buffer         ; set command pointer
            mov         command_ptr,ax

.mai1:      call        interpret             ; perform the first/next command

.mai2:      xor         cx,cx
            xchg        cx,time_out           ; CX = timeout
            test        cx,cx                 ; did last command set a timeout?
            jz          .mai1                 ; if not continue processing
            call        delay                 ; else delay for the requisite period
            call        [recall_address]      ; then call the completion code
            jmp         SHORT .mai2           ; which can timeout again

.mai3:      mov         ah,9h                 ; get here with SI -> error message
            int         21h                   ; have DOS display it

.mai4:      jmp         terminate             ; die
main        endp

;*****************************************************************************
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*                    Primary PAN Command Interpreter                        *
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*****************************************************************************

interpret   proc        near
            mov         si,command_ptr        ; SI -> next command
            xor         ax,ax
            lodsb                             ; AX = command length
            test        al,al                 ; zero-length command => end of script
            jz          .int3
            add         command_ptr,ax        ; update the command pointer
            mov         current_command,si    ; save pointer to current command
            lodsb                             ; AX = command index
            mul         command_entry_size    ; convert to table offset
            mov         bx,ax                 ; BX = entry offset
            xor         ax,ax
            or          al,if_condition
            jnz         .int1                 ; if processing off
                                    ; call the command processor with AX = 0
            call        WORD PTR [command_table+PC_PROC+bx]
            mov         time_out,ax           ; store time-out counter
            mov         recall_address,bx     ; and recall address if valid
            ret

.int1:      xor         ax,ax                 ; get AX = command type
            mov         al,BYTE PTR [command_table+PC_TYPE+bx]
            mov         bx,ax                 ; and call corresponding proc
            call        [n_table+bx]

.int2:      ret
.int3:      jmp         c_Quit                ; Quit on end of script
interpret   endp

;*****************************************************************************
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*              Procedures for performing PAN commands                       *
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*****************************************************************************

;           Break On/off

c_Break     proc        near
            mov         bx,OFFSET on_off      ; BX -> "ON/OFF"
            call        match_key             ; check the argument
            jne         .cb1                  ; if not "ON" nor "OFF"
            mov         break_condition,al    ; else index sets the break condition
            xor         ax,ax                 ; this command complete
            ret

.cb1:       mov         si,OFFSET .cbmsg      ; "Break should have argument On or Off"
            jmp         command_error

.cbmsg      db          'Break should have argument "On" or "Off"',0
c_Break     endp

;           Else - if Else belongs to the last If processed then reverse the
;                  current if condition

c_Else      proc        near
            mov         al,if_nest_level      ; is this else effective?
            cmp         al,if_effect_level
            ja          .ce1                  ; ignore if not
            not         if_condition          ; switch the condition marker

.ce1:       xor         ax,ax                 ; this command completed
            ret
c_Else      endp

;           Cursor <row> <column> - move the cursor to the given position.

c_Cursor    proc        near
            call        get_screen_position   ; decode row and column
            mov         ah,02h                ; BIOS Set Cursor Position
            xor         bx,bx                 ; assume page 0
            mov         dx,screen_position    ; DH = row, DL = column
            int         10h
            xor         ax,ax                 ; that does it
            ret
c_Cursor    endp

;           EndIf - terminate an IF clause

c_EndIf     proc        near
            cmp         if_nest_level,0       ; is EndIf appropriate?
            jz          .ce1                  ; ignore if not (should be impossible)
            mov         al,if_nest_level      ; if this EndIf effective?
            dec         if_nest_level         ; count out one level
```

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```
            cmp     al,if_effect_level
            jne     .cen1               ; if not there is no more to do
            dec     if_effect_level
            mov     if_condition,0      ; process!

.cen1:      xor     ax,ax               ; all done
            ret
c_EndIf     endp

;           Flush - flush keypress buffer

c_Flush     proc    near

.cf1:       mov     ah,01h              ; check for keyboard input
            pushf                       ; by emulating interrupt to the BIOS
            call    [i_BIOS_kb]         ; int     16h
            jz      .cf2                ; if no input
            xor     ax,ax               ; else read that input
            pushf
            call    [i_BIOS_kb]         ; int     16h
            jmp     SHORT .cf1          ; keep checking until there is none

.cf2:       xor     ax,ax               ; no continuation
            ret
c_Flush     endp

;           GetKey - input a keypress

c_GetKey    proc    near
            cmp     pan_state,PS_RUNNING ; target program in action?
            je      .gk3                ; yes, get a keypress by stealth
            mov     ah,00h              ; else just use BIOS service
            int     16h
            mov     keypress,ax         ; save the codes
            cmp     break_condition,0   ; break mode on?
            jz      .gk1                ; no, don't handle aborts specially
            cmp     ax,2E03h            ; Control-C?
            je      .gk2                ; quit if so

.gk1:       xor     ax,ax
            ret

.gk2:       jmp     c_Quit

.gk3:       mov     ax,1                ; check on every tick
            mov     bx,OFFSET .gk4      ; come back at label .gk4
            inc     keyboard_feed       ; lock the keyboard
            ret

.gk4:       mov     ah,01h              ; check for keyboard input
            pushf
            call    [i_BIOS_kb]         ; int     16h
            jz      .gk5                ; if none
            xor     ax,ax               ; read that input
            pushf
            call    [i_BIOS_kb]         ; int     16h
            mov     keypress,ax         ; save it
            dec     keyboard_feed       ; release the keyboard
            ret

.gk5:       inc     time_out            ; continue waiting
            ret
c_GetKey    endp

;           Go - initiate execution of a loaded program

c_Go        proc    near
            cmp     pan_state,PS_LOADED ; check that state is correct
            je      .go2                ; if okay...
            mov     si,OFFSET .gomsg2   ; "Program already running"
            jg      .go1                ; error if Go done already
            mov     si,OFFSET .gomsg1   ; "No program loaded"

.go1:       jmp     command_error

.gomsg1     db      'No program loaded',0
.gomsg2     db      'Program already running',0

; Copy command line to child's PSP

.go2:       call    normalize           ; copy command line
            mov     es,child_psp        ; ES = PSP of child
            mov     di,81h              ; ES:DI -> command-line area
            mov     al,' '              ; force a blank at the start
            cmp     [si],al
            je      .go3
            stosb                       ; good command lines start this way

.go3:       rep     movsb               ; copy command line
            dec     di                  ; and append a carriage return
            mov     BYTE PTR es:[di],CR
            mov     ax,di               ; calculate length of command line
            sub     al,81h
            mov     es:[80h],al         ; and prepend length to the line

; Set up default FCBs just in case

            push    ds
            mov     ax,2901h            ; DOS Parse filename
            mov     ds,child_psp
            mov     si,81h              ; DS:SI -> command line to parse
            mov     di,92               ; ES:DI -> place for 1st FCB
            int     21h
            mov     cx,ax               ; save drive valid flag
            mov     ax,2901h            ; DOS Parse filename
            mov     di,108              ; ES:DI -> place for 2nd FCB
            int     21h
            pop     ds

            mov     in_pan_flag,1       ; make intercepts ineffective
            call    set_traps           ; set traps
            mov     pan_state,PS_RUNNING ; set state to running
            jmp     run_it              ; and transfer control
c_Go        endp

;           IfKey "keylist"-check if last captured keystroke is in the given list

c_IfKey     proc    near
            call    normalize           ; copy and fix the string

.ifk1:      call    translate           ; get AX = key code
            jc      iffalse             ; if no more keys in string
            cmp     ax,keypress         ; is it what we captured?
            je      iftrue
            jne     .ifk1
c_IfKey     endp

;           IfLoad "program_name" - attempt to load the specified program and
;                                   set condition code according to result

c_IfLoad    proc    near
            cmp     pan_state,PS_INITIAL ; check that state is suitable
            jne     .ifl1               ; if a program has already been loaded
            call    loader              ; try the load
            jc      iffalse             ; if load failed
            jnc     iftrue

.ifl1:      mov     si,OFFSET .loadm    ; complain, complain, complain
            jmp     command_error

.loadm      db      'A program is already loaded',0
c_IfLoad    endp

;           IfScreen <row> <column> "string" - check if "string" appears on screen

c_IfScreen  proc    near
            call    get_screen_position ; decode row and column
            call    skip_whitespace     ; find the "string"
            call    normalize           ; copy and normalize the string
            call    check_screen        ; check if it's there
            jns     iftrue              ; if the string is there
            js      iffalse             ; if it's not
c_IfScreen  endp

;           Set If condition false

iffalse     proc    near
            not     if_condition        ; inhibit processing
                                        ; and fall through
iffalse     endp

;           Set If condition true

iftrue      proc    near
            inc     if_nest_level       ; count up one more If level
            inc     if_effect_level     ; and active level
            xor     ax,ax               ; and we're done
            ret
iftrue      endp

;           Jump label - transfer control to command following the named label.

c_Jump      proc    near
            lodsw                       ; AX -> destination
            mov     command_ptr,ax      ; set new command pointer
            xor     ax,ax               ; done
            ret
c_Jump      endp

;           Key "string" - make it appear as though "string" were typed.

c_Key       proc    near
            call    copy_string         ; copy the string
            mov     kiq_first,si        ; point to first character
            mov     ax,1                ; continue on next tick
            mov     bx,OFFSET stuff_keys ; at proc stuff_keys
            ret
c_Key       endp

;           Label name

c_Label     proc    near
            ret                         ; no operation
c_Label     endp

;           Load "program_name"

c_Load      proc    near
            cmp     pan_state,PS_INITIAL ; check that state is suitable
            jne     .ifl1               ; if a program has already been loaded
            call    loader              ; attempt a load
            jc      bad_load            ; if load failed

.cl1:       xor     ax,ax               ; load successful, continue
            ret

bad_load:
            mov     dx,OFFSET .clA      ; "Cannot find target program"
            cmp     al,3                ; file or path not found?
            jle     .bl1
            mov     dx,OFFSET .clB      ; "Insufficient memory to load"
            cmp     al,8
            je      .bl1
            mov     dx,OFFSET .clC      ; "Cannot load target program"

.bl1:       mov     ah,9h
            int     21h
            call    ttyz                ; display filename
            jmp     c_Quit

.clA        db      'PAN Error:  Cannot find target program:  $'
.clB        db      'PAN Error:  Insufficient memory to load program:  $'
.clC        db      'PAN Error:  Cannot load target program:  $'
c_Load      endp

;           Lock - disconnect keyboard from application

c_Lock      proc    near
            cmp     keyboard_state,0    ; is keyboard already locked?
            jne     .loc1               ; if so this is a no-op
            inc     keyboard_state      ; else set state to locked
            mov     dx,OFFSET keyboard_intercept; replace keyboard interrupt
            mov     al,9h
            mov     bx,OFFSET i_keyboard
            call    set_vector
```

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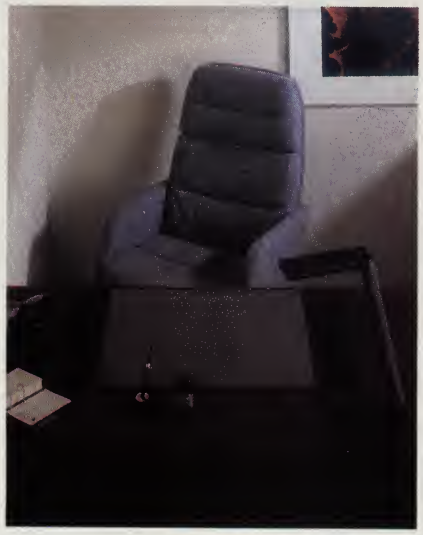

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```
        mov     dx,OFFSET ctrl_break_intercept; replace Ctrl-Break interrupt
        mov     al,23h
        mov     bx,OFFSET i_ctrl_break
        call    set_vector

.loc1:  xor     ax,ax
        ret
c_Lock  endp

;       Mode - force reassessment of current video mode

c_Mode  proc    near
        mov     ah,0Fh                  ; BIOS Get Video Mode
        int     10h                     ; returns AH = # columns, AL = mode,
                                        ;   and BH = active page
        cmp     al,7                    ; we only do text modes (0,1,2,3 and 7)
        ja      .cm1
        mov     screen_columns,ah       ; save number of columns on screen
        xor     ah,ah
        mov     bx,ax                   ; BX = mode
        xor     ax,ax
        mov     ah,[vseg_table+bx]      ; AX = video buffer segment
        mov     video_segment,ax
        ret

.cm1:   mov     video_segment,0         ; video mode that PAN does not handle
        ret
c_Mode  endp

;       Output <string> - send a string to standard output

c_Output proc   near
        cmp     pan_state,PS_RUNNING    ; is state suitable for DOS call?
        jae     .co2                    ; ignore the command if it's not
        call    normalize               ; straighten up the string

.co1:   lodsb                           ; AL = next character
        test    al,al
        jz      .co2                    ; at end of string
        mov     ah,02h                  ; DOS Display Output
        mov     dl,al                   ; DL = character
        int     21h
        jmp     SHORT .co1              ; loop for all characters

.co2:   xor     ax,ax                   ; and we're done
        ret
c_Output endp

;       Pause <n> ticks/seconds/minutes - delay for a given period

c_Pause proc    near
        call    decode_decimal          ; decode decimal count
        test    ah,ah                   ; 0 - 255 allowed
        jnz     .cp2                    ; if out of bounds
        mov     cx,ax                   ; CX = number
        call    skip_whitespace         ; skip to units
        jz      .cps                    ; if no units then use seconds
        call    isletter                ; check that units starts with a letter
        jc      .cp2                    ; give error if it doesn't
        cmp     al,'T'                  ; ticks?
        je      .cpt
        cmp     al,'S'                  ; seconds?
        je      .cps
        cmp     al,'M'                  ; minutes?
        jne     .cp2
        cmp     cl,60                   ; 60 minutes is the max
        jg      .cp2
        mov     ax,1092                 ; AX = number of ticks in a minute
        mul     cx                      ; get AX = number of seconds
        jmp     SHORT .cp0

.cps:   mov     al,18                   ; multiple by 18.25 to approximate 18.2
        mul     cl
        shr     cx,1
        shr     cx,1
        add     ax,cx
        jmp     SHORT .cp0

.cpt:   mov     ax,cx                   ; AX = tick count

.cp0:   mov     bx,OFFSET .cp1          ; return with AX = timeout, recall here

.cp1:   ret

.cp2:   mov     si,OFFSET .cpmsg; 'Pause 1-255 ticks, 1-255 seconds or 1-60
minutes'
        jmp     command_error

five    db      5
.cpmsg  db      'Pause 1-255 ticks, 1-255 seconds or 1-60 minutes',0
c_Pause endp

;       Quit

c_Quit  proc    near
        call    unset_traps             ; make sure no traps are left set
        call    c_Unlock                ; and that the keyboard is unlocked
        cmp     pan_state,PS_LOADED; got a program loaded and ready to go?
        je      .cq2                    ; if so we must get rid of it
        cmp     pan_state,PS_RUNNING    ; running a child program?
        je      .cq1                    ; if so
        jmp     terminate               ; otherwise we can exit gracefully

.cq1:   mov     pan_state,PS_QUIT       ; quit when target program quits
        mov     ax,1
        ret

.cq2:   mov     child_cs,cs             ; fix things so child will die at birth
        mov     ax,OFFSET terminate
        mov     child_ip,ax
        mov     pan_state,PS_QUIT       ; quit when target program quits
        jmp     run_it                  ; then go run it
c_Quit  endp

;       Screen <row> <column>  "string" - write a string directly onto the
;                                                       screen.

c_Screen proc   near
        call    get_screen_position     ; decode row and column
        call    skip_whitespace         ; skip to "string"
        call    normalize               ; copy and fix the string
        mov     dx,screen_position      ; DX = row + column
        mov     bl,va                   ; BL = video attribute
        call    display_string          ; display the string
        xor     ax,ax                   ; no continuation
        ret
c_Screen endp

;       SetIf - set the if nesting level after a Label.
;
; Note:  This is an internal command that is inserted automatically
;        following each Label command.  The effect is to make Ifs and
;        EndIfs work like proper bracket operators.  It allows Jumps
;        to be made out of If/EndIf blocks.  It also, er, allows Jumps
;        to be made into If/EndIf blocks!!

c_SetIf proc    near
        lodsb                           ; AL = current level
        mov     if_nest_level,al        ; make that the nesting level
        mov     if_effect_level,al      ; and the effective level
        xor     ax,ax                   ; that's it
        ret
c_SetIf endp

;       TypeRate <ticks> - set a rate for emulating typing (in ticks)

c_TypeRate proc near
        call    decode_decimal          ; decode decimal tick count
        mov     type_rate,ax            ; store the type rate
        xor     ax,ax                   ; no continuation
        ret
c_TypeRate endp

;       Unlock - connect keyboard to application

c_Unlock proc   near
        cmp     keyboard_state,1        ; is keyboard locked?
        jne     .unl1                   ; if not this is a no-op
        dec     keyboard_state          ; set state to unlocked
        mov     al,9h                   ; remove keyboard intercept
        mov     bx,OFFSET i_keyboard
        call    restore_vector
        mov     al,23h                  ; reset Control-Break vector
        mov     bx,OFFSET i_ctrl_break
        call    restore_vector

.unl1:  xor     ax,ax
        ret
c_Unlock endp

;       Video <attribute> - set video attribute.

c_Video proc    near
        call    decode_hex              ; decode attribute into AL
        mov     va,al                   ; and store it away
        xor     ax,ax                   ; no continuation
        ret
c_Video endp

;       WaitChild - wait for child to die.

c_WaitChild     proc    near
        cmp     pan_state,PS_RUNNING    ; only valid in running state
        jne     .wc2                    ; error in any other state
        mov     pan_state,PS_OBIT       ; change state to PS_OBIT
        call    unset_traps             ; no longer need these

.wc1:   mov     ax,1                    ; to stop command processing
        ret

.wc2:   mov     si,OFFSET .wcA          ; what is PAN expected to do?
        jmp     command_error

.wcA    db      'No program running to wait for',0
c_WaitChild     endp

;       WaitScreen <row> <column> "string" - wait for the given string to
;                                                       appear on screen.

c_WaitScreen    proc    near
        call    get_screen_position     ; decode row and column
        call    skip_whitespace         ; skip to the "string"
        call    normalize               ; copy and normalize the string
        mov     ax,1                    ; check on next tick
        mov     bx,OFFSET .ws1          ; at label .ws1
        ret

.ws1:   mov     si,OFFSET line_buffer; SI -> string to be matched
        call    check_screen            ; see if it's there
        jnc     .ws4                    ; if the string has appeared

.ws3:   mov     time_out,3              ; try again in 3 more ticks' time

.ws4:   ret
c_WaitScreen    endp

;       WaitUntil <HH:MM> - wait until a given time of day

c_WaitUntil     proc    near
        cmp     pan_state,PS_RUNNING    ; cannot do this in background mode
        jae     .wu5
        call    decode_decimal          ; decode decimal tick count
        mov     hour,al                 ; save hour (0-24)
        inc     si
        call    decode_decimal          ; decode decimal tick count
        mov     minute,al               ; save minute (0-60)
        mov     ax,18                   ; check every second
        mov     bx,OFFSET .wu1          ; below
        ret

.wu1:   mov     ah,2Ch                  ; DOS Get Time
        int     21h
        cmp     cx,until_time           ; has the due time come around?
        jne     .wu3                    ; no, keep waiting

.wu2:   ret                             ; yes, do next command
```

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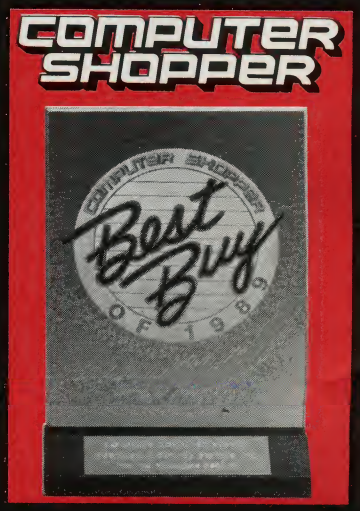

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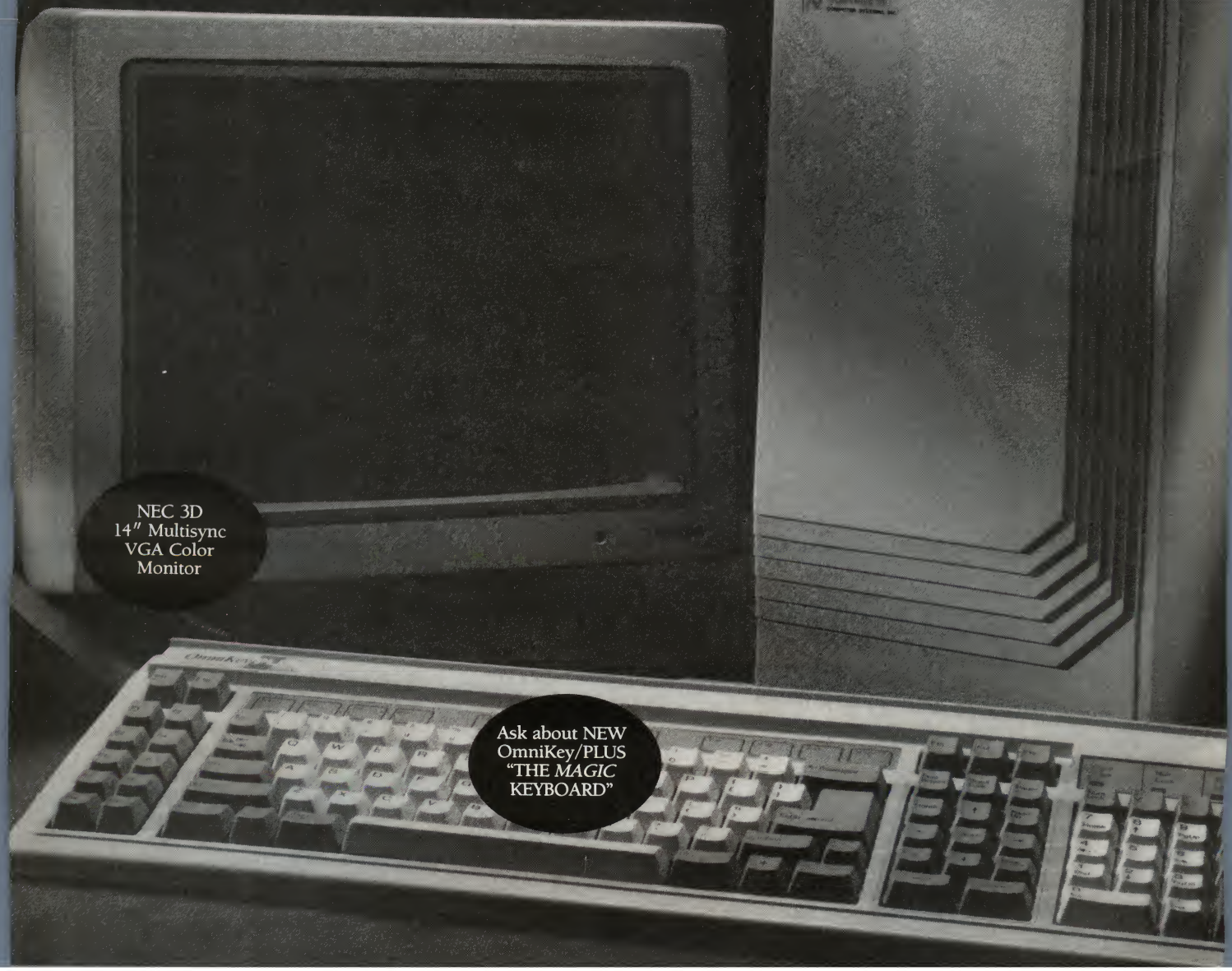

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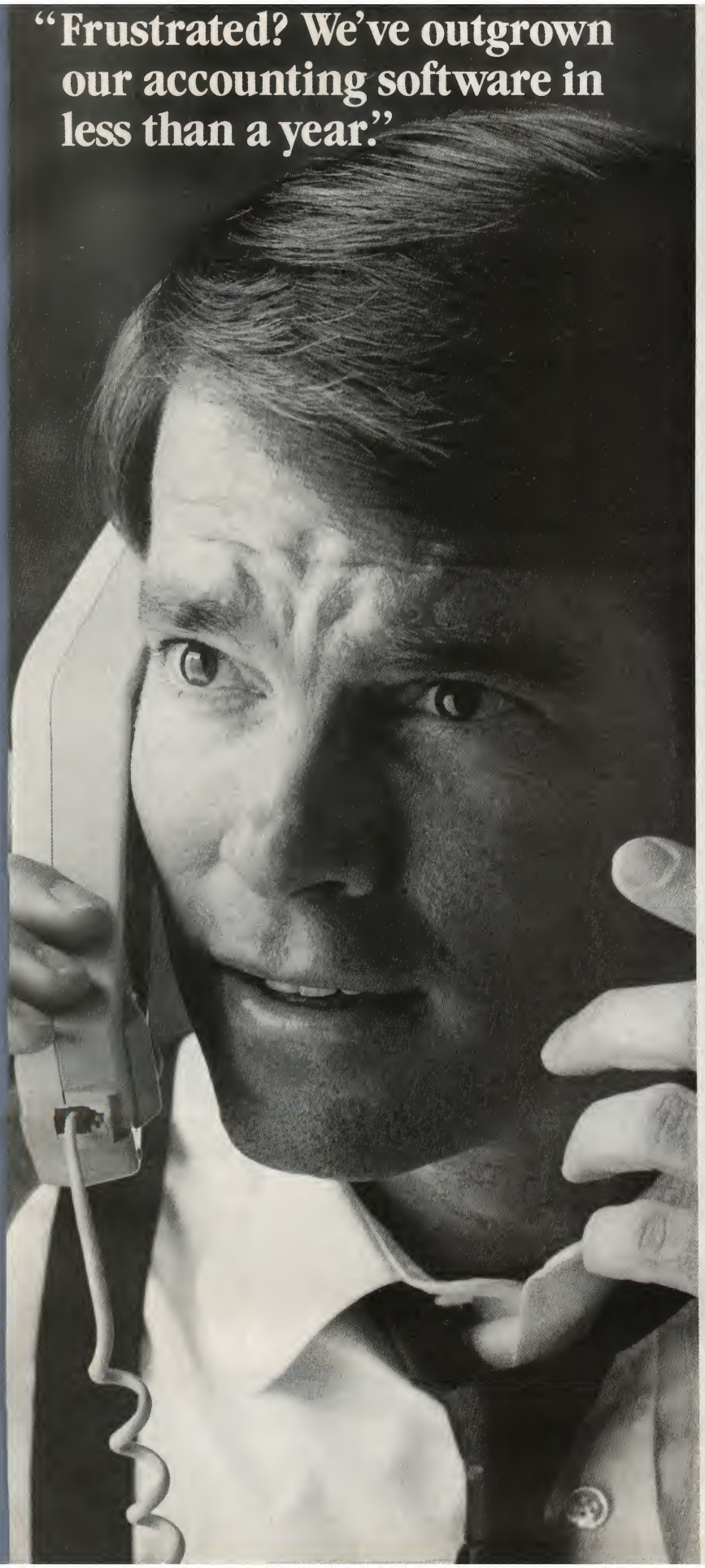
```
.wu3:       mov         ah,01h                  ; check for keyboard input
            pushf
            call        [i_BIOS_kb]             ; int      16h
            jz          .wu4                    ; if none
            xor         ax,ax                   ; read that input
            pushf
            call        [i_BIOS_kb]             ; int      16h
            cmp         al,1Bh                  ; Escape?
            jne         .wu4                    ; ignore anything but
            cmp         pan_state,PS_RUNNING    ; running a program?
            je          .wu2                    ; yes, skip to next command
            jmp         terminate               ; no, terminate the program

.wu4:       mov         time_out,18             ; wait another second
            ret

.wu5:       mov         si,OFFSET .wuA; "Command not valid during background operation"
            jmp         command_error

.wuA        db          'Command not valid during background operation',0
c_WaitUntil             endp

;           Wipe - clear the screen

c_Wipe      proc        near
            mov         ah,0Fh                  ; BIOS get video mode
            int         10h                     ; returns AL = display mode
            mov         ah,00h                  ; BIOS set video mode
            int         10h                     ; which incidentally clears the screen
            xor         ax,ax                   ; no continuation
            ret
c_Wipe      endp

; Procedures for handling commands while command-processing is inhibited.

;           Process any kind of IF command when processing suspended

n_If        proc        near
            inc         if_nest_level           ; one level of If/EndIf deeper
            ret
n_If        endp


; Regular commands are no-ops

n_Nop       proc        near
            ret
n_Nop       endp


;*****************************************************************************
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*                        Miscellaneous procedures                           *
;*                                                                           *
;*                                                                           *
;*                                                                           *
;*****************************************************************************

;       check_screen - checks if a given string appears at a given screen position
;
; Called with:
;           SI -> string to be sought
;           'screen_position' holding the row and column
;
; Returns:
;           CF = 0 if string is found
;           CF = 1 otherwise

check_screen            proc        near
            push        es
            mov         dx,screen_position      ; set PAN screen position
            call        set_video_address

.chs1:      cmp         BYTE PTR [si],0         ; check the next byte
            je          .chs3                   ; if null we matched the whole string!
            mov         ax,es:[di]              ; AH = attribute, AL = character code
            cmp         [si],al                 ; is character the one we want?
            jne         .chs2                   ; no, so match fails...
            inc         di                      ; yes, check next
            inc         di
            inc         si
            jmp         SHORT .chs1

.chs2:      stc                                 ; return CF set for failure

.chs3:      pop         es
            ret                     ; returns CF = 0 if match else CF = 1
check_screen            endp

;           command_error - spits out error information and quits.
;
; Called with:
;           SI -> diagnostic (null terminated string)

command_error           proc        near        ; SI -> diagnostic message
            push        si                      ; save diagnostic pointer
            cmp         pan_state,PS_LOADED     ; check the state
            jbe         .ce1                    ; if PAN is in control
            cli                                 ; else turn off interrupts

; Prepare screen for messages

.ce1:       mov         ah,0Fh                  ; BIOS get video mode
            int         10h                     ; returns AL = display mode
                                                ; convert to a suitable mode
            xor         bx,bx
            mov         bl,al
            mov         al,[bomb_Mode+bx]       ; AL = safest text mode
            mov         ah,00h                  ; BIOS set video mode
            int         10h                     ; which incidentally clears the screen

            mov         si,OFFSET ferrmsg       ; "Fatal error in PAN Command:  "
            call        ttyz
            call        reconstruct_command     ; recreate text of command
            call        ttyz                    ; and display it
            mov         si,OFFSET crlfz
            call        ttyz
            pop         si                      ; display the specific diagnostic
            call        ttyz
            cmp         pan_state,PS_LOADED     ; check the state
            ja          .ce2                    ; if PAN is not in control
            jmp         c_Quit                  ; then get out quick

.ce2:       mov         si,OFFSET bomb_msg2     ; else wait for confirmation
            call        ttyz
            xor         ax,ax                   ; wait for input
            pushf
            call        [i_BIOS_kb]             ; int      16h
            xor         ax,ax                   ; do a warm boot
            mov         ds,ax
            mov         ax,1234h
            mov         ds:[472h],ax
            db          0EAh                    ; JMP FFFF:0000
            dw          0000h, 0FFFFh

bomb_Mode   db          0,1,2,3,0,0,0,7,0,0, 0,11,12, 2, 2, 2, 2, 2, 7, 2
;                                   0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19
bomb_msg2   db          CR,LF,'Press the [Space Bar] to reboot.',0
ferrmsg                 db          'Fatal error in PAN command:',CR,LF,0
command_error           endp

;           compare_strings
;
; Called with:
;           SI and DI -> strings to be compared
;           CX = length
;
; Returns:
;           CX, SI and DI unchanged
;           flags:  see CMPS instruction

compare_strings         proc        near
            push        si
            push        di
            push        cx
            repe        cmpsb
            pop         cx
            pop         di
            pop         si
            ret
compare_strings         endp

;           Copy a null-terminated string.
;
; Called with:
;           SI -> source string (null terminated)
;           DI -> destination
;
; Returns:
;           SI = garbage
;           DI -> null at end of the copy

copyz       proc        near

.cz1:       lodsb                               ; copy each byte including the null
            stosb
            test        al,al
            jnz         .cz1                    ; continue until null
            dec         di                      ; DI -> null at end of copied string
            ret
copyz       endp

;           Copy a delimited terminated string to 'line_buffer'.
;
; Called with:
;           SI -> "string"
;
; Returns:
;           SI -> copy
;           DI = garbage

copy_string             proc        near
            mov         di,OFFSET line_buffer; DI -> standard destination
            push        di
            lodsb                               ; AL = delimiter
            mov         ah,al                   ; keep in AH

.cs1:       lodsb                               ; AL = next character
            test        al,al                   ; allow missing closing delimiter
            jz          .cs3                    ; if end of string
            cmp         al,ah                   ; delimiter?
            jz          .cs3
            stosb
            jmp         SHORT .cs1

.cs3:       xor         ax,ax                   ; store null terminator
            stosb
            pop         si                      ; SI -> line_buffer
            ret                     ; returns SI -> copied string
copy_string endp

;           decode a decimal number
;
; Called with:
;           SI -> numeric string
;
; Returns:
;           SI -> first non-numeric character in string
;           AX = decoded value

decode_decimal          proc        near
            xor         bx,bx                   ; decode value into bx
            mov         cx,10                   ; CL = 10, keep sign indication in CH
            cmp         BYTE PTR [si],'+'       ; initial + or - is allowed
            je          .dec0
            cmp         BYTE PTR [si],'-'
            jne         .dec1
            inc         ch

.dec0:      inc         si                      ; push SI past sign

.dec1:      lodsb                               ; AL = next character
            sub         al,'0'                  ; check if it's a digit
            jl          .dec2
```



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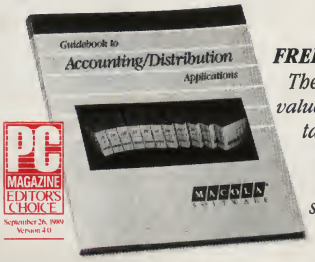

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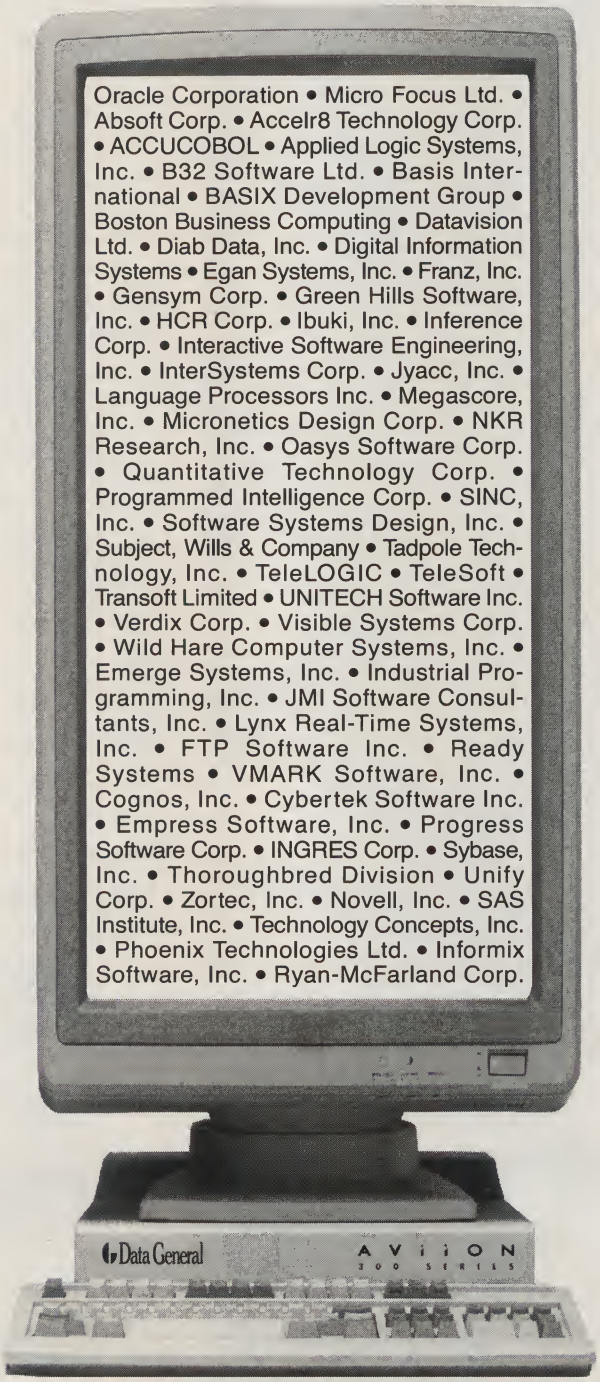

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PAN.ASM 7 of 10

```
        cmp     al,9
        jg      .dec2
        xchg    ax,bx                   ; AX = cumulative total
        mul     cl                      ; multiply by ten
        add     bx,ax                   ; and add in the new digit
        jmp     .dec1

.dec2:  mov     ax,bx                   ; AX = decoded value for return
        test    ch,ch                   ; + or -
        jz      .dec3                   ; if +
        neg     ax                      ; if - then negate it

.dec3:  dec     si                      ; back up SI to first non-digit
        ret
decode_decimal  endp

;       decode a hex number
;
; Called with:
;       SI -> numeric string
;
; Returns:
;       SI -> first non-numeric character in string
;       AX = decoded value

decode_hex proc         near
        xor     bx,bx                   ; put decoded value in bx

.hex1:  lodsb                           ; AL = next character
        cmp     al,'0'                  ; check if it's a hexit
        jl      .hex2
        cmp     al,'9'
        jg      .hex2
        sub     al,'0'

.hex0:  mov     cl,4                    ; multiply result so far by 16
        shl     bx,cl
        add     bx,ax                   ; and add in the new hexit
        jmp     .hex1

.hex2:  call    isletter
        jc      .hex3                   ; if not a letter
        cmp     al,'G'
        jae     .hex3
        sub     al,'A'-10
        jmp     .hex0

.hex3:  mov     ax,bx                   ; set result in AX
        dec     si                      ; point SI to terminator
        ret
decode_hex endp

;       delay - pause for a given count of clock ticks.
;
; Called with:
;       CX = number of 18.2-to-a-second ticks

CLOCK   =       46Ch                    ; low-memory timer word
delay   proc    near
        push    es                      ; get ES = 0
        xor     ax,ax
        mov     es,ax
        mov     ax,es:[CLOCK]           ; AX = current clock value

.del1:  cmp     ax,es:[CLOCK]           ; count down changes in the clock
        je      .del1
        mov     ax,es:[CLOCK]
        loop    .del1

        pop     es
        ret
delay   endp

;       display_string          - display a null-terminated string on the screen.
;
; Called with:
;       DX = screen position
;       BL = video attribute
;       SI -> string

display_string  proc    near; DX = screen position, BL = video attribute
        push    es
        call    set_video_address       ; get ES:DI -> video buffer
        mov     ah,bl                   ; AH = attribute

.ds1:   lodsb                           ; AL = next character from string
        test    al,al                   ; ends at a null
        jz      .ds2
        stosw                           ; pop into video memory
        jmp     SHORT .ds1

.ds2:   pop     es
        ret
display_string  endp

;       get_screen_position - decode a row-column spec.  Note that the row and
;                             column numbers are counted from zero, and are
;                             deliberately not checked for validity.
; Called with:
;       SI -> "<row> <column>"
;
; Stores the result in 'screen_position'.

get_screen_position  proc       near
        call    decode_decimal          ; decode row number
        mov     n_row,al
        call    skip_whitespace         ; skip separator
        call    decode_decimal          ; decode column number
        mov     n_col,al
        ret
get_screen_position  endp

;       get_script - determines the script-file name from the command-line
;                    argument, loads and preprocesses the file.
;
; On return:
;       AX = number of bytes read

get_script proc         near
        mov     si,80h                  ; SI -> command line
        xor     ax,ax                   ; first character holds the lebgth
        lodsb
        mov     bx,ax                   ; AX = BX = character count
        mov     [si+bx],ah              ; replace terminator with null
        call    skip_whitespace         ; skip any spaces
        mov     dx,OFFSET .gsB          ; "ERROR:  No script file specified"
        jz      .gs6                    ; if no filename given
        mov     dx,si                   ; DX -> filename
        xor     ax,ax

.gs1:   lodsb                           ; see if name includes an extension
        cmp     al,'.'                  ; that is a period
        jne     .gs2
        mov     ah,al                   ; note period in AH

.gs2:   cmp     al,' '                  ; take any control character as the end
        ja      .gs1                    ; this is chancy but...

        cmp     ah,'.'
        je      .gs3                    ; if an extension was given
        mov     di,si                   ; else append the default
        dec     di
        mov     si,OFFSET pan_extension
        mov     cx,5                    ; which is 5 characters long with null
        rep     movsb

.gs3:   mov     ax,3D00h                ; open the command file
        int     21h
        mov     dx,OFFSET .gsC
        jc      .gs7                    ; if open returned an error
        mov     file_handle,ax          ; else save the handle
        call    load_script             ; load the script from the file
        jc      .gs7                    ; if there was something wrong with it
        mov     ah,3Eh                  ; DOS close file
        mov     bx,file_handle
        int     21h
        cmp     if_nest_level,0
        jnz     .gs4                    ; if Ifs and EndIfs don't match
        mov     ax,di                   ; return size of script
        sub     ax,OFFSET script_buffer
        clc
        ret

.gs4:   mov     dx,OFFSET .gsD          ; complain

.gs6:   stc

.gs7:   ret

.gsB    db      'PAN Error:  No script file specified$'
.gsC    db      'PAN Error:  Cannot find script file$'
.gsD    db      "PAN Error:  Unbalanced Ifs and EndIfs$"
get_script endp

;       is_digit - checks if character is an ASCII-coded digit
;
; Called with:
;       AL = character
;
; Returns:
;       CF = 0 if character is a digit ('0' - '9')
;       CF = 1 otherwise

is_digit  proc  near
        cmp     al,'0'                  ; is it a numeric ASCII code?
        jb      .id1
        cmp     al,'9'
        ja      .id1
        clc
        ret

.id1:   stc
        ret
is_digit  endp

;       isletter - check and fold a letter
;
; Called with:
;       al = ASCII code
;
; Returns:
;       CF = 0 if AL contains a letter
;          1 otherwise
;       AL = ASCII code, folded to uppercase if letter

isletter  proc  near
        cmp     al,'A'
        jb      .let1
        cmp     al,'Z'
        jbe     .let2
        cmp     al,'a'
        jb      .let1
        cmp     al,'z'
        ja      .let1

.let2:  and     al,0DFh                 ; fold
        ret

.let1:  stc
        ret
isletter  endp

;       loader - attempt to load a target program given a filename.
;
; Called with:
;       SI -> program filename

loader  proc    near
        call    normalize               ; copy filename and arguments
        mov     ax,4B01h                ; DOS Load Program and Return function
        mov     bx,OFFSET parameter_block; BX -> parameter block
        mov     dx,si                   ; DX -> filename
        int     21h                     ; returns in child context
        jc      .load1                  ;     unless load attempt failed
```

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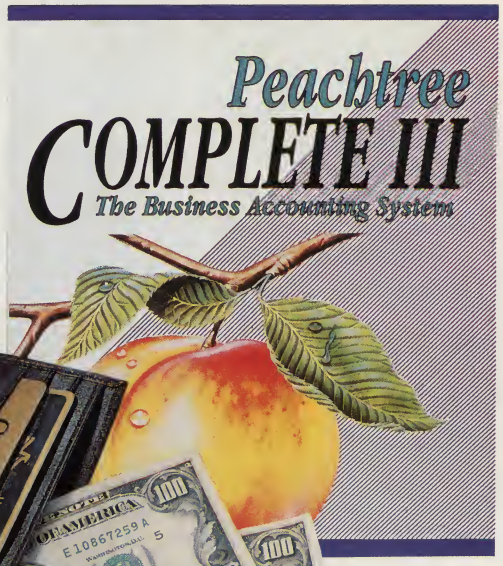

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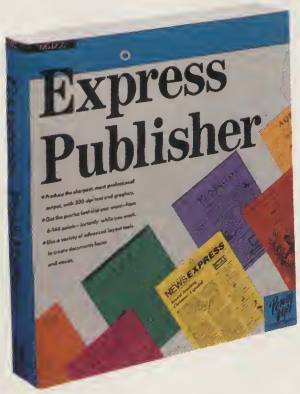

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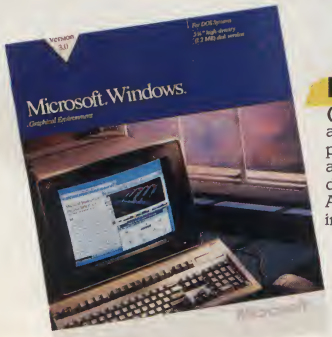

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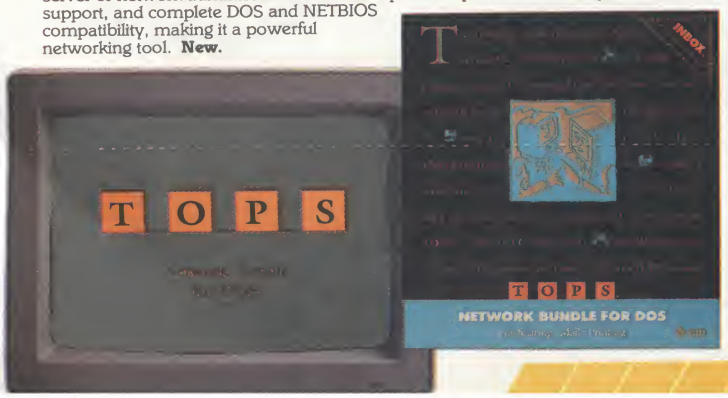

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```
            mov         child_size,bx           ; save size of program
            mov         ah,51h                  ; DOS get PSP address
            int         21h                     ; returns BX = segment of PSP
            mov         child_psp,bx            ; save that
            mov         al,50h                  ; DOS set PSP address
            mov         bx,cs                   ; set process back to us
            int         21h
            mov         pan_state,PS_LOADED     ; set state to PS_LOADED
            clc

.load1:     ret
loader      endp

;           load_script - loads the script from a given opened file.
;
; Called with:
;           'file_handle' containing the handle of the file.
;
; Returns:
;           CF = 0 if script was loaded succesfully
;           CF = 1 if an error occurred

load_script             proc        near
            mov         di,OFFSET script_buffer

.ls1:       mov         bx,file_handle
            call        read_line               ; read one line = one command
            jc          .ls3                    ; on EOF
            call        skip_whitespace         ; skip any initial blanks
            test        al,al                   ; blank line?
            jz          .ls1                    ; yes, ignore it
            cmp         al,';'                  ; comment line?
            je          .ls1                    ; yes, ignore it
            mov         bx,OFFSET command_keys; identify the command
            call        match_key               ; returns AL = command index if valid
            jnz         .ls4                    ; if it's invalid
            push        di                      ; save pointer to start of command
            inc         di                      ; reserve a byte for command length
            stosb                               ; store command index
            call        skip_whitespace         ; skip any blanks after command

.ls2:       lodsb                               ; copy the rest of the line
            stosb
            test        al,al                   ; including the null terminator
            jnz         .ls2
            pop         bx                      ; BX -> start of command
            mov         ax,di                   ; AX -> end of command
            sub         ax,bx                   ; AX = length of command
            mov         [bx],al                 ; store that

; Do If/EndIf checking

            xor         ax,ax
            inc         bx
            mov         al,[bx]                 ; AX = command index
            push        ax
            mul         command_entry_size
            mov         bx,ax                   ; BX = offset of command table entry
            xor         ax,ax                   ; get AX = the command type
            mov         al,BYTE PTR [command_table+PC_TYPE+bx]
            mov         bx,ax
            pop         ax                      ; call preprocessor with AX = index
            call        [preprocessing_table+bx]
            jnc         .ls1                    ; if no error
            ret                                 ; else return with CF set

.ls3:       xor         ax,ax                   ; zero-length command at end of script
            stosw
            ret

.ls4:       call        ttyz                    ; display the offending line
            mov         dx,OFFSET .lsA          ; DX -> "Invalid command"
            stc
            ret

.lsA        db          CR,LF,'PAN Error:  Invalid command.$'
load_script             endp

; Procedures for preprocessing commands:

pp_regular proc         near        ; for regular commands there is nothing to do
            cmp         al,LABEL_INDEX          ; unless this was a label command
            jne         .ppr1
            mov         al,3                    ; store length for a SetIf
            stosb
            mov         al,SETIF_INDEX          ; insert a SetIf
            stosb
            mov         al,if_nest_level
            stosb

.ppr1:      clc
            ret
pp_regular endp

pp_If       proc        near                    ; for Ifs increment the nest level
            inc         if_nest_level
            clc
            ret
pp_If       endp

pp_Else     proc        near                    ; for Else ensure it's in an If block
            cmp         if_nest_level,0
            jnz         .ppe1
            mov         dx,OFFSET .ppeA         ; complain about misplaced Else
            stc

.ppe1:      ret

.ppeA       db          "PAN Error:  'Else' command not in If/EndIf clause$"
pp_Else     endp

pp_EndIf    proc        near        ; For EndIf decrement the nest level
            cmp         if_nest_level,0
            jnz         .ppf1
            mov         dx,OFFSET .ppfA         ; complain about dangling EndIf
            stc
            ret

.ppf1:      dec         if_nest_level
            clc
            ret

.ppfA       db          "Error:  EndIf found with no matching If$"
pp_EndIf    endp

;           match_key - match a string to a set of keys.  The comparison is for
;                       letters only and is case insensitive.
;
; Called with:
;           BX -> list of keys
;           SI -> string to be matched
;
; Returns:
;           If match made:  ZR = 1 and AX = index of the key
;           Else:  ZR = 0

match_key   proc        near
            push        di
            call        skip_whitespace         ; skip any leading blanks
            mov         di,si                   ; SI, DI -> first non-white char
            xor         cx,cx                   ; count keys in CX

.mat1:      mov         si,di                   ; SI -> target of match

.mat2:      mov         ah,[bx]                 ; AH = character to compare against
            inc         bx                      ; bump the pointer
            test        ah,ah                   ; check for end of key
            jz          .mat4                   ; we got a match
            lodsb                               ; AL = next character of string
            cmp         al,' '                  ; match up to blank or control char
            jbe         .mat3
            cmp         al,ah                   ; do the real comparison
            je          .mat2                   ; if they match then keep trying
            xor         al,20h                  ; else switch case of string char
            cmp         al,ah                   ; and compare that way
            je          .mat2

.mat3:      cmp         BYTE PTR [bx],0         ; push BX to end of current key
            pushf
            inc         bx
            popf
            jnz         .mat3
            inc         cx                      ; increment key counter
            cmp         BYTE PTR [bx],0         ; have we tried all keys?
            jnz         .mat1                   ; no, try next

.mat35:     mov         si,di                   ; no match, return SI as it was
            inc         cx                      ; just to ensure that ZR = 0
            pop         di
            ret                         ; no match:  return ZR = 0, SI as on entry

.mat4:      lodsb                               ; AL = next character of string
            cmp         al,' '                  ; it should be blank or control char
            ja          .mat35
            dec         si
            xor         ax,ax                   ; set ZR
            mov         ax,cx                   ; AX = key number
            pop         di
            ret                         ; match: return ZR = 1, AX = key number
match_key   endp                        ;                       and SI -> character past key

;           normalize - normalize translates a string containing control characters
;                       in the form '^X' while copying it to line_buffer.
;
; Called with:
;           SI -> delimited string
;
; Returns:
;           SI -> normalized string in 'line_buffer'
;           DI -> end of normalized string
;           CX = length

normalize   proc        near
            mov         di,OFFSET line_buffer
            push        di
            xor         ax,ax
            lodsb                               ; AL = delimiter
            or          ah,al                   ; keep in AH
            jz          .nor3                   ; if no argument

.nor1:      lodsb                               ; AL = next character
            test        al,al
            jz          .nor3                   ; if end of input
            cmp         al,ah                   ; end of delimited string?
            je          .nor3
            cmp         al,' '
            jb          .nor1                   ; ignore "real" control characters
            cmp         al,'^'
            jne         .nor2
            lodsb
            cmp         al,'^'                  ; ^^ means ^
            je          .nor2
            and         al,1Fh                  ; make a control

.nor2:      stosb                               ; and store into string
            jmp         SHORT .nor1

.nor3:      xor         ax,ax                   ; store null terminator
            stosb
            pop         si                      ; SI -> line_buffer
            mov         cx,di                   ; calculate new length
            sub         cx,si
            ret                         ; returns SI -> normalized string, CX = length
                                        ;         DI -> end of normalized string
normalize endp

;           read_line - read one line from a file into line_buffer.
;
; Called with:
;           BX = file handle
;
; Returns:
;           If data read then:  CF = 0, SI -> line, CX = length
;           Else CF = 1 (implies end-of-file)

read_line   proc        near
            mov         si,OFFSET line_buffer; SI -> line_buffer
            mov         cx,1                    ; read one byte at a time
```

```
.re1:       mov     ah,3Fh                  ; DOS read function
            mov     dx,si                   ; DS:DX -> buffer
            int     21H
            jc      .re5                    ; if read error
            test    ax,ax
            jz      .re4                    ; if EOF
            mov     al,[si]                 ; AL = byte just read
            cmp     al,' '                  ; control character?
            jb      .re2                    ; if so
            inc     si                      ; else bump buffer pointer
            cmp     si,OFFSET line_buffer+127; and check for overflow
            jb      .re1                    ; handle over-long lines ungracefully:

.re3:       xor     ax,ax                   ; null terminate the line
            mov     [si],al
            mov     CX,si                   ; calculate its length
            mov     si,OFFSET line_buffer; SI -> line_buffer
            sub     cx,si                   ; CX = line length
            clc
            ret                     ; return with CF zero and SI -> input, CX = length

.re2:       cmp     al,CR                   ; check for CR
            jne     .re1                    ; and discard other control characters
            jmp     SHORT .re3              ; end the line on CR

.re4:       cmp     si,OFFSET line_buffer; accept a last line with no CR
            jne     .re3

.re5:       stc
            ret                     ; EOF or read error, return with CF set
read_line   endp

;           reconstruct_command - reconstruct the text form of the current
;                                         command.
;
; Returns:
;           SI -> command key

reconstruct_command  proc       near
            mov     di,OFFSET line_buffer; reconstruction done here
            push    di                      ; save a copy for later
            mov     si,current_command      ; SI -> internal form of command
            xor     ax,ax                   ; get AX = command index
            lodsb
            mul     command_entry_size      ; calculate AX = offset of entry
            push    si
            mov     si,ax
            mov     si,WORD PTR [command_table+PC_KEY+si]
            call    copyz                   ; copy null-terminated string
            mov     al,' '                  ; put in a blank
            stosb
            pop     si
            call    copyz                   ; and copy the arguments
            pop     si                      ; return SI -> reconstructed text
            ret
reconstruct_command  endp

;           resolve jumps - replace labels in Jump commands with offsets.

resolve_jumps       proc       near

.rj1:       mov     si,command_ptr          ; SI -> next command
            xor     ax,ax
            lodsb                           ; AX = command length
            test    ax,ax
            jz      .rj4                    ; at end of script
            add     command_ptr,ax          ; update the command pointer
            lodsb                           ; AX = command index
            cmp     al,JUMP_INDEX           ; is it a jump?
            jne     .rj1

            mov     di,si                   ; DI -> target label
            mov     si,OFFSET script_buffer; scan through script for label
            xor     cx,cx

.rj2:       add     si,cx                   ; SI -> next command
            xor     ax,ax
            lodsb                           ; AX = length of current command
            test    ax,ax
            jz      .rj3                    ; at end of script
            sub     ax,2
            mov     cx,ax                   ; CX = length - 2
            lodsb                           ; AX = command index
            cmp     al,LABEL_INDEX          ; is it a label?
            jne     .rj2
            call    compare_strings
            jne     .rj2
            add     si,cx                   ; SI -> next command
            mov     [di],si                 ; overwrite label in jump
            jmp     SHORT .rj1

.rj3:       mov     si,di                   ; SI -> label
            call    ttyz                    ; display the offending line
            mov     dx,OFFSET .rjA          ; DX -> "ERROR:  Label not found."
            stc

.rj4:       ret

.rjA        db      CR,LF,'PAN Error:  Label not found.$'
resolve_jumps       endp

;           restore_vector - restores a value into an interrupt vector
;
; On entry:
;           AL = vector number
;           DS:BX = address at old vector is stored
;
; Destroys AX.

restore_vector      proc       near
            push    si
            push    es
            xor     ah,ah                   ; calculate offset of vector
            shl     ax,1                    ;     = number * 4
            shl     ax,1
            mov     si,ax                   ; SI = offset of vector
            xor     ax,ax
            mov     es,ax                   ; ES:SI -> vector
            pushf
            cli                             ; interrupts off during switch
            mov     ax,[bx]                 ; move in the saved value
            mov     es:[si],ax
            mov     ax,[bx+2]
            mov     es:[si+2],ax
            popf
            pop     es
            pop     si
            ret
restore_vector      endp

;           run_it - transfer control to child program.

run_it      proc    near
            mov     ax,5000h                ; DOS set PSP address
            mov     bx,child_psp            ; BX = PSP of loaded program
            int     21h
            cli
            mov     pan_sp,sp  ; save own SP
            mov     ss,child_ss             ; set child's stack
            mov     sp,child_sp
            sti

            pop     ax                      ; dump original drive valid flag
            mov     ax,cx                   ; set real drive valid flag
            push    child_cs                ; set stack to "return" to child
            push    child_ip

            mov     es,child_psp
            mov     ds,child_psp            ; DS = ES = child PSP

            mov     WORD PTR es:[000AH],OFFSET child_return

            xor     bx,bx
            xor     dx,dx
            xor     bp,bp
            xor     si,si
            xor     di,di
            mov     cs:in_pan_flag,bl       ; clear in-Pan flag
            retf                    ; Note that we are in a NEAR procedure

child_return:                       ; returns in PAN context except DS = ???
                                    ; SP restored from Load operation not from Go
            mov     ax,cs                   ; make sure DS and ES are set
            mov     ds,ax
            mov     es,ax
            mov     sp,pan_sp               ; restore SP saved just above
            call    unset_traps             ; should this be here ??? ***
            mov     al,pan_state            ; check state while resetting it
            cmp     al,PS_QBIT              ; waiting for this?
            je      .cr1                    ; yes, continue
            mov     pan_state,PS_QUIT       ; set state so death can occur and
            jmp     c_Quit                  ;    quit if chump did not wait for die

.cr1:       mov     pan_state,PS_INITIAL ; revert to initial state
            xor     ax,ax
            ret
run_it      endp

;           set_traps - capture the timer and BIOS-keyboard-function interrupts.

set_traps   proc    near
            mov     dx,OFFSET timer_intercept; replace timer interrupt
            mov     al,8h
            mov     bx,OFFSET i_timer
            call    set_vector

            mov     dx,OFFSET BIOS_kb_intercept; replace BIOS-kb interrupt
            mov     al,16h
            mov     bx,OFFSET i_BIOS_kb
            call    set_vector
            ret
set_traps   endp

;           set_vector - copies the contents of an interrupt vector then stores
;                        a new value in the vector.
;
; On entry:
;           AL = vector number
;           DS:DX = new address for interrupt vector
;           DS:BX = address at which to store old vector
;
; Destroys AX and BX.

set_vector proc     near
            push    si
            push    es
            xor     ah,ah                   ; calculate offset of vector
            shl     ax,1                    ;     = number * 4
            shl     ax,1
            mov     si,ax                   ; SI = offset of vector
            xor     ax,ax
            mov     es,ax                   ; ES:SI -> vector
            pushf
            cli                             ; interrupts off during switch
            mov     ax,es:[si]              ; move out the old
            mov     [bx],ax
            mov     ax,es:[si+2]
            mov     [bx+2],ax
            mov     es:[si],dx              ; move in the new
            mov     ax,ds
            mov     es:[si+2],ax
            popf
            pop     es
            pop     si
            ret
set_vector endp

;           set_video_address - set the video address corresponding to a given
;                                   row and column.
;
; Called with:
;           DX = screen position (DH = row, DL = column)
;
; Returns:
;           ES:DI -> corresponding word in video buffer memory

set_video_address   proc       near         ; DX = screen position
            mov     ax,video_segment
            mov     es,ax
            xor     di,di                   ; ES:DI -> start of video buffer
```

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CIRCLE 145 ON READER SERVICE CARD

PAN.ASM 10 of 10

```
        mov     al,dh                   ; DH = row number
        mul     screen_columns
        xor     dh,dh
        add     ax,dx
        add     di,ax
        add     di,ax
        ret                     ; returns ES:DI -> word in video buffer
set_video_address       endp

;       skip_whitespace - skip blanks and tabs in a string.
;
; Called with:
;       SI -> string
;
; Returns:
;       SI -> first character that is neither a blank nor a tab
;       AL = that character

skip_whitespace         proc    near

.sw1:   lodsb
        cmp     al,' '
        je      .sw1
        cmp     al,09h                  ; check for TAB
        je      .sw1
        dec     si
        test    al,al
        ret     ; returns SI -> first non-white char, AL = said char
skip_whitespace         endp    ;       and ZR = 1 if character is a null

;       stuff_keys - stuff keycodes into the BIOS keyboard buffer.

stuff_keys proc         near
        pushf                           ; save interrupt flag
        push    es
        mov     es,kbb_segment          ; ES = keyboard-buffer segment
        cli                             ; no interrupts while poking key buffer

.sk0:   mov     bx,es:[KBB_TAIL]        ; get tail
        mov     di,bx                   ; and copy
        inc     bx                      ; bump tail pointer
        inc     bx
        cmp     bx,es:[KBB_END]
        jne     .sk1
        mov     bx,es:[KBB_START]       ; if wrapped around

.sk1:   cmp     bx,es:[KBB_HEAD]        ; any room in buffer
        mov     ax,1                    ; for timeout
        je      .sk3                    ; if not...

        pop     es
        mov     si,kiq_first            ; SI -> string of key codes
        call    translate               ; translate next character
        mov     kiq_first,si            ; update pointer
        push    es
        jc      .sk4                    ; if at end of string
        mov     es,kbb_segment          ; ES = keyboard-buffer segment
        stosw                           ; store scan code and ASCII to KBB
        mov     es:[KBB_TAIL],bx        ; update tail

        mov     ax,type_rate            ; AX = inter-key delay (in ticks)
        test    ax,ax
        jz      .sk0                    ; if zero just continue

.sk3:   mov     time_out,ax             ; set new timeout

.sk4:   pop     es
        popf
        ret
stuff_keys endp

;       terminate - terminate the current program.

terminate proc          near
        mov     ax,4C00h                ; DOS terminate a program
        int     21h
terminate endp

;       translate - translates a character in keyboard format
;
; Called with:
;       SI -> string of encoded key symbols
;
; Returns:
;       CF = 0 if character available, and
;               AX = key code suitable for insertion into BIOS keyboard buffer
;               DL = shift status for character
;       CF = 1 if end-of-string

translate proc          near    ; SI -> key spec
        push    bx                      ; save all registers but those
        push    cx                      ;    used to return stuff
        push    di

.tra1:  xor     dx,dx                   ; prepare DL to hold shift information

; We start by checking for a caret which is usually a Ctrl-shift indicator

.tra2:  cmp     [si],BYTE PTR '^'       ; Ctrl-shifted character?
        jne     .tra3
        inc     si
        cmp     [si],BYTE PTR '^'       ; doubled?
        je      .tra8                   ; send character
        or      dl,04h                  ; set "Ctrl key is down" bit in status

.tra3:  cmp     [si],BYTE PTR '['       ; special-key delimiter?
        jne     .tra8
        inc     si                      ; push pointer past \
        cmp     [si],BYTE PTR '['       ; doubled?
        je      .tra8                   ; '[[' means '['
        mov     bx,si                   ; save pointer to '['

.tra4:  lodsb                           ; search for closing ']'
        test    al,al                   ; or end of string
        jz      .tra6                   ; if no closing ']'
        cmp     al,']'
        jne     .tra4
        dec     si
        mov     BYTE PTR [si],0         ; replace the ']' with a null
        mov     si,bx                   ; SI -> keyname
        mov     bx,OFFSET shiftname_list; check the list of shift-key names
        call    match_key               ; look it up
        jne     .tra5                   ; if no match
        inc     si                      ; push SI past the null
        mov     bx,ax
        or      dl,[shiftbits+bx]       ; or bit for shift key into DL
        jmp     SHORT .tra2

.tra5:  mov     bx,OFFSET keyname_list; try other named keys
        call    match_key               ; look it up
        jne     .tra6                   ; if no match
        inc     si                      ; push SI past the null
        mov     bx,ax
        mov     ah,[key_scans+bx]       ; AH = scan code
        xor     al,al                   ; AL = zero
        jmp     SHORT .tra9

.tra6:  mov     al,[si]                 ; AL = character following '['
        call    is_digit                ; only valid thing now is a decimal
        jc      .tra8                   ;    code of exactly three digits
        xor     ax,ax
        call    decode_decimal          ; decode the code
        cmp     BYTE PTR [si],']'
        stc
        jne     .tra12
        inc     si                      ; push SI past ']'
        test    al,al
        jz      .tra1                   ; zero is invalid
        test    ah,ah
        jz      .tra11                  ; accept only codes between 1 and 127

.tra7:  jmp     .tra1                   ; need a long jump here

.tra8:  xor     ax,ax                   ; load and return literal ASCII
        lodsb
        test    al,al                   ; test for end of string
        stc                             ; at end we return with CF set
        jz      .tra12
        js      .tra11                  ; if extended ASCII (no scan code)
        mov     bx,ax
        mov     ah,[scan+bx]            ; AH = scan code
        xor     bx,bx                   ; check if we need to add a Shift
        mov     bl,ah
        add     bx,bx
        add     bx,OFFSET No_shift
        cmp     [bx],al
        je      .tra9                   ; if char matches without a Shift
        or      dl,02h                  ; assume a Left Shift

; Convert ASCII and scan codes according to shifts

.tra9:  test    dl,08h                  ; Alt takes precedence
        mov     bx,OFFSET Alt_shift
        jnz     .tra10
        test    dl,04h                  ; Ctrl is next
        mov     bx,OFFSET Ctrl_shift
        jnz     .tra10
        test    dl,03h                  ; Shift is lowest
        mov     bx,OFFSET Shift_shift
        jnz     .tra10
        mov     bx,OFFSET No_shift

.tra10: xchg    al,ah                   ; get scan code in AL
        xor     ah,ah
        add     ax,ax                   ; convert to word index
        add     bx,ax                   ; BX -> entry in shift table
        mov     ax,[bx]                 ; load revised codes
        test    ax,ax                   ; zero entry means key combination
        jz      .tra7                   ;    generates nothing

.tra11: clc                             ; return character and CF = 0

.tra12: pop     di
        pop     cx
        pop     bx
        ret
translate endp

;       ttyz - display a null-terminated string at the cursor using the BIOS.
;
; Called with:
;       SI -> string

ttyz    proc    near
        xor     bx,bx                   ; assume page 0

.tz1:                                   ; do it one character at a time
        lodsb
        test    al,al
        jz      .tz2
        mov     ah,0Eh                  ; using the BIOS
        int     10h
        jmp     SHORT .tz1

.tz2:   ret
ttyz    endp

;       unset_traps - remove traps set by set_traps.

unset_traps     proc    near
        mov     ax,x_timer_offset       ; were traps set?
        or      ax,x_timer_segment
        jz      .uns1                   ; skip if not
        mov     al,8h                   ; remove timer intercept
        mov     bx,OFFSET i_timer
        call    restore_vector
        mov     al,16h                  ; remove BIOS-keyboard intercept
        mov     bx,OFFSET i_BIOS_kb
        call    restore_vector

.uns1:  ret
unset_traps     endp

; Interrupt stack

        dw      80h DUP (0)
interrupt_stack LABEL   WORD            ; stack used within interrupts

script_buffer   db      0               ; script loaded starting here
code    ends
        end     start
```

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a. Your Personal Information

Requested Line of Credit $ _____

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Present Address _____ Street Apt. # City State Zip

Social Security Number _____ ( ) Home Phone

Date of Residence _____ Month Year **Monthly Payment** $ _____ ☐ Buy ☐ Rent ☐ Other

Previous Address _____

Dates of Residence _____ From To

Your Employer _____
(If self-employed, see rear panel.)

Date of Employment _____ Mo. Yr. **Position** _____

Monthly Income _____ Gross $ Net $

Employer's Address _____ Street

City State Zip ( ) Business Phone

Previous Employer _____ **Address** _____

Dates of Employment _____ From To

Other Income _____ I have received since (Date) _____
Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as a basis for repaying this obligation.

Monthly Income _____ Gross $ Net $

Name and Address of Nearest Relative Not Living With You _____

Relationship _____

b. Credit Information

Include joint information, if joint account requested.

Bank Account _____ Bank Name ☐ Checking ☐ Savings

Address _____

Bank Account _____ Bank Name ☐ Checking ☐ Savings

Address _____

Bank Loan Reference _____ Bank Name Address

Payment _____ Balance _____

Bank Card Reference _____ Bank Name Address

☐ VISA ☐ Mastercard Payment _____ Balance _____

(please check appropriate box):

☐ **Joint Credit** with another person. Complete all information.
☐ **Individual Credit** but rely on income or assets of another person as a basis for repaying the credit requested. Complete all information
☐ **Individual Credit** Complete sections "a" and "b" only.

Please complete all appropriate sections, *providing at least two years' residence and employment history.* This will enable your information to be processed as quickly as possible. If you are self-employed, please be sure to complete section "d" below.

Other Credit Card Reference _____ Bank Name Address

Payment _____ Balance _____

Other Credit References _____ Payment _____ Balance _____

Account No. _____ Expires _____

Driver's License No. _____ State _____ Expires _____

c. Joint Personal Information

Joint Name _____ First Initial Last

Date of Birth _____ Mo. Day Yr. **Social Security Number** _____

Address _____ Street Apt. #

City State Zip

Date of Residence _____ Mo. Yr. **Home Phone** ( )

Employer _____

Date of Employment _____ Mo. Yr. **Position** _____

Monthly Income _____ Gross $ Net $

Employer's Address _____ Street

City State Zip ( ) Business Phone

d. Self-Employed Information

Complete this section only if you are self employed.

Business Name _____

Business Address _____

☐ Proprietorship ☐ Corporation ☐ Partnership **Business Phone** ( )

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Your Position _____ **In Business Since** _____

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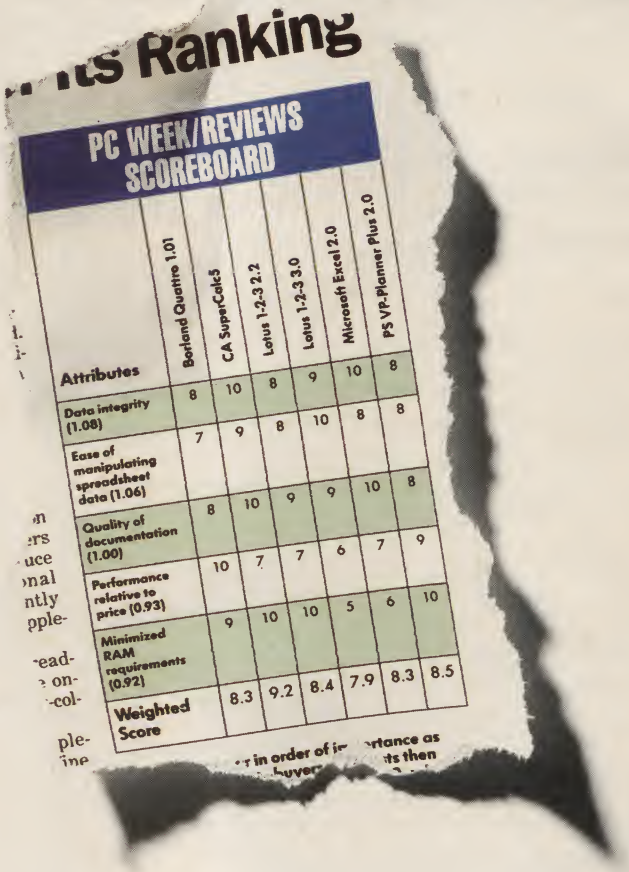
CIRCLE 115 ON READER SERVICE CARD

Perhaps The Best Way To Choose A Spreadsheet Is By The Numbers.



its Ranking

PC WEEK/REVIEWS SCOREBOARD

Attributes	Borland Quattro 1.01	CA SuperCalc5	Lotus 1-2-3 2.2	Lotus 1-2-3 3.0	Microsoft Excel 2.0	PS VP-Planner Plus 2.0
Data integrity (1.08)	8	10	8	9	10	8
Ease of manipulating spreadsheet data (1.06)	7	9	8	10	8	8
Quality of documentation (1.00)	8	10	9	9	10	8
Performance relative to price (0.93)	10	7	7	6	7	9
Minimized RAM requirements (0.92)	9	10	10	5	6	10
Weighted Score	8.3	9.2	8.4	7.9	8.3	8.5

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by
Charles Petzold

Environments

Why You Need to Multitask in the OS/2 Presentation Manager

I'm still amazed at how many people—even people who are seemingly technically knowledgeable—continue to downplay the advantages of multitasking under OS/2. Their attitude is commonly expressed in the statement, "People can do only one thing at a time, so who needs multitasking?"

I recently came upon a variation on this theme in a place I didn't expect it: in the pages of *Byte* magazine. *Byte* is the oldest surviving magazine devoted to small systems, and I've been a reader for 12 years. I have often found it very useful (although far less frequently in recent years).

Don Crabb's Macinations column in *Byte*'s December 1989 issue was definitely not very useful. Titled, "A Tale of Two Operating Systems," the column attempts a comparison of the Apple Macintosh System 6 with OS/2 1.1. It's certainly a good idea for an article, though the subject obviously requires more than the page and a half that *Byte* allotted it. Perhaps it needs a different author, as well.

While Crabb acknowledges that OS/2 has full preemptive multitasking (something even Mac System 7 lacks), he doesn't think it very important: "Since most people simply want to use multitasking to perform downloads or print in the background, the benefits of OS/2's multitasking are dubious. If your work really needs serious time-sliced preemptive multitasking, you should consider Unix."

My immediate reaction was: "Someone should send this guy a copy of Aldus's *PageMaker for Presentation Manager*!"

I've discussed OS/2 multitasking and multithreading in past installments of Environments, but some people still haven't quite gotten it, and it's worth yet another try. Fortunately, this time through there is a commercial application that demonstrates the advantages of multithreading more vividly than words could ever do. Aldus has done a superb job of porting *PageMaker* to Presentation Manager, and I'll use it in showing why multithreading is so important to PM applications.

■ Multiple threads are key to handling multiple tasks and banishing the dreaded hourglass icon.

PROCESSES AND THREADS

Since few people seem to attach the same meaning to the word *multitasking,* let me start by defining my terms.

Multitasking is the term used to describe an operating system that can maintain several programs in memory at the same time and switch among them quickly enough to give the appearance that they are actually running concurrently.

There are two forms of multitasking commonly used in PC operating systems and environments.

The first form is called *nonpreemptive* multitasking (also called *cooperative* multitasking). This is the type of multitasking found in *Microsoft Windows* and the Macintosh *MultiFinder*. *Windows* and *MultiFinder* are both message-driven (also called event-driven) environments. I'll discuss how this multitasking works in *Windows* because I know that program much more intimately than I do the Mac.

Several *Windows* programs can be loaded in memory at the same time. Very often these programs remain inactive until an important event—such as the user typing something at the keyboard—occurs. *Windows* then translates this event into a message that it deposits in the message queue of the appropriate *Windows* program. The program (more precisely, the window procedure for one of the program's windows) then processes this message and returns control back to *Windows*.

Multitasking in *Windows* is based on this message-driven architecture. When *Windows* sends messages to different programs, the programs often seem to be running concurrently. For example, a *Windows* clock program will run while you're typing something in a *Windows* word processor. However, if a *Windows* program receives a message and goes into an infinite loop (to take an extreme example), then the program never returns control to *Windows*. The clock, and everything else in *Windows,* will stop. This is why *Windows* is called a nonpreemptive or cooperative multitasking environment. The multitasking works only if each program acts on a message quickly and returns control to *Windows*.

Preemptive multitasking is the type of multitasking found in more-sophisticated operating systems such as Unix and OS/2 and in many minicomputer and mainframe operating systems. In this system, the operating system uses a hardware clock to switch among the various programs, saving the context of each so that it can be restored. This is classic time slicing.

OS/2's preemptive multitasking is specifically tailored for a single-user environment. For example, OS/2 gives much higher priority to the program running in the foreground session. In the PM session, the program that owns the active window gets a higher priority. OS/2 assumes that you want the program you're working with

to receive the bulk of the time slices. But if the foreground program is simply sitting there waiting for a keystroke from the user, then the program is blocked and does not receive any time slices. Background programs are then free to run.

Preemptive multitasking is obviously most important in multiuser systems, and some people were rather confused as to why it was necessary in a single-user system like OS/2. True, users like moving quickly among programs, but that can be done in *any* multitasking or task-switching environment. (A task-switcher can maintain several programs in memory but lets only one run at a time. The programs in the background are suspended.)

Yet many OS/2 users have learned to rely on specifically preemptive multitasking and find it very useful. It's certainly convenient to let a program doing some lengthy job run in the background while you move to another program.

Multithreading goes one step further than preemptive multitasking. A program running under an operating system that supports multithreading can effectively split itself into several pieces that run concurrently. These pieces are known as *threads of execution*.

Historically, multithreading has not been supported under Unix. Unix does have a *fork* function, which can split one running program into two programs (that then go on to do different things), but in practice this is more clumsy than OS/2's multithread support. In recent years, some Unix variants have picked up multithread support, however, and it appears to be gaining in popularity.

At first sight, multithreading doesn't seem to make much sense. For example, if a program has two lengthy processing jobs to do and puts these two jobs in separate threads, each thread will run at half speed. The two jobs won't get finished any faster.

But here's where it starts to make sense. If one of the two threads is interacting with the user, *that* thread, though uppermost in the user's mind, will not in fact require very much CPU time. For most of the time, the thread will be blocked, waiting for the comparatively slow-moving user to generate some input. During this time the second thread can then do its own processing, filling in the cracks between the keystrokes, so to speak.

Multithreading can be beneficial even if you're running only one program. The commercial application that best illustrates this is Aldus's *PageMaker for Presentation Manager*. By creating separate threads to perform different jobs, *PageMaker* can reduce waiting time and the attendant appearance of the infamous hourglass icon. Specifically, *PageMaker* uses separate threads for printing, screen updates, text imports, and text flows. For anyone who has used the program on the Mac or under *Windows,* it's a real eye-opener to see what *PageMaker* can do under PM.

Over the last few Environments columns, I presented a program called PRINTCAL that illustrates how to use a separate thread for printing. For reasons I'll explain below, using separate threads for long processing jobs is very important in PM programming, and multithreading is what makes PM such a powerful and time-efficient graphical interface.

You may also have heard that PCs containing more than one microprocessor are on the horizon. A multiprocessor PC can't do much for a DOS environment because under DOS there is only one execution thread for the entire system. The single thread could not be split up among multiple processors.

But for a preemptive multitasking or multithreading operating system, the different microprocessors can be allocated to different programs or to different threads in the same program. By using multithreading now, an OS/2 program can make itself ready for future OS/2 multiprocessor support. Both IBM and Microsoft have announced that multiprocessor support is a goal for a future version of OS/2.

SERIALIZATION OF USER INPUT

Although OS/2 supports preemptive multitasking, single-threaded PM programs often behave as if only nonpreemptive, cooperative multitasking were in effect. This is why *multithreading* is so important in Presentation Manager programs. Simply put, multithreading is the way that PM programs can take advantage of OS/2's preemptive multitasking.

Why do single-threaded PM programs behave as if OS/2 were merely a nonpreemptive multitasking environment like *Windows*? To understand this issue, you must understand how PM programs handle user input from the keyboard and the mouse. I'll start with the keyboard.

A Presentation Manager program gets keyboard input in the form of messages. These messages provide all the information the program needs to identify the keystroke and process it in the application.

A keyboard message is always directed to a particular window that has been created by a particular program running in the Presentation Manager session. This window is alternately called the *focus window* or the window with the *input focus*. The focus window is either the *active window* (the window that appears atop all others in PM session) or a child of the active window. A window usually indicates that it has the input focus by displaying a cursor of some sort.

The user can use the keyboard to switch the input focus among the various windows. For example, pressing Alt-Tab or Alt-Esc switches to a new active window, and therefore to a new focus window. Similarly, when a dialog box is displayed, the Tab key or the Arrow keys switch the input focus among the various child window controls (buttons, text entry fields, list boxes, and so on) in the dialog box.

Every PM program creates a message queue for the purpose of storing messages to the windows created by that program. The keyboard messages are placed in the program's message queue by Presentation Manager. Each keyboard message is addressed to the window with the input focus. The program retrieves these messages from the queue and dispatches them to the appropriate window procedure for processing.

PM also maintains its own message queue, called the *system message queue*. This message queue is used to store keyboard messages before they are placed in a program's message queue.

If you type faster than a program can process the keyboard messages, the extra keystrokes are stored in the system message queue rather than a program's message queue. The reason is simple: one of the stored keystrokes may have the effect of changing the input focus from one window to another. PM doesn't know which window is supposed to receive a particular keystroke until all previous keystrokes have been processed.

Let us suppose, for example, that you run two copies of Presentation Manager System Editor program that comes with OS/2 1.2. One of the two programs has the active window. The other will become the active window when you press Alt-Tab. Very quickly, you type "Hello", followed by Alt-Tab, followed by "World." You want the "Hello" to appear in the window

of one copy of the System Editor and "World" to appear in the other.

If PM placed all waiting keystrokes in the message queue of the program that's in the window with the current input focus, it would produce incorrect results. The word "World" would appear in the window of the first System Editor right after the Alt-Tab keystroke caused the input focus to change to the second System Editor.

For this reason, then, PM saves all the keystrokes in the system message queue. One at a time, these keystrokes are placed in a program message queue. Only when a program finishes processing a keyboard message can PM be sure which window and which program's message queue should get the next keyboard message.

Mouse messages (which include both mouse movement and button activity) are handled in a basically similar way. But unlike keyboard messages, which go to the window with the input focus, mouse messages go to the window currently under the mouse pointer.

You can use the mouse to change keyboard input focus. So let's look at a similar example involving two copies of the System Editor program. Suppose you very quickly type "Hello," click on the window of the second copy of the System Editor, and then type "World."

If PM placed the first keyboard message (the "H" of "Hello") in the message queue of the first System Editor, and placed the mouse click message in the message queue of the second System Editor—that is, the window underneath the mouse pointer—you'd be in trouble. The second System Editor would respond to the mouse click by becoming the active window, and all the keystrokes after the "H" would go to the second System Editor. Again, that's not what you want!

For this reason, then, all keyboard and mouse input must be "serialized" in the system message queue. That is, the keyboard and mouse messages must be stored in the *system* message queue in the exact order that the input events occur.

From there, PM must transfer these messages, one at a time, to the appropriate program message queue of the window that should receive the message. Only when the window finishes processing the keyboard or mouse message can PM determine which window and which message queue should get the next message.

The implications are simple: as far as keyboard and mouse messages are concerned, PM is a nonpreemptive multitasking environment. No two PM programs can be processing keyboard or mouse input at the same time.

MESSAGE QUEUE HANG-UPS

Of course, PM programs handle more than just keyboard and mouse messages. Almost everything a PM program does is in response to a message.

For example, you can use the keyboard or mouse to select an option from the program's menu. This causes the menu to place a menu-command message in the program's message queue. This message could have the result of changing the focus window. Indeed, in programs (like *Microsoft Excel*) that can display several documents in different windows, there is a

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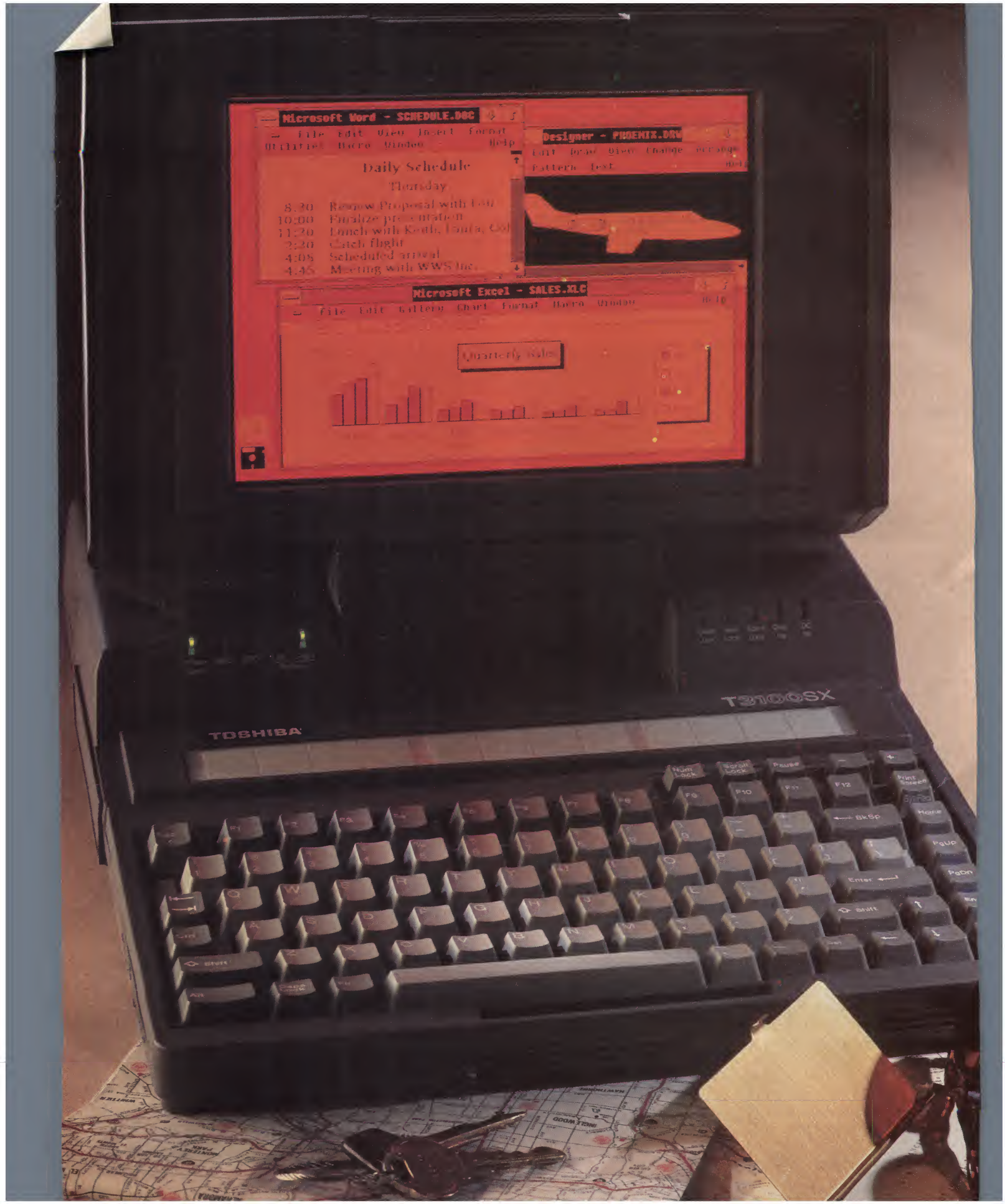
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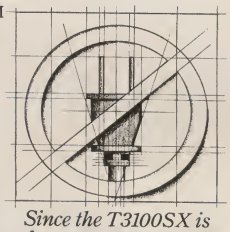

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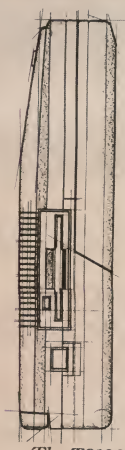

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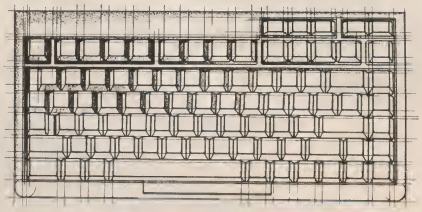

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menu option specifically intended to change the focus window.

This means that the Presentation Manager cannot transfer a keyboard or mouse message from the system message queue to a program message queue until a program has finished processing a menu-command message from its menu. Again, PM must behave as if it were a nonpreemptive multitasker.

Let's suppose one of the menu options is to print a document from the program. The document might comprise many pages of complex text and graphics, which the program requires several minutes to prepare for printing. During that time, no PM program can receive keyboard or mouse input.

The result? The program has effectively shut down operation of Presentation Manager until it has finished printing. PM will appear to be entirely unresponsive to user input. You can't switch to another program in the PM session because switching to another program requires keyboard or mouse input.

To indicate that the program is spending some time doing something, it displays the despised hourglass icon and the user must wait.

HIGHER EXPECTATIONS

It's funny how our expectations of program performance have changed. A few years ago we didn't give a second thought to the inconvenience caused by a program spending a long time to print out a long, complex document. Even with a print buffer or spooler, the program would still be out of commission until it had finished preparing the printed output. Similarly, everybody knew that when the database program indexed a large file or when the spreadsheet program started on a huge macro, it was time for a coffee break, or perhaps lunch.

When working with Presentation Manager, today's users feel otherwise. When you can actually *see* multiple programs on the screen, you feel that you should be able to run any of them, even if one of them has to take a long time to do something in response to a menu command.

This led Microsoft to recommend that Presentation Manager programs take no longer than 1 second to process any message. (In documentation released with beta-test versions of PM, the recommendation was a much stricter 1/10th second!) Even when a program is doing some lengthy processing, you should still be able to interact with it in some way. At the very least, you should be able to switch to another program and do something else.

THE THREAD SOLUTION

The solution, of course, is for a program to create additional threads of execution to handle lengthy processing jobs. These additional threads do not create message queues and do not process messages, so they *can* run concurrently with the thread that has the message queue.

Program functionality is thus divided between the message-queue thread (which processes user input, as well as any other messages and anything that can be handled quickly) and non-message-queue threads, which take care of long processing jobs. This technique was illustrated in the PRINTCAL program of the last few issues. That program does everything in the message-queue thread except printing. Printing is handled in the non-message-queue thread.

There are some restrictions on what a non-message-queue thread can do. Basically, it cannot use WinSendMsg to send a message to a window created by a message-queue thread, and it cannot call any PM function that causes a message to be sent. (However, a non-message-queue thread can use WinPostMsg to put a message in the message queue of a message-queue thread.) And a non-message-queue thread can't create a window because there is no message queue to store messages to that window.

Multithreading is one of the features of OS/2 that make Presentation Manager stand head and shoulders above *Microsoft Windows* and the Apple Macintosh. The problem of user input serialization is endemic to windowing environments, and multithreading is the solution.

Now, if you run PRINTCAL, you'll undoubtedly notice that the program takes a while to update its window. That's because it uses the GPI vector fonts, and these are still very slow to render on the screen in OS/2 1.2. Is it then possible to put the window update function in a separate thread?

Yes, it is, and although painting a window is one of the most complex things you can do in a separate thread, it's also one of the most important. I'll discuss ways to do it in the next issue. ■

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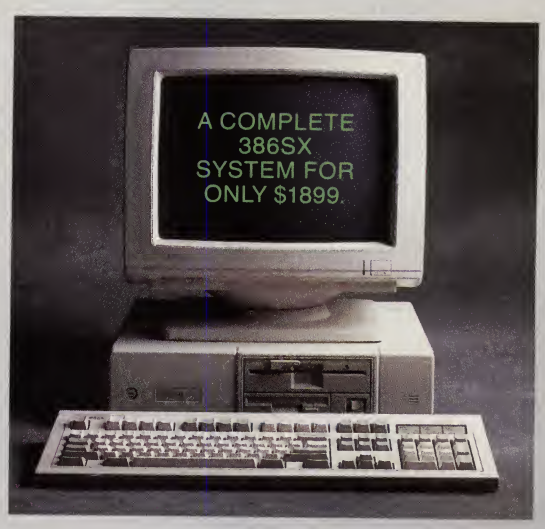

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by
Ray Duncan

Power Programming

Using Long Filenames And Extended Attributes, Part 2

The pace of change in our PC programming corner of the universe—never anything to sniff at—has recently become dizzying. I've been working with OS/2 1.2 for three months, and only in the last few weeks have I begun to feel that I have some understanding of the new High Performance File System (HPFS). Yet yesterday I opened a Federal Express box from Microsoft only to find the first beta release of OS/2, 2.0, the eagerly awaited 32-bit version of OS/2 for the 80386 and 80486.

The prospect of delving into another unfinished, partially documented, complex operating system evokes conflicting emotions. It's almost enough to make a fellow think about abandoning the PC and joining the Macintosh camp. But Mac developers are about to get their own massive dose of future shock in the form of Apple's System Version 7. This will offer virtual memory management, powerful interprocess communication facilities, built-in outline font management, true multitasking, and a relatively massive appetite for RAM and fixed disk. Better stick to beating one last time on the subject of long filename and extended-attribute support for OS/2 1.2 and the HPFS.

■ Some important new function calls needed to convert applications to OS/2 1.2 are far from optimal, but these workarounds will help.

SUPPORTING LONG FILENAMES

Incorporating long-name support in your applications is a three-step process. First, you must carefully comb through your program and make sure that all buffers that are going to hold filenames and pathnames are adequate for the longest filenames and pathnames that might be accepted or returned by the operating system. In OS/2 1.2, the maximum length of a fully qualified pathname is 260 characters. The maximum length of a filename or any other single component of a pathname (including the terminal null) is 255 characters. When declaring buffers, you can either reference the constants CCHMAXPATH and CCHMAXPATHCOMP defined in the header file BSEDOS.H, or else you can call up the function DosQSysInfo() in order to obtain the maximum length of a pathname at your program's runtime.

If you are programming in a high-level language (HLL), supporting long names in your application probably means you'll have to forgo using your HLL's runtime library (RTL) file functions and call the OS/2 API file functions directly. This is because you have no guarantee that the buffers allocated within the runtime library will be large enough for any arbitrary pathname that might be coughed up by the operating system. If you have the complete source code for the RTL, you can try and twiddle it to provide for long filenames, but the necessary changes can be subtle and must be tested carefully.

Next, you must revise with great caution and care any subroutines in the application that parse or compare filenames and pathnames. The file system in the first IBM release of OS/2 1.2 supports multiple dot (.) delimiters within the filename. This can confound routines that try to strip an extension off a pathname by scanning backward from the end for a backslash (if any) and then scanning forward for a dot character. To compound the problem, the general OEM release of OS/2 1.2 (which IBM customers received as a CSD update in December) also supports mixed case and embedded blanks in filenames. That is, the file system will preserve the case of the characters supplied in a file creation or renaming operation and will return the original case in response to a DosFindFirst or DosFindNext function call. But the file system ignores case when matching names in DosOpen or DosFindFirst.

Finally, having made the changes just described, you need to mark your application program as "long-name-aware." Otherwise, the OS/2 file system will "hide" files with long names from it in the interest of backward compatibility. You can flag your application as long-name-compatible at LINK time either by including the LONGNAMES modifier on the NAME statement in the program's module-definition (.DEF) file or by including the NEWFILES directive as the second line in the .DEF file. Or you can set the long-name-compatible flag in the .EXE file after the application is linked, using the MARKEXE utility supplied in the OS/2 1.2 *Programmer's ToolKit*.

SUPPORTING EXTENDED ATTRIBUTES

Enhancing your application programs to deal with Extended Attributes (EAs) goes hand in hand with the work you must do to support long filenames. In fact, the support for both must be incorporated at the same time, because OS/2 assumes that if your program knows how to deal with long names it also knows how to deal with EAs, and vice versa.

Your program's first responsibility is to preserve and protect the EAs attached to

files that your program touches but does not "own," that is, files for which your program is not the primary creator and user. The new OS/2 API DosCopy and DosEditName functions are very useful here, as I showed you in the demonstration program EDITDEMO.C last issue. DosEditName lets you transform one filename into another (MYFILE.DAT into MYFILE.BAK, for example) by supplying the original name, an editing pattern (which can include wildcards), and a buffer to receive the newly generated filename. DosCopy lets your program "duplicate" a file, together with its extended attributes, without requiring your program to understand the file's contents or the presence or significance of its EAs.

For the data files that it does own, your program is responsible for appropriately setting and maintaining at least the .LONGNAME and .TYPE EAs (see Power Programming, April 10, 1990, Figure 1). The .LONGNAME EA's value should be set to the complete name of the file. If the file is copied to a FAT volume that requires its name to be truncated or modified (to eliminate multiple dot delimiters, for example), the PM Shell and other utilities can use the .LONGNAME EA to search for the file by its full name. The .LONGNAME EA also provides a convenient way to determine and restore the file's original name when it is copied back to an HPFS volume or other file system that supports long, free-form filenames.

The .TYPE EA describes the contents of the file and supersedes the older use of file extensions for this purpose. A number of standard .TYPE values have been defined and reserved by Microsoft and IBM, as follows: Plain Text, OS/2 Command File, DOS Command File, Executable, Metafile, Bitmap, Icon, Binary Data, Dynamic Link Library, C Code, Pascal Code, BASIC Code, COBOL Code, FORTRAN Code, Assembler Code, Library, Resource File, and Object Code. To use .TYPE values other than those listed above, the EA value strings should include the software publisher and application names (for example, "Microsoft Excel Spreadsheet") to eliminate possible conflict with other vendor's products.

How do you add or modify these EAs for your program's data files? The three most important new "EA-aware" functions that you will need to use are DosOpen2, DosQFileInfo, and DosSetFileInfo. In order to use these functions, you must become familiar with a new data structure called an EAOP. The EAOP structure contains three fields, two of which are pointers to other data structures called a GEAList and an FEAList. These latter two structures each begin with a double word that contains the length of the entire structure followed by one or more variable-size entries, as shown in Figure 1.

The usage of the GEAList and FEAList structures varies with the type of function. When a program is "reading" EAs, it will set the FEAList pointer in the EAOP structure to the address of a suitable buffer, initialize the double word at the head of that buffer to the length of the buffer, and put the names of the EAs it wants to inspect into the GEAList structure. If the read operation is successful—that is, if the file or directory has EAs and the FEAList buffer is large enough—the system returns the requested EA information in the FEAList structure. When a program is "writing" EAs, the GEAList is usually ignored (and the pointer to the GEAList in the EAOP structure can be null) and the FEAList contains the EA information that the program wishes to bind to the file or directory.

DosOpen2, which is one of the new functions added in OS/2 1.2, differs from the original DosOpen in two ways. First, the OpenMode parameter has been changed from a 16-bit value to a 32-bit value. This allows room for some additional bit flags related to the capabilities of the High Performance File System, as outlined in Figure 2. Second, an additional pointer to an EAOP structure has been added. You would be well advised to replace all calls to DosOpen in your existing programs with calls to DosOpen2 and to use only DosOpen2 in your new programs, because the parameters for DosOpen2 are symmetric with the DosOpen that is available to 32-bit applications in OS/2 2.0.

But DosOpen2's abilities to handle

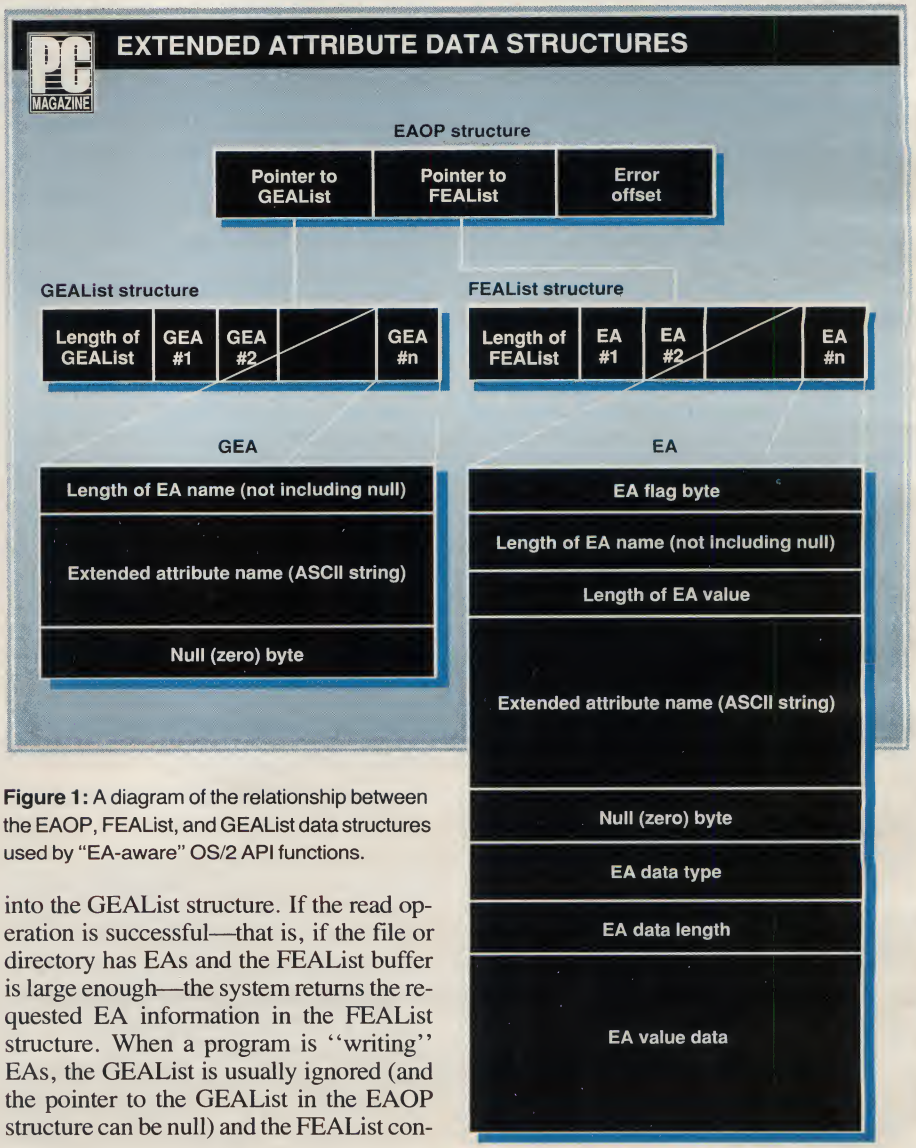

Figure 1: A diagram of the relationship between the EAOP, FEAList, and GEAList data structures used by "EA-aware" OS/2 API functions.

EAs are limited. The EAOP pointer parameter is inspected only if a file is being created or replaced: if the pointer is NULL, the new file has no EAs, even if it replaced a previously existing file that had EAs, and no warning of this is given. If the EAOP pointer is non-NULL, the FEAList pointer is assumed to be the address of a valid FEAList structure with EAs that are bound to the new file and replace any previous EAs (the GEAList pointer is ignored).

It would have been rather more convenient if DosOpen2 had also been given the ability to add, modify, or return the EAs when an existing file was opened. Sadly, this is not the case, even though the semantics for a much more powerful approach to handling EAs on an open operation would have been quite straightforward:

- If the EAOP pointer is NULL, do nothing to any existing EAs and don't return any EA information.
- If the EAOP pointer is non-NULL, the GEAList pointer is NULL, and the FEAList pointer is non-NULL, then the FEAList buffer contains EA information to be attached to the file.
- If the EAOP, GEAList, and FEAList pointers are all non-NULL, then GEAList contains the EA names the program wants to inspect, and the EA information should be returned in the FEAList buffer.

In any event, after a fair amount of experimentation with EAs, I have concluded that it is simpler to supply a NULL EAOP pointer and so bypass DosOpen2's limited EA capabilities altogether. In their stead I have developed some general-purpose routines that use the file handle from a DosOpen operation along with DosQFileInfo and DosSetFileInfo, to read and write EAs. Sample source code for two such subroutines, called getEA() and putEA(), can be found in the module GETPUTEA.C in Figure 3. I have not used the Microsoft header file prototypes and TYPEDEFs in these examples, because as of this writing the OS/2 1.2 *Programmer's ToolKit* had not yet been finalized.

An example program called SETEA, which is available on PC MagNet, uses the getEA() and putEA() routines to add or modify an ASCII EA for a file. The module definition file for SETEA and the Make file to build SETEA.EXE are also available on PC MagNet. Further instructions and examples of SETEA's use are in the source listing.

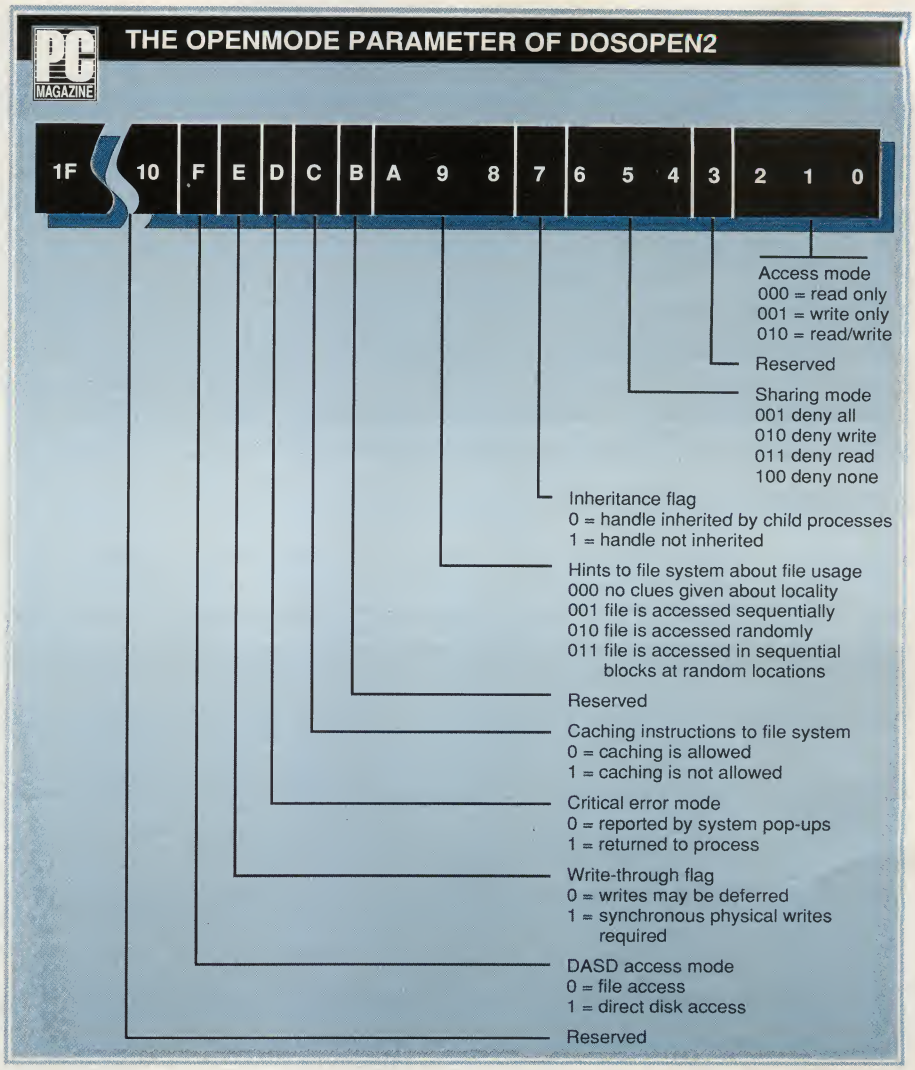

Figure 2: A number of new flags have been added that allow an application program to tell the High Performance File System (HPFS) how it will use the file and to control caching.

SEARCHING FOR FILES WITH EAS

Knowing that EAs are supposed to be the basis for the object-oriented file systems and user interfaces that lie in OS/2's future, you might think that OS/2 1.2 would offer powerful new search functions based on EAs rather than filenames. Some EA searching capability does exist as a new API function called DosFindFirst2, but like DosOpen2, its capabilities are not everything you might wish for. But, as with DosOpen2, you should be highly motivated to convert your code for use of DosFindFirst2, because it is symmetric with the DosFindFirst that will be exported to 32-bit applications in OS/2 2.0.

Like DosFindFirst, DosFindFirst2 is used in concert with DosFindNext and DosFindClose, but DosFindFirst2 has one more parameter than its predecessor: an *information level* number. When DosFindFirst2 is called for information level 1, it returns information about matched files in exactly the same format as does DosFindFirst. For level 2, the format of the returned information is the same as for level 1 except that the length of the file's EAs is returned as a 32-bit value just ahead of the filename's count byte. (Incidentally, Microsoft *Programmer's Reference*, Volume IV, incorrectly lists the EA length as a USHORT, or 16-bit value.)

But when you call DosFindFirst2 for information level 3, things get a bit complicated: the function expects your pro-

GETPUTEA.C — **COMPLETE LISTING**

```
/*
    GETPUTEA.C  Routines to read and write extended attributes.
                Compatible with OS/2 version 1.2.  Microsoft or
                IBM PTK header files not required.  Will need
                modification for OS/2 2.0.

    Copyright (C) 1989 Ziff Davis Communications
    PC Magazine * Ray Duncan, December 1989
*/

#include <stdio.h>
#include <string.h>
#include <memory.h>
#include <malloc.h>

                                        // EA predefined value types
#define EAT_BINARY      0x0fffe         // Length-preceeded binary
#define EAT_ASCII       0x0fffd         // Length-preceeded ASCII
#define EAT_BITMAP      0x0fffb         // Length-preceeded bitmap
#define EAT_METAFILE    0x0fffa         // Metafile
#define EAT_ICON        0x0fff9         // Length-preceeded icon
#define EAT_EA          0x0ffee         // ASCIIZ name of associated EA
#define EAT_MVMT        0x0ffdf         // Multi-value multi-type
#define EAT_MVST        0x0ffde         // Multi-value single-type
#define EAT_ASN1        0x0ffdd         // ASN.1 field

#define MAXPATHNAME     260             // max length of pathname
#define MAXFILENAME     255             // max length of filename
#define FEALISTSIZE     1024            // arbitrary buffer size
#define GEALISTSIZE     260             // arbitrary buffer size

#define API unsigned extern far pascal  // OS/2 API function prototypes
API DosQFileInfo(unsigned, unsigned, void far *, unsigned);
API DosSetFileInfo(unsigned, unsigned, void far *, unsigned);

struct _EA {                            // extended attribute header
        unsigned char flags;            // critical flag etc.
        unsigned char nsize;            // length of EA name (without null)
        unsigned vsize;                 // total size of EA value
        char name[1]; } ;               // EA name and value begin here

struct _EAval {                         // extended attribute value
        unsigned type;                  // EA value type
        unsigned size;                  // length of EA variable data
        char data[1]; } ;               // actual data begins here

struct _FEAList {                       // receives extended attributes
        unsigned long size;             // total size of structure
        char data[1]; } ;               // extended attributes begin here

struct _GEA {                           // extended attribute target name
        unsigned char size;             // length of name
        char name[1]; } ;               // actual name begins here

struct _GEAList {                       // holds names of EAs to get
        unsigned long size;             // total size of structure
        struct _GEA GEA; } ;            // name length and name text

struct _EAOP {                          // used by all EA functions
        void far *pGEAList;             // pointer to GEAList structure
        void far *pFEAList;             // pointer to FEAList structure
        unsigned long oError; } ;       // offset of error, if any

/*
    putEA: constructs and writes an extended attribute for a previously
    opened file.  Called with the handle of the file, the extended
    attribute name, the EA value type, and the address and length of
    the EA value field data.  Returns FALSE if extended attribute was
    written successfully. Returns -1 or OS/2 errcode if function failed.
*/
int putEA(int handle, char * eaname,
          void * eavalue, unsigned eavalsize, unsigned eatype)
{
    struct _FEAList *pFEAList;          // misc scratch variables
    struct _EA      *pEA;               // and pointers
    struct _EAval   *pEAval;
    struct _EAOP    EAOP;
    int errcode;

    pFEAList = malloc(FEALISTSIZE);     // allocate buffer for FEAList

    if(pFEAList == NULL) return(-1);    // bail out if no heap available

    EAOP.pFEAList = pFEAList;           // initialize contents of
    EAOP.pGEAList = NULL;               // EAOP pointer structure
    EAOP.oError   = NULL;

    (char *) pEA = pFEAList->data;      // point to EA header field

    pEA->flags = 0;                     // construct header portion
    pEA->nsize = strlen(eaname);        // of extended attribute
    pEA->vsize = eavalsize + 4;
    strcpy(pEA->name, eaname);

    (char *) pEAval =                   // calculate address of
        pEA->name + pEA->nsize + 1;     // EA's value field

    pEAval->type = eatype;              // construct value portion
    pEAval->size = eavalsize;           // of extended attribute
    memcpy(pEAval->data, eavalue, eavalsize);

    pFEAList->size =                    // calculate size of entire
        pEA->nsize + pEA->vsize + 9;    // FEAList structure

    errcode =                           // set extended attributes
        DosSetFileInfo(handle,          // file handle
                       2,               // info level 2 = set EAs
                       &EAOP,           // EAOP structure holds pointer
                       sizeof(EAOP));   // to FEAList containing EAs

    free(pFEAList);                     // release working buffer
    return(errcode);                    // return DosSetFileInfo status
}

/*
    getEA: fetches an extended attribute for a previously opened file.
    Returns FALSE if the extended attribute does not exist; otherwise,
    returns a pointer to the extended attribute value in a chunk of
    heap memory.  The EA value is in the form of the EA type indicator,
    followed by the length of variable data, followed by the data itself.
    The exact format of the EA value is given by the structure _EAval.
    The caller must be sure to free the memory holding the extended
    attribute value after the value has been used or copied elsewhere.
*/
struct _EAval * getEA(int handle, char * eaname)
{
    struct _FEAList *pFEAList = NULL;   // misc scratch variables
    struct _GEAList *pGEAList = NULL;   // and pointers
    struct _EA      *pEA = NULL;
    struct _EAval   *pEAval = NULL;
    struct _EAOP    EAOP;

    pFEAList = malloc(FEALISTSIZE);     // allocate buffers
    pGEAList = malloc(GEALISTSIZE);

    if((pFEAList == NULL) || (pGEAList == NULL))
        goto errexit;                   // bail out if no heap

    EAOP.pFEAList = pFEAList;           // initialize contents of
    EAOP.pGEAList = pGEAList;           // EAOP pointer structure
    EAOP.oError   = NULL;

    strcpy(pGEAList->GEA.name, eaname); // fill in EA name & length
    pGEAList->GEA.size = strlen(eaname);

    pFEAList->size = FEALISTSIZE;       // fill in structure sizes
    pGEAList->size = pGEAList->GEA.size + 6;

    if(DosQFileInfo(handle,             // get extended attribute
                    3,                  // info level 3 = get EA
                    &EAOP,              // EAOP struct holds pointers
                    sizeof(EAOP)))      // to GEAList and FEAList
        goto errexit;                   // exit if API function failed

    (char *) pEA = pFEAList->data;      // point to EA header field

    if(pEA->vsize == 0) goto errexit;   // exit if no EA value present

    if((pEAval = malloc(pEA->vsize))    // allocate space for EA value
        == NULL) goto errexit;          // exit if heap is full

                                        // copy EA value to heap
    memcpy(pEAval, pEA->name + pEA->nsize + 1, pEA->vsize);

    free(pFEAList);                     // release working buffers
    free(pGEAList);
    return(pEAval);                     // return pointer to EA value

errexit:                                // common exit point for errors
    if(pFEAList != NULL) free(pFEAList);
    if(pGEAList != NULL) free(pGEAList);
    return(NULL);                       // NULL pointer indicates error
}
```

Figure 3: This source file contains the routines getEA() and putEA(). These two subroutines allow EAs to be read and written straightforwardly.

gram to set up an EAOP structure at the beginning of the buffer that is to receive the match results. The FEAList pointer can be NULL (it is ignored anyway), but the GEAList pointer must be valid. The GEAList contains the name(s) of the EAs in which your program is interested.

The results of an information level 3 search come back in a rather bizarre form. In essence, a FEAList structure containing the requested EAs is embedded into the returned file information just ahead of the filename count byte. Since the FEAList, all of its members, and the filename are built up from variable length components, and DosFindFirst2 and DosFindNext are capable of returning multiple matches for a single function call, an awesome amount of pointer wrangling is required to pick the whole mess apart into something useful.

Oddly, DosFindFirst2 really only carries out searches based on the filename argument. It dumps the burden of sifting the results for correct EA matches onto the application program. In fact, DosFindFirst2 will return as matches files that don't even have any EAs, let alone the EAs that you specified in the GEAList. In the information returned for such files, you'll find that the FEAList contains phantom EA names for each entry in the GEAList, but the EAs have zero-length value fields.

Using DosFindFirst2's EA capabilities also entails a rather severe performance hit. In some of the tests I ran, searches that requested information level 3 ran seven

times slower than those using information level 1, even though 99 percent of the files on the disk had no EAs at all. We hope that this will be cleaned up a bit in OS/2 2.0, or efficient disk browser utilities that exploit EAs will be rather difficult to write!

To introduce you to the contortions needed to use DosFindFirst2 with EAs effectively, I upgraded the WHEREIS.C program from my *Advanced OS/2 Programming* book to make it EA-aware. The source code is posted on PC MagNet. Use this improved program to search for a file based on its name, the value of one of its EAs, or both. For example, enter

```
WHEREIS *.ICO
```

to search for all files with the extension .ICO and any (or no) EA's. The command

```
WHEREIS * .TYPE=Icon
```

finds all files with the .TYPE EA value of "Icon," accepting any filename at all. (Note: the HPFS interprets filenames with wildcards somewhat differently than does the FAT file system.) The command

```
WHEREIS *.ICO .TYPE=Icon
```

would limit its search on both name and EA value, displaying the names of only those files with the filename extension .ICO and the .TYPE extended attribute value of Icon.

In order to embed blanks into the EA value that WHEREIS searches for, you must "quote" the command line parameter in the usual C manner, for example:

```
WHEREIS *.TXT ".TYPE=Plain Text"
```

The module-definition file for the WHEREIS utility and the Make file are also on PC MagNet. Further instructions for compilation, linking, and use of WHEREIS can be found in the source code listing.

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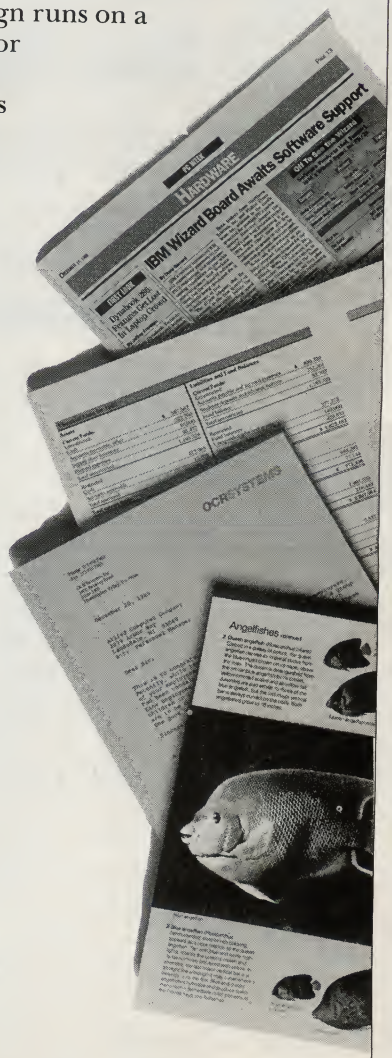

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CompuAdd 325 Monitor And Hard Drive Options

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Career Starter Kit Monitor And Hard Drive Options

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40MB (69ms)	*64718* — $1329	*64723* — $1469	*64728* — $1689

Professional Starter Kit Monitor And Hard Drive Options

Printer	MGA	MVGA	CVGA
Panasonic			
KX-P1180	*64747* — $1495	*64746* — $1595	*64757* — $1825
KX-P1124	*66326* — $1635	*66327* — $1735	*66328* — $1965

SX Success Kit Monitor And Printer Options

Printer	MGA	MVGA	CVGA
Panasonic			
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KX-P1124	*66329* — $1935	*66330* — $2035	*66331* — $2265

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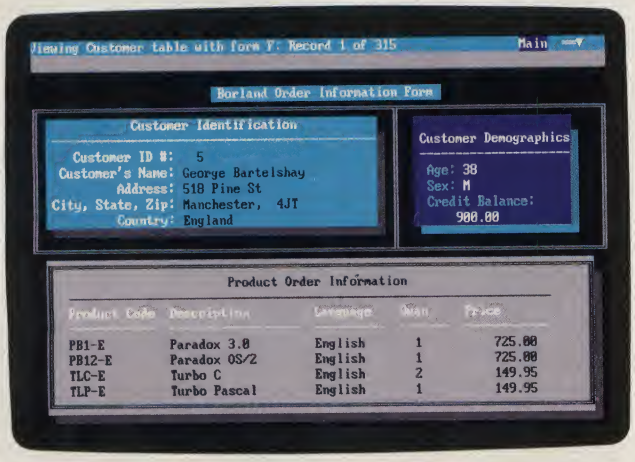
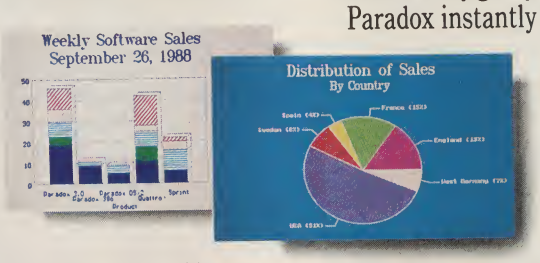


Multitable form dynamically displaying information from three related tables.

You don't have to be a programmer to have easy access to our highly sophisticated, powerful relational database, Paradox® 3.0.

Paradox 3.0 is all-powerful and never painful because *it* makes all the complex inside moves, you don't. While it does the complex for you, the complexity is hidden beneath clear, natural, even intuitive pathways and patterns that make life easy for you.



With Paradox 3.0, there are no Unclears, no Unknowns. You don't need an army of in-house technical support people. And best of all, you *don't have to be a programmer* to be a pro with Paradox. It's all gain, no pain.

"Query-by-Example" for example

Use this checkmark and you're using QBE. It's that easy. Let's say you need to know in a hurry which of your Los Angeles customers bought more than 5 pairs of white shoes. First ✓ the customer field, then type "LA," "white," and ">5," and you're done. Paradox gives you the right answer, right now. And how much programming to do all that ? Zero.

If your database experience so far is limited to the flat-file type rather than relational, or even if a spreadsheet is the only program you've used before, Paradox gets you up and running immediately with just a ✓.

Record-locking and Auto-Refresh make the network safely network

Paradox has become the leading networker because it handles multiple users intelligently. If someone in your group or network has accessed a record, automatic record-locking keeps everyone else from changing it.

That way, two or more people can't change the same data at the same time. (As a bonus, Paradox also tells you *who* is using a record at a particular instant.)

Once the record has been changed by someone in the network, *Auto-Refresh* kicks in *automatically* and updates everything. Everyone in the network is looking at up-to-the-minute information.

Paradox, for the looks of things

Presentation-quality graphics are another Paradox distinction. They give you and your work the professional look.

Paradox instantly turns your tables into graphs with *one* keystroke—and in multiuser environments, with a few keystrokes your graph can show up-to-the-minute changes. Not only does everyone get the picture, they get an accurate picture.

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B O R L A N D

CIRCLE 147 ON READER SERVICE CARD

edited by
Trudy Neuhaus

Databases

DEVELOP THE BEST APPS

Last time, we looked at the pros and cons of developing applications using database languages such as *dBASE,* and the alternate approach of using a high-level language (HLL). You may have concluded from our discussion that C isn't a natural when it comes to writing database applications. Unlike *dBASE,* C has no built-in database commands or features; the standard C library contains file-handling functions for opening, reading, writing, and closing files, but none for high-level database access and manipulation; and, if you want to create an index file or use an indexing scheme, such as ISAM (Indexed Sequential Access Method) or B-Tree, you have two choices: purchase a third-party library or write your own.

Choosing the right database library isn't easy, and there are definitely limitations. Each third-party library is different. Some use a standard file format, such as *dBASE* .DBF files, but they cannot read or write *dBASE* index files, and they have their own indexing schemes. Other libraries have developed their own file formats, which are completely nonstandard.

None of the libraries offer a standardized front end, if they offer one at all. What do you need a front end for once you finish your application? Well, once you finish it, nothing. But until you do, a front end can be extremely useful and can provide a great deal of flexibility. For example, using a front end, you can maintain a database interactively without writing a separate program. In addition, it lets end users begin entering data into a new database while development is still underway. By not using a front end, you forego these time-saving techniques.

Some database libraries are actually interface calls to a resident database engine: the engine is a separate program that is loaded in much the same fashion as many popular TSR (terminate-and-stay-resident) utilities. Unfortunately, like TSRs, these libraries use an inordinate amount of memory and often conflict with other TSRs.

■ Borland's new Paradox Engine lets you customize database applications while maintaining full compatibility with Paradox.

Btrieve is one example.

Knowing the company that publishes the library is just as important as knowing the library. How well established is the company? Does it offer the source code for the product? Is it willing to put the code in escrow in the event that it goes out of business? Does it have a reputation for issuing regular updates? Will it make the library available on a variety of platforms? The answers you get to these questions could convince you of the merits of your other alternative—to "roll your own."

Writing your own library of database functions does have certain advantages. You can fine-tune the performance of your database functions, easily port your library to other operating environments (since you have the source code), and customize the library to fit your own needs. But this is no small task; you should seriously consider whether it is worth the effort, not to mention the time away from developing the actual application.

Both of these choices are limited. But Borland has just given you a viable alternative.

THE PARADOX ENGINE

In February of this year, Borland International shipped its new *Paradox Engine* and became the first major PC database vendor to offer a full-fledged C library built specifically to interact with its established database system.

Paradox Engine is a set of database functions that have been extracted from the heart of the *Paradox* database and placed in libraries. By simply linking these libraries to their applications, Turbo C and Microsoft C developers can add the database management capabilities found in interactive *Paradox.* They will be able to have their applications read and write *Paradox* database and index files, support *Paradox*'s multiuser concurrency features, support multiuser record locking and dynamic encryption, use interactive *Paradox* as a front-end, and use PAL (Paradox Application Language) as a prototyping tool.

But C developers aren't the sole beneficiaries of this new product. For *Paradox* developers, the *Engine* means that they can increase the performance of their applications by writing the most processing-intensive modules in C. They can also add features such as windowing to their applications via third-party libraries.

Borland has also incorporated the *Engine* into *Quattro Pro* and *SideKick for Presentation Manager,* so your applications can share data with them as well as interactive *Paradox.* Plus, it appears likely that Borland will continue to incorporate the *Engine* in many of its future commercial applications, so an application that uses the *Engine* will be forward-compatible as well.

Let's take a closer look at the *Engine*'s features.

FILE COMPATIBILITY

Many a programmer will now be able to jump the initial hurdles of database development because, with the *Engine,* applications can be built that access *Paradox* database and index files. With file compatibility, you, the developer, can have end users use *Paradox* to enter data directly into a database before the application is finished. You can use the same tables as *Paradox,* even create the tables with *Paradox,* while the application is under development. Futhermore, you can use *Paradox* for database maintenance—creating and modifying tables and indexes, testing queries, and importing data from *dBASE* and other file formats for

use by the *Engine* application. (Normally, you'd have to write a separate maintenance program.) Finally, file compatibility means you can write customized C applications against the relatively large installed base of *Paradox* databases.

PROTOTYPING

Since *Engine* applications are compatible with PAL applications, you can use *Paradox* to prototype your application, screens, menus, and so on, while the C version is still under development. You can also use PAL and the Paradox Report Generator to prepare and prototype reports. Keep in mind, however, that you do not need to own *Paradox* to use the *Engine* and write *Engine*-based applications.

EXPAND APPLICATIONS

If you have already invested in *Paradox*—trained your staff and completed a lot of data entry—you can add capabilities to your current applications by writing *Engine* applications. For instance, it's a relatively simple task to write an *Engine* application to download data from a serial port on your PC into a *Paradox* table (using your favorite C routines for accessing the serial port). You could run the application from *Paradox* or PAL with the RUN command. Or leave it running on a network workstation and have it deposit the data in a table used by *Paradox* running on other workstations. Another idea might be to add data import and export capabilities, to and from *Paradox* tables, which can handle different file formats not supported by *Paradox*. These features are difficult or impossible to implement with *Paradox* and PAL, but easy in an *Engine* application.

PROGRAM EFFICIENTLY

PAL has full access to every aspect of interactive *Paradox*, along with the ability to extend macros that "walk" through *Paradox* menus, and a full complement of facilities for writing interactive menus and screens. So if the end users already own *Paradox*, save yourself some time and write the bulk of the application in PAL. Then use the *Engine* to write time-critical sections or features that cannot be written in PAL. For example, a point-of-sale system with a bar code reader might be written in PAL, while the portion that interacts with the bar code reader could be written as an *Engine* application in C.

ADD YOUR FAVORITE LIBRARIES

Since *Engine* applications are written in C, you can add graphics, serial communications, and windowing from C routines that you've written yourself or purchased elsewhere. The *Engine* does not get in the way since its purpose is to supply database-handling capabilities. In fact, Turbo C offers a number of windowing and graphics features in its standard library.

QUATTRO PRO AND SIDEKICK

You can extend *Quattro Pro* and *SideKick for Presentation Manager* with *Engine* applications or, conversely, use these programs to complement and extend your *Engine* applications. In addition, since the *Engine* fully incorporates *Paradox*'s multiuser concurrency technology, it can even share data and tables with *Quattro Pro* and *SideKick PM* across a network.

Over 70 functions in the *Paradox Engine* API let you access and update *Paradox* tables, records, and fields.

Let's suppose you need to write a statistical analysis application in C with the *Engine*. *Quattro Pro* can be the front end through which the user enters data and displays graphs from the data. And as long as the user remembers to save the data in a *Paradox* table, the *Engine* application can perform its analysis and even change the data in the table if necessary.

If *Quattro Pro* is running on another machine across a network, it can automatically sense the changes being made to the financial data and refresh its own display of the data (including graphs). Because *Paradox*'s multiuser concurrency technology is incorporated in the *Engine* (and thus in your application), your application and *Quattro Pro* can easily access and share the same data simultaneously.

The reverse is also true: you can use *Quattro Pro* and *SideKick PM* to extend the capabilities of your *Engine* applications. For instance, *Quattro Pro* could be a spreadsheet front end for an inventory-control *Engine* application. Bring up *Quattro Pro* against the inventory database and you can graphically display the inventory relationships without writing these into your application. With *SideKick PM*, your *Engine* application can make notations in the Scheduler file to remind or notify a user of an upcoming event.

(Note: the *Paradox Engine* is not yet available for OS/2 programmers. The PARADOX.DLL dynamic link library provided with *SideKick PM is* the *Engine*, but in a form before the current *Engine* was developed.)

MULTIUSER CONCURRENCY

As we just mentioned, you can use *Paradox*'s multiuser concurrency to build auto-refresh into your *Engine* applications. The *Engine* provides functions to see whether tables on a network have changed. You can use these functions to examine a table periodically to see if some other application has changed it, and to refresh the *Engine*'s buffers for that table accordingly. Then you can redisplay any on-screen data from those buffers. This gives your application the same auto-refresh capabilities as *Paradox*, PAL, *Quattro Pro*, and *SideKick PM*. Incidentally, the *Engine* offers support for the same networks as *Paradox*, including those from IBM (Token-Ring/Extended Edition), Novell, 3Com, Banyan, Torus, and AT&T (StarLAN).

DATA ENCRYPTION

The *Engine* provides full support for *Paradox*'s data encryption scheme and prevents unchecked access to password-protected files. So not only can you include these features in an *Engine* application, but such an application will have no more right to access a password-protected file without a password than *Paradox*. The *Engine* can also dynamically encrypt and decrypt records, so an encrypted table remains largely protected while individual records are being accessed.

PROGRAMMING THE ENGINE

The *Engine* has the full capabilities of *Paradox*. It supports up to 64 open tables and 128 file locks at a time. You can have up to 2 billion records per table, and 255 fields per record. The record size extends to 4,000 bytes, minus some space given over to managing indexes.

The *Engine* API consists of over 70 functions that let you access and update

Paradox tables, records, and fields. You can also manipulate indexes, search for records in indexed and database order, control multiuser access (via both table and record locking), and encrypt (password-protect) and decrypt a table.

When you open a table, the appropriate API function returns a handle, which your program uses to reference the table; to access the records in a table, another function lets you create a record buffer, and returns a handle to be associated with that buffer. Use these handles when using the API functions to manipulate the table, the records, or the fields.

It is possible to create more than one record buffer at a time (up to 10 by default, and a maximum of 128), in order to access different parts of different tables at the same time.

The contents of each field can be retrieved from the record buffer. Each field is referenced by a field handle—the offset of the field in the record, beginning with 1. You also have the option of referencing a field by name.

To put it simply, this is powerful stuff! The payback in flexibility and performance (you can fine-tune your routines) gained by investing in a system like the *Paradox Engine* is enormous.

A program that is unfamiliar with the structure of a table can query the *Engine* for the number of fields per record in a given table, then retrieve the field information (name, type, length) and the contents of any field in any record.

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To put it simply, this is powerful stuff! The payback in flexibility and performance (you can fine-tune your routines) gained by the investment in a more complex system like the *Paradox Engine* is enormous.

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Research for this column was provided by Richard Hale Shaw, a contributing editor of PC Magazine.

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Performance							
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Graphics	(75)	Excellent	Poor	Good	Good	Good	Very Good
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Macros	(50)	Excellent	Good	Good	Good	Excellent	Good
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Capacity	(50)	Very Good	Very Good	Very Good	Very Good	Good	Good
Documentation	(75)	Excellent	Excellent	Excellent	Satisfactory	Excellent	Very Good
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Ease of use	(100)	Very Good	Very Good	Excellent	Good	Excellent	Good
Error handling	(50)	Very Good	Poor	Very Good	Poor	Very Good	Very Good
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CIRCLE 377 ON READER SERVICE CARD

by
Craig Stinson

Spreadsheets

MULTIPLY RANGES PAINLESSLY

"Go forth and multiply," Noah commanded the creatures de-arking after the Flood. Perplexed, one pair of snakes asked, "How can we multiply when we're adders?" The wise old owl could only suggest asking the beavers. After some thought the beavers felled a few trees and made log tables so that the adders could multiply.

This old mathematicians' tale can shed light on a certain spreadsheet problem: how to multiply a range of numbers.

In *Lotus 1-2-3,* it's no trick to write A1*A2*A3, but what if the range extends from A1 to A300? Even if you could stand the tedium of writing out the formula, you'd have to edit it if you later added to or deleted from the range.

Unfortunately, there's no multiplicative function, say "@PROD", that's comparable to @SUM. But as you learned (or didn't learn) in Algebra II, $\log(x*y) = \log(x) + \log(y)$. So following the beavers' lead, you could create a log range that contains the natural logarithm of each value to be multiplied. Then add all the log values and find the inverse log for the sum.

For example, if your range is A1..A300, put @LN(A1) in cell B1, and then copy B1 to B2..B300. In another cell—C1, for example—you'd write

```
@EXP(@SUM(B1..B300))
```

This is the formula that adds all the logs, finds the inverse, and thus the product of the values.

This simple scheme works only for a factor range consisting of positive numbers. However, it can be generalized to include negative entries through clever use of the @IF and @ABS functions and by determining whether the number of negative values in the factor range is even or odd. Be wary also if the range contains any zeros: the product should be zero, but this is difficult to work out with the formulas, since the log of zero is undefined.

Ric Blacksten
Arlington, Virginia

- **MULTIPLY RANGES PAINLESSLY: Jettison the traditional operator for @LN and a simple macro.**
- **A CLEAN START IN EXCEL: Make a simple change to your WIN.INI file, and banish sheet1 automatically.**

PC MAGAZINE

Even in the age of electronics, it pays to stay awake in Algebra II. With far fewer than 300 events, creating a formula with the standard multiplication operator could be a pain. Mr. Blacksten's elegant idea produces the hypothetical "@PROD" of a range of numbers. It's a useful trick, if you're calculating the probability that a certain number of independent events will all occur—the probability of the first multiplied by the probability of the second and so on.

But if your range includes negative numbers or zeros, you'll need a macro that generalizes Mr. Blacksten's idea. The macro, shown in Figure 1, works for two-dimensional ranges of any shape and handles zeros as well as negative numbers.

Beginning in cell B2, the macro names a range called INPUT and waits for you to indicate where that range lies. You point to the range (or name its coordinates) and press Enter. Control then passes to the {paneloff}{windowsoff} instructions in B3. This line is optional; all it does is speed up the execution of the macro by suppressing *1-2-3*'s normal window and panel update.

The instructions in B4 and B5 initialize a pair of cells, named NEGCNT and LOGSUM, to 0. We'll use NEGCNT to keep track of the number of negative values in our INPUT range; the value in NEGCNT will later be used to determine the sign of the product. LOGSUM will serve as our logarithm "adder."

The main business of the macro is carried out by the nested pair of {for} loops in B6, B9, and B11..13. B6 sets up the outer part of the loop, causing the instructions in B9 to be performed once for each *column* in the INPUT range. The *instruction in B9*, in turn, causes *1-2-3* to execute the instructions in B11..B13 once for each *row* in the range. The net result is that the instructions B11..B13 are performed on each cell in the INPUT range.

The first {if} instruction of Loop 2, located in B11, tests for a zero value. If the cell tested is zero, the macro jumps forthwith to B21; the {let} command here places the value 0 in the RESULT cell and terminates the macro. This makes sense: if any term in the factor range is zero, the product of all factors is zero, and there's no need for you to waste time evaluating the rest of the range.

If the macro doesn't find a zero in the cell being tested, it moves to the {if} instruction in B12, which tests for a negative value. If a negative value is found, the NEGCNT cell is increased by 1.

Next, for each cell in the INPUT range, the {let} instruction in B13 finds the logarithm of the absolute value and adds that number to the LOGSUM.

After all cells in the INPUT range have been evaluated, control passes to the payoff instruction—in B7. The argument in the {let} instruction uses @EXP (the inverse of @LN) to calculate the value of *e* raised to the *LOGSUM* power. This result is multiplied by -1 raised to the *NEGCNT* power. The term, (-1)^NEGCNT, will be -1 if the macro has found an odd number of negatives, and +1 if it has found an even number of negatives or no negatives at all. The outcome of all this work is deposited in the RESULT cell.

To use this macro, enter the instructions shown in Figure 1 onto your worksheet. Then use /Range Name Labels Right to assign range names based on all the labels in A2..A21. Finally, press Alt-P to run the macro.

While my macro takes care of negative

MULTIPLYING RANGES — **COMPLETE LISTING**

```
     A          B                C                D
1
2   \P        /rncINPUT~{?}~
3             {paneloff}{windowsoff}
4             {let NEGCNT,0}
5             {let LOGSUM,0}
6             {for COLCNT,0,@cols(INPUT)-1,1,LOOP1}
7             {let RESULT,@exp(LOGSUM)*(-1)^NEGCNT}~
8
9   LOOP1     {for ROWCNT,0,@rows(INPUT)-1,1,LOOP2}
10
11  LOOP2     {if @index(INPUT,COLCNT,ROWCNT)=0}{branch ZEROQUIT}
12            {if @index(INPUT,COLCNT,ROWCNT)<0}{let NEGCNT,NEGCNT+1}
13            {let LOGSUM,LOGSUM+@ln(@abs(@index(INPUT,CLCNT,ROWCNT)))}
14
15  COLCNT
16  ROWCNT
17  NEGCNT
18  LOGSUM
19  RESULT
20
21  ZEROQUIT {let RESULT,0}{quit}
```

Figure 1: This macro uses @LN and @EXP to find the product of an entire range of values.

numbers and zeros, you should be aware of two other hazards.

First, if you're really going to multiply a range of 300 numbers, you may run into overflow problems. The results of mathematical formulas in spreadsheets, like those in calculators, are limited by maximum and minimum values. For example, *Lotus 1-2-3* (Release 2.2 and Release 3) returns ERR to formulas that calculate answers greater than plus (or less than minus) 10^{99}; it also returns an error message to values between 0 and plus or minus 10^{-99}.

Quattro Pro and *Microsoft Excel* are more generous. Their values are limited by plus or minus $10^{\pm 308}$ approximately. Both spreadsheets also have the courtesy to convert a number like 10^{-475} to 0 instead of burdening you with an error message.

Second, products calculated by the addition of logarithms may not be *exactly* equal to products generated by the use of multiplication operators. The two methods often produce minute differences—on the order of 10^{-14} or less. But this shouldn't be a problem, unless you happen to calculate your product both ways and then use a logical test to see if the two values are equal.

A CLEAN START IN EXCEL

Microsoft Excel opens by default to a blank worksheet called Sheet1, but I usually need an existing worksheet when I use the program. To dispose of Sheet1, I wrote a simple macro that closes all open files and windows including the macro itself. I then edited my WIN.INI file so that it opens this macro—thereby closing Sheet1—each time I start up *Excel*.

Here are the details: Open a new macro sheet, and give it a distinct name, such as XCLCLEAN.XLM. Activate cell A2 and define its range name as AUTO_OPEN. Type the formula =CLOSE.ALL() in A2 and enter =RETURN() in A3 to end the macro. You should also type AUTO_OPEN in A1 so that the macro runs immediately after the macro sheet opens. Next, hide the macro sheet so that you'll never see it again and exit *Excel* (responding Yes to the Save Changes prompt).

Next, make a backup of your WIN.INI file (for safety) and then use a text editor to modify the original. Go to the section with the heading [Microsoft Excel]. Below the last entry in this section, type Open= followed by the full path of the macro sheet you just created. Assuming you gave the sheet the name suggested above and you saved it to drive C: in the WINDOWS directory, you'd type

```
Open=C:\WINDOWS\XCLCLEAN.XLM
```

Save the changed WIN.INI as a text file.

Now, when you start *Excel*, you'll be greeted with a clean screen and a menu bar containing only the File and Help menus.

Marty Schiffenbauer
Berkeley, California

All spreadsheet programs start you out with a blank worksheet, just as *Excel* does. But, unlike *Excel*, most programs have commands that replace this opening sheet with a specified disk file. So when you load the file you really want to work with, the blank startup sheet goes away.

Replacing one worksheet with another in *Excel*, however, requires two separate actions: one to close the current file, and another to load (or create) the newcomer. While this approach prevents you from accidentally overwriting unsaved data (something that's easy to do in every version of *1-2-3*), it has the annoying side effect that Mr. Schiffenbauer describes. So either you snuff Sheet1 or it just hangs around on your screen while you work.

Mr. Schiffenbauer's macro is one way to defeat this quaint safety feature of *Excel*.

But you can also avoid the blank startup sheet by naming the file you want at the same time that you invoke *Excel*. There are a number of ways this can be done.

Whether you're starting *Excel* from the DOS command prompt or from the *Windows* MS-DOS Executive, you can type the name of the file you want after the word *Excel*. Use the format

```
EXCEL pathspec\filename.xls
```

where *pathspec* is the file's full path and *filename* is its full name. To do this from the MS-DOS Executive, use the File Menu's Run command, instead of double-clicking EXCEL.EXE. *Windows* will display a dialog box in which you can enter the full command, complete with the path and filename.

You can also add an entry to your WIN.INI file that associates all .XLS files with *Excel*, so that when you double-click any filename with the .XLS extension in the MS-DOS Executive, *Excel* starts up with the selected file (and no Sheet1). To make this alteration, use a text editor to open WIN.INI. Search for the section headed by [Extensions], add a line that reads

```
xls=excel.exe ^.xls
```

and then resave WIN.INI as a text file.

If you're already in *Windows* when you modify WIN.INI, you must quit and restart *Windows* to implement the changes.

HINTS, TIPS, QUESTIONS

Share your latest spreadsheet discovery through *PC Magazine*'s Spreadsheets. We'll pay you $50 for anything we print. Please submit your letter on a disk, together with a printout. Mail your contributions to Spreadsheets, *PC Magazine*, One Park Ave., New York, NY 10016. ■

by
Craig L. Stark

The Working Word

While we've been looking at the new *Word for Windows,* faithful *WordPerfect* aficionados have continued to submit tips and macros for making *their* favorite word processor more productive. In due course, I'll discuss some of the specific features of the much-enhanced *WordPerfect* 5.1. In the meantime, I'll present, with minimal comment, some of the reader submissions that currently threaten to make my mailbag fall victim to stack overflow.

- **ALTERNATIVE ACCENTS: Here's a faster way to enter foreign language characters.**
- **SPANISH STYLE: Modifying WordPerfect's date format for Spanish correspondence.**
- **PAGE ? of ?: WordPerfect 5.1 finally makes it easy to implement this handy page-numbering format.**

ALTERNATIVE ACCENTS

After reading Neil Rubenking's Lab Notes (*PC Magazine,* October 31, 1989), it suddenly dawned on me that *WordPerfect* 5.0's user-definable variables 0 - 9 could store *commands* as well as phone numbers.

The pair of macros in Figure 1 illustrates an alternative to the usual methods (using Alt-ASCII-numbers or Compose) of generating foreign-language characters. Entering FR puts accented French letters into variables 1 to 9 and a message at the bottom of the screen telling the user to press H for help or any other key to continue.

In addition to its ease, a further advantage of this technique is that it can be modified to create an intricate web of macros for doing just about anything, since one or more of these commands can call other commands or other macros.

Figure 1 shows the macros as you see them in the Macro Editor. In the Help menu, note that the Ctrl-letter codes ({^B}, {^C}, and so on), which designate the line on which the following characters appear, work fine up through {^G}. From {^H} through {^L}, however, the length of the commands that are associated with these control keys makes it necessary to adjust the spacing so that the box around the menu will look even on the regular screen.

Obviously, accented Spanish or German characters could be substituted for the French ones shown; there's no limit to the possibilities!

Rade Calich
Thunder Bay, Ontario
Canada

The limit that occurs to me is that Version 5.0 allows you a total of only ten variables, which is far short of what you'd need to handle all the accenting possibilities in classical Greek, for example. That limit goes away in *WordPerfect* 5.1, however, whose advanced macro programming language is incomparably stronger in every way.

SPANISH STYLE

WordPerfect is one of the most accepted word processors in Puerto Rico. Most of the business communication here is done both in English and Spanish. But to our distress, *WordPerfect*'s date format can only be applied in English.

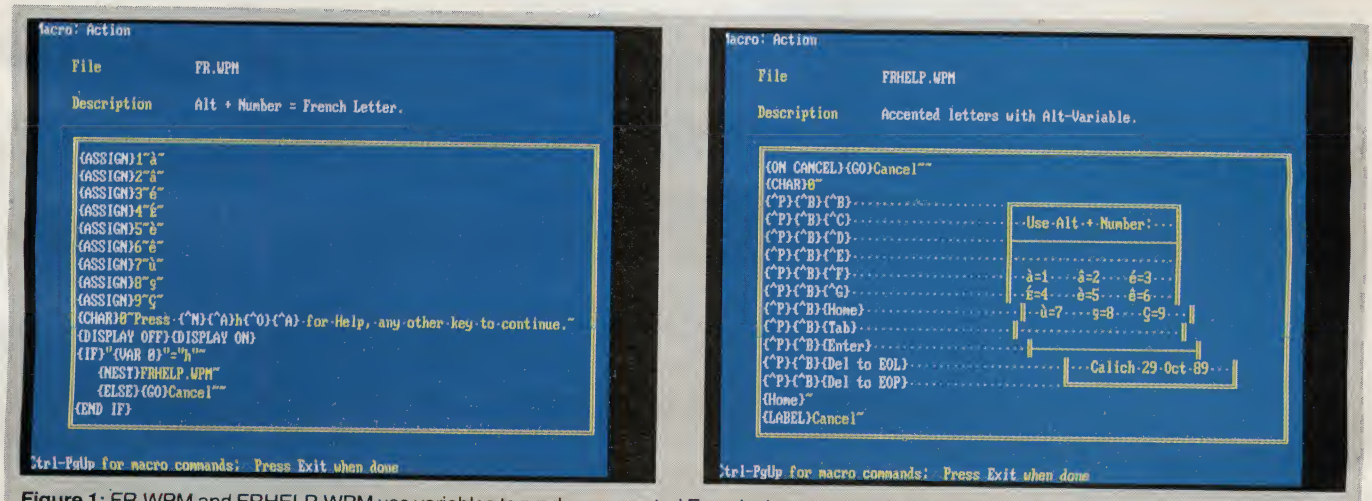

Figure 1: FR.WPM and FRHELP.WPM use variables to produce accented French characters and a nested macro to provide a help screen. Spaces between words are represented by centered dots in the *WordPerfect* Macro Editor.

FETCHA.WPM — **COMPLETE LISTING**

```
<Ctrl-F10>        {;} Begin macro definition~
<Alt-F>           {;} Call it <Alt-F> for "fecha" (date)~
<Shift-F5>3       {;} Activate date format and~
1 de <Enter>      {;} Change it to Day of Month followed by " de "~
1                 {;} Activate Date Text~
enero             {;} Enter current month, followed by a space~
<Shift-F5>3       {;} Activate date format and~
de 4<Enter>       {;} Change it to current year (4) preceded by "de"~
1                 {;} Activate Date Text~
<Enter><Enter>    {;} Two hard returns (optional)~
<Ctrl-F10>        {;} End Macro definition~
```

Figure 2: This macro adapts *WordPerfect*'s date format for Spanish-speaking letter writers.

I've created a simple macro, listed in Figure 2, for all the Spanish-speaking people who have to write at least one letter a day. Every letter needs a date, and if it can be done with a single stroke, why not do it?

Robert Caro
San Juan, Puerto Rico

Why not, indeed? Users will have to change the name of the month from *enero* to *febrero, marzo, abril, mayo, junio, julio, agosto, septiembre, octubre, noviembre,* or *diciembre* when and as appropriate. And even non-Spanish speakers will want to keep the above list of months handy if their mornings, like mine, begin with the daily crossword puzzle.

PAGE ? OF ?

It's long been hard to use *WordPerfect* macros to automate page numbering in the form "Page 1 of 5." Because the total page count is normally not known until the document has been completed, automatic page numbering, headers, and footers have had to be retrofitted manually.

The macro shown in Figure 3(A) will ease this task. And if you include it as part of a final document-saving or spell-checking macro, it will prevent you from forgetting to attend to the page-numbering details.

WordPerfect 5.1's new {SYSTEM} page~ command is the key. It reads the current page number from *WordPerfect*'s internal system and assigns it to a variable, which can then be played back to type the page-count number.

After blanking the display, the macro moves to the top of the document to create a new header. By moving the cursor above all codes, you avoid a positioning conflict that might disable the header on the first page. Note that regular page numbering must be turned off to prevent the printing of duplicate page numbers, and that the macro makes use of a user-defined variable ({VARIABLE}pgcount ~)—another new feature of Version 5.1. The { ^B} code must be inserted in the Macro Editor by holding down Ctrl and pressing B.

If a header created at the start of the session were provided with a unique place marker (for example, @^^@), the macro could easily be modified to do an extended search (Home, F2) or an extended reverse search (Home, SHFT-F2), delete the marker, and retrofit the page-count number. Extended search-and-replace (Home, ALT-F2n) or extended reverse search-and-replace (Home, ALT-F2n, Up Arrow) could also be used.

By utilizing another new feature of Version 5.1, you could implement this without using a header. Simply substitute the lines in Figure 3(B) for those below the

```
{Home}{Home}{Home}{Up}
```

code line in Figure 3(A) in the listing.

Jordan V. Hodgson
Torrance, California

Every lecture and article I write or edit uses this kind of document numbering, and it mystifies me that it's not a standard feature. Years ago, for a previous version of *WordPerfect*, it took a 50-line macro by Neil Rubenking to do the job, and PAGEOFX shows how much more powerful the macro language has become. I still find it simpler to put

```
Page «PN» of «FP»
```

in a *XyWrite* header, however.

PAGEOFX.WPM — **COMPLETE LISTING**

```
(A) Header version:

{DISPLAY OFF}
{Home}{Home}{Down}                    {;} Move to last page~

{;} Assign final page No. to {VARIABLE}pgcount:  ~
{ASSIGN}pgcount~{SYSTEM}page~~

{Home}{Home}{Home}{Up}                {;} To doc top, past all codes~
{Format}pnpn{Enter}                   {;} Turn off page numbering~
hap                                   {;} New Header A, every page~

{;} Play back variable to insert No. in header wording:  ~
Page {^B} of {VARIABLE}pgcount~

{Exit}{Exit}                          {;} Return to document screen~

(B) Non-header version:  Substitute the lines below for those that
    follow the {Home}{Home}{Home}{Up} code line above:

{Format}pns                           {;} Page Numbering Style~
Page {^B} of {VARIABLE}pgcount~
{Enter}{Exit}
```

Figure 3: Alternative header (A) and nonheader (B) macros that will cause *WordPerfect* 5.1 to number pages in the form "Page *x* of *y*."

TIPS FROM WORKING WORDSMITHS

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☐ **INDIVIDUAL CREDIT.** Complete sections "a" and "b" only.

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a. Your Personal Information

Requested Line of Credit $ _____

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Present Address Street Apt. # City State Zip **Home Phone** ( ) –

Date of Residence: Month Year **Monthly Payment: $** *Buy* ☐ *Rent* ☐ *Other* ☐

Previous Address: **Dates of Residence:** From To

Your Employer: (If self-employed, see rear panel) **Date of Employment:** Mo. Yr. **Position:** **Monthly Income:** Gross $ Net $

Employer's Address: Street City State **Business Phone:** ( ) –

Previous Employer: **Address:** **Dates of Employment:** From To

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as a basis for repaying this obligation.

Other Income:

I have received since: (Date) Monthly Income: Gross $ Net $

Name and Address of Nearest Relative Not Living With You: Relationship:

b. Credit Information

Include joint applicant's information, if joint account requested.

Bank Account: Bank Name Address ☐ Checking ☐ Savings

Bank Account: ☐ Checking ☐ Savings

	Payment	Balance
Bank Loan Reference:		
Bank Card Reference: ☐ **VISA** ☐ **MasterCard**		
Other Credit Card Reference		
Other Credit References: Account No: Expires:		

Driver's License No. State: Expires:

c. Joint Applicant's Personal Information

*If you are a married Wisconsin applicant, you must provide your spouse's information below, even though your spouse may not be signing this contract.

Joint Applicant's Name: First Initial Last **Date of Birth:** Mo. Day Yr. **Social Security Number:**

Address Street Apt. # City State Zip **Date of Residence:** Mo. Yr. **Home Phone** ( ) –

Employer: **Date of Employment:** Mo. Yr. **Position:** **Monthly Income:** Gross $ Net $

Employer's Address: Street City State **Business Phone:** ( ) –

d. Self-Employed Information

Complete this section only if you are self-employed.

Business Name: ☐ Proprietorship ☐ Corporation ☐ Partnership

Business Address: Business Telephone: ( ) –

Description of Business: Your Position: In Business Since:

Your annual income from business: Business' annual income: (gross) (net)

You must provide at least one of the following:

1. Business Bank: Name Telephone ( ) – Personal Banker's Name:
2. Accountant's Name Telephone ( ) –
3. **Financial statement on business attached.**

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by
Neil J. Rubenking

User-to-User

SAVING AND RESTORING YOUR PATH

Each application on my hard disk resides in its own directory, and I invoke it using a batch file that takes care of the dirty work of changing drives, setting the correct path, and so on.

Until recently I used batch commands like the ones shown below for saving and restoring my original path:

```
PATH > SETPATH.BAT
PATH = C:\APPDIR
MYAPP
SETPATH
```

The first line saves the value of the current path into a batch file called SETPATH.BAT, and the last line executes SETPATH to restore the path to its original state. However, if the primary batch file happens to call a second batch file that also tries to save the path in SETPATH.BAT, the path will not be properly restored when the first batch file finishes executing.

My solution is to use the two batch files shown in Figure 1. PUSHPATH.BAT saves the current path, while POPPATH.BAT restores the appropriate path. These batch files use FOR loops to search for existing files of saved paths. After determining the current "stack" level, they create unique files to hold the corresponding path.

Using PUSHPATH and POPPATH, the above lines would be replaced with

```
CALL PUSHPATH
PATH = C:\APPDIR
CALL SECOND.BAT
MYAPP
CALL POPPATH
```

There are a few things worth noting regarding the use of PUSHPATH and POPPATH:

■ The ♥ in PUSHPATH.BAT represents ASCII 3, the Ctrl-C character. If you type this file, use whatever means your word processor or editor provides for direct entry of ASCII codes.

■ SAVING AND RESTORING YOUR PATH: Here are two ways that you can save different versions of your path on a stack.

■ If you are working with a DOS version earlier than 3.3, you will, of course, need to replace all occurrences of the word CALL with COMMAND /C and to remove any "at" signs (@).

■ I have found that a "stack size" of three is sufficient for my needs. However, you can easily adjust it by changing the number of identifiers in the FOR loops.

■ These batch-file acrobatics work especially well when you use a RAMdisk. Not only do the batch files run faster and more quietly, but any temporary files will disappear when the machine is turned off. If you aren't using a RAMdisk, it's probably a good idea to include a line in your AUTOEXEC.BAT file to delete any SETPATH?.BAT files that might still remain from a previous session.

I hope other readers find PUSHPATH .BAT and POPPATH.BAT to be as useful as I have.

James N. Hancock
Redwood City, California

PUSHPATH.BAT and POPPATH.BAT — **COMPLETE LISTING**

AVAILABLE ON PC MAGNET

```
:=========================================================:
:                        PUSHPATH.BAT                     :
:      Save current path on "stack" of setpath files.     :
:=========================================================:
@echo off

set N=
for %%n in (3 2 1) do if not exist setpath%%n.bat set N=%%n

if (%N%)==() goto ERROR
   path > setpath%N%.bat
   set N=
   goto END
:ERROR
   echo.
   echo PUSHPATH ERROR:  Path stack overflow...
   echo ♥ | pause > nul
:END

        ---------------------------------------------

:=========================================================:
:                        POPPATH.BAT                      :
:       Retrieve path from "stack" of setpath files.      :
:=========================================================:
@echo off

set N=
for %%n in (1 2 3) do if exist setpath%%n.bat set N=%%n

if (%N%)==() goto ERROR
   call setpath%N%.bat
   del  setpath%N%.bat
   set N=
   goto END
:ERROR
   echo.
   echo POPPATH ERROR:  Path stack is empty...
   echo.
:END
```

Figure 1: These batch files can be used to save your current path on a "stack" of temporary files and then to restore it at a later time.

PUSHP2.BAT and POPP2.BAT — **COMPLETE LISTING**

```
:==========================================================:
:                          PUSHP2.BAT                      :
:    Save current path on "stack" of setpath variables.    :
:==========================================================:
@echo off

set N=
IF "%SETPATH3%"==""  SET N=SETPATH3
IF "%SETPATH2%"==""  SET N=SETPATH2
IF "%SETPATH1%"==""  SET N=SETPATH1

if "%N%"==""  goto ERROR
   SET %N%=%PATH%
   set N=
   goto END
:ERROR
   echo.
   echo PUSHPATH ERROR:  Path stack overflow...
   echo ♥ | pause > nul:
:END

       ---------------------------------------------

:==========================================================:
:                          POPP2.BAT                       :
:     Retrieve path from "stack" of setpath variables.     :
:==========================================================:
@echo off

set N=
IF NOT "%SETPATH1%"==""  SET N=%SETPATH1%
IF NOT "%SETPATH2%"==""  SET N=%SETPATH2%
IF NOT "%SETPATH3%"==""  SET N=%SETPATH3%

if "%N%"==""  goto ERROR
   PATH %N%
   set N=
   IF NOT "%SETPATH1%"==""  SET N=SETPATH1
   IF NOT "%SETPATH2%"==""  SET N=SETPATH2
   IF NOT "%SETPATH3%"==""  SET N=SETPATH3
   set %N%=
   set N=
   goto END
:ERROR
   echo.
   echo POPPATH ERROR:  Path stack is empty...
   echo.
:END
```

Figure 2: These batch files also save and restore your current path, but they use a stack of environment variables to do the job.

Note that this system will break down if your temporary path doesn't include the directory containing PUSHPATH.BAT and POPPATH.BAT—DOS will not be able to find the file that POPPATH calls. Instead of *replacing* the old PATH with a new one, you might consider simply *adding* the new path. In the example shown above, you would use

```
PATH C:\APPDIR;%PATH%
```

in place of

```
PATH C:\APPDIR
```

You can use PUSHPATH and POPPATH at the DOS prompt, too, as long as they remain available on the new path you set. Just PUSHPATH, change the path, do whatever it is you have to do, and then POPPATH.

There's an interesting line in PUSHPATH.BAT. It echoes a ^C (Ctrl-C, represented in the batch file by a ♥), pipes it to PAUSE, and redirects the PAUSE message to NUL. The result is a "Terminate batch job? (Y/N)" prompt, as if you had pressed ^C from the keyboard. If you answer Y, not only will PUSHPATH terminate, but so will the batch file that called it. It works only with CALL, not COMMAND /C, so if you're using a DOS version earlier than 3.3, replace this line with a simple PAUSE.

For a further exercise in batch programming, I converted Mr. Hancock's batch programs so that they would use environment variables rather than temporary files. You may find this method slightly faster. Note, however, that these files work *only* with CALL, not COMMAND /C. If your DOS version doesn't have the CALL command, stick to PUSHPATH.BAT and POPPATH.BAT.

> **For a further exercise in batch programming, I converted these batch programs so that they would use environment variables rather than temporary files. You may find that this method is slightly faster.**

Figure 2 shows my batch programs, PUSHP2.BAT and POPP2.BAT. PUSHP2 isn't very different from PUSHPATH: environment variables replace the temporary batch files. Instead of redirecting the current path to a file, we just SET the variable whose name is contained in N to the current path.

In POPP2, we have to check the stacked-up path variables twice: The first time, we put the *contents* of the top item on the stack into N and then set the PATH to that value. The second time, we get the *name* of the top item and clear out its contents. Since this is all happening in memory, checking the variable twice hardly slows things down.

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by Jeff Prosise

Tutor

USING CODE PAGES

I've tried to use code pages with a Model 80, an IBM Proprinter, and DOS 3.3 to type and print Canadian-French characters—so far without success. The DOS manual makes it so difficult that I wonder if it's supposed to work at all. Can you provide some guidance?

J. David Williams
Vancouver, British Columbia
Canada

■ USING CODE PAGES: Code-page switching adds multilanguage support for displays and printers—if you can figure out how to set it up.

■ A NEAT TRICK: The NEAT CHIPSet combines control logic for ATs and support for LIM 4.0.

No doubt about it—IBM's documentation on code-page switching is quite poorly presented. Nonetheless, code-page switching does work, provided you set it up correctly in the very beginning. For starters, you can try adding the following lines to your CONFIG.SYS file:

```
DEVICE=d:[path]DISPLAY.SYS
 CON=(EGA, 437, 2)
```

```
DEVICE=d:[path]PRINTER.SYS
 PRN=(4201, 437, 2)
```

Then add these lines to your AUTOEXEC.BAT

```
NLSFUNC d:[path]COUNTRY.SYS
```

```
MODE CON CP PREPARE=((437 863)
 d:[path]EGA.CPI)
```

```
MODE PRN CP PREPARE=((437 863)
 d:[path]4201.CPI)
```

Substitute the correct path information in place of the d:[path] designations in all of these commands. Normally, this will be the drive and path where your DOS files are stored. When your Model 80 boots up with these parameters, it will default to code page 437—the default code page when no code-page commands are given. To switch to code page 863, which contains the Canada-French character set, type CHCP 863.

To demonstrate what code-page switching does, display an "a" accented with an acute diacratic by holding down the Alt key and entering 160 on the numeric keypad. Then press Enter (ignore the "Bad command or file name" DOS message). Next, type CHCP 863 and watch the accented character on the last line change to a " | " symbol. In response to the CHCP command, DOS downloaded the Canada-French character set to your VGA so that ASCII code 160 is displayed as a " | " rather than an "á."

What exactly is code-page switching? Code pages were added in DOS 3.3 to provide multilanguage support for displays and printers. Code page is a fancy term for a table of 256 characters corresponding to ASCII codes 0 through 255. By using special device drivers, DOS allows you to load different code pages so that what you type on the keyboard shows up differently on the screen and printer. DOS 3.3 provides five user-selectable code pages, listed in Figure 1. The contents of these code pages are illustrated in Appendix C of the DOS, Version 3.3, user's manual.

One catch to code-page switching is that it requires display adapters and printers to be compatible with IBM's drivers. For displays, you need an IBM-compatible video adapter that will accept downloaded fonts—an EGA or VGA. For printers, only the IBM Proprinter 4201 and IBM Quietwriter III 5202 are supported. If you don't own an IBM printer, you can use code-page switching on the display alone provided you can live without hardcopies of what appears on the screen.

The keys to code-page switching are the DISPLAY.SYS and PRINTER.SYS device drivers and the NLSFUNC, MODE, and CHCP commands. DISPLAY.SYS and PRINTER.SYS, loaded with DEVICE=*commands in CONFIG.SYS*, are used to control display adapters and printers, respectively.

```
DEVICE=DISPLAY.SYS CON=(EGA, 437, 2)
```

tells DOS to load DISPLAY.SYS for an EGA or EGA-compatible display adapter, that the hardware code page (the default character set built into the adapter) is code page 437, and that space should be reserved in memory for two additional code pages. Similarly,

```
DEVICE=PRINTER.SYS PRN=(4201,
 437, 2)
```

tells DOS that the attached printer is a Proprinter Model 4201, that the hardware code page is 437, and that it should also reserve room for two more code pages.

Once the device drivers are loaded, new code pages must be *prepared* before they can be used. The command

```
MODE CON CP PREPARE=((437 863)
 d:[path]EGA.CPI)
```

CODE PAGES SUPPORTED IN DOS 3.3

Code page no.	Code page description
437	United States
850	Multilingual
860	Portugal
863	Canada—French
865	Norway

Figure 1: Here are the five international code pages supported by DOS 3.3. New code pages can be assigned to compatible printers and display devices using the device drivers PRINTER.SYS and DISPLAY.SYS.

tells DOS to prepare code page 863 for use with the display device (CON). Code page 437 is already prepared by virtue of having been declared the hardware code page when DISPLAY.SYS was loaded. DOS uses information in EGA.CPI to program the display adapter for downloadable fonts. Likewise, the command

```
MODE PRN CP PREPARE=((437 863)
 d:[path]4201.CPI)
```

prepares code page 863 for use with the Proprinter. The device names LPT1, LPT2, and LPT3 can be used in lieu of PRN to prepare code pages for specific printers if more than one is attached.

Before the MODE command is invoked, you must execute an NLSFUNC (National Language Support FUNCtions) command. NLSFUNC is a RAM-resident program that provides the functions DOS uses to switch between code pages. The parameter passed with NLSFUNC is the name of the country information file that comes with the operating system, COUNTRY.SYS.

Once these steps are completed, you're ready to start switching back and forth between code pages. There are two ways to switch. One is with the MODE CP SELECT command.

```
MODE CON CP SELECT=863
```

sets the active display code page to 863;

```
MODE PRN CP SELECT=863
```

does the same for the printer. Rather than typing two MODE CP SELECT commands, you can change the code page on both devices with a single CHCP command. CHCP 863 switches the active code page to 863 for all devices. One possible hitch is that CHCP can be rather finicky. If you're using code pages on the display device but not on the printer, for example, CHCP will return an error message. The fallback is to use the device-specific MODE CP SELECT command, even though it is verbose by comparison.

One thing you'll find about code pages is that although they give you access to a wider range of characters, they don't do anything to help you type those characters. To help, DOS offers the KEYB command. KEYB loads a set of memory-resident routines which take over keyboard processing from the BIOS and substitute their own logic for translating scan codes to ASCII codes. Not only does KEYB remap the keyboard to better suit the language in which it is being used, it also adds the capability to enter selected characters with "dead-key combinations"—combinations of alphanumeric keys typed in sequence with other keys to produce special versions of selected characters.

The general syntax for the KEYB command is

```
KEYB [country[,[code page],
 d:[path]filename]]
```

in which the country is a two-character code denoting the language the keyboard is to be used in; code page is the code page to be loaded, and the filename is the name of DOS's keyboard definition file, KEYBOARD.SYS. The command

```
KEYB CF, 863, d:[path]KEYBOARD.SYS
```

changes the mapping of the keyboard to match that of the Canada-French keyboard. Figure 2 shows the different country codes that DOS supports.

With KEYB loaded, the right Alt key on the Model 80's enhanced keyboard becomes an auxiliary Shift key that allows certain keys to produce the additional characters diagrammed in Appendix E of the DOS 3.3 manual. In addition, you can use the dead-key combinations. With KEYB loaded for the Canada-French keyboard layout, for example, typing the apostrophe key followed by an "a" produces an "a" with a grave diacritic (à). Typing the Close-square-bracket key followed by "C" produces a "Ç." The letter "a" preceded by the Open-square-bracket key produces "â," while "a" preceded by Shift-] produces the character "ä."

KEYB is really intended for use with the 102-key keyboards sold in foreign countries, not the 101-key models we're accustomed to in the United States. Nonetheless, it works on 101-key keyboards, but it takes a little practice to learn where the keys are located because there's not a one-to-one correspondence between keys on the two versions of the keyboard.

OS/2 also provides support for code pages, controlled in much the same way as they are in DOS. If you one day decide to switch to OS/2, you won't have to give up the ability to type characters in different languages.

VALID COUNTRY CODES

Country	Code
Australia	US
Belgium	BE
Canada (Eng.)	US
Canada (Fr.)	CF
Denmark	DK
Finland	SU
France	FR
Germany	GR
Italy	IT
Latin America	LA
Netherlands	NL
Norway	NO
Portugal	PO
Spain	SP
Sweden	SV
Switzerland (Fr.)	SF
Switzerland (Ger.)	SG
United Kingdom	UK
United States	US

Figure 2: Shown here are the international languages supported by DOS 3.3 and the KEYB country codes that correspond to them.

A NEAT TRICK

What is the NEAT CHIPSet that I've heard so much about, and what does it do that other chip sets don't?

Audrey Blackburn
Ashland, Oregon

NEAT stands for New Enhanced AT. The NEAT CHIPSet is a product from Chips and Technologies that combines all the control logic needed to drive an AT into four tightly integrated VLSI chips: an 82C211 CPU/Bus Controller, an 82C212 Page/Interleave and EMS Memory Controller, an 82C215 Data/Address Buffer, and an 82C206 Integrated Peripherals Controller.

What's so remarkable about the NEAT CHIPSet, other than the fact that it makes it easy for systems integrators to build 12- and 16-MHz AT-compatible systems around the Intel 80286? One important reason is that it includes built-in support for LIM 4.0 expanded memory. PCs designed with NEAT CHIPSets do not need additional EMS hardware to access expanded memory in the DOS environment. In addition, the chip set features ROM shadowing capabilities that permit routines encoded in ROM to be offloaded to faster

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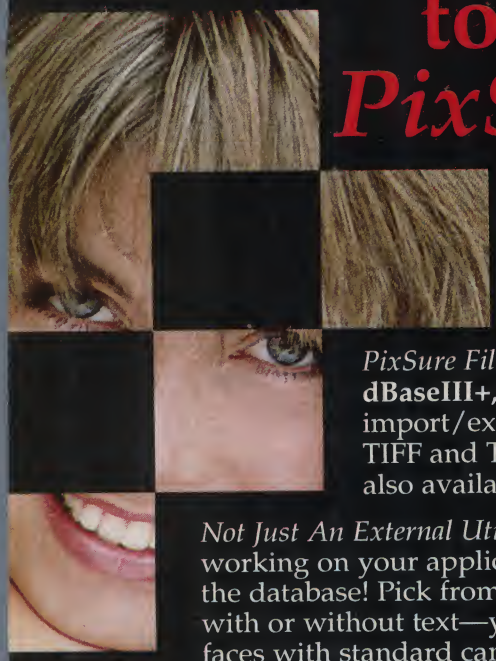

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RAM, a feature more commonly found in 386-based PCs.

Another difference that distinguishes the ATs built with the NEAT CHIPSet is that several features of the hardware can be configured through software. The number of wait states with which the CPU operates when accessing memory, for example, can be set to 0, 1, 2, or 3 with a simple OUT to an I/O port. Bus timing can be changed in order to adapt to different I/O speeds. And the memory subsystem can be configured for page-mode or page-mode/interleave operation with various combinations (you read it right—combinations) of 64 kilobits, 256 kilobits, and 1 megabit DRAM chips.

The NEAT CHIPSet combines all the control logic needed to drive an AT into four VLSI chips.

Chips and Technologies also offers the SCAT (Single-Chip AT) chip set for 12.5-MHz ATs, the NEATsx CHIPSet for 386SX systems, the PEAKset/386 chip set for 16-, 20-, 25-, 33-, and 40-MHz 386 systems, and chips for building XT clones, PS/2 clones, VGA- and 8514/A-compatible video adapters, and more. The benefit to the end user: a greater variety of small-sized PCs and peripherals to choose from, and as a result, better prices.

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PC MAGNET

CIRCLE 497 ON READER SERVICE CARD

PC Magazine, December 26, 1989...

"Northgate's SlimLine™ 320 is a good reason for not buying a 386SX™...When it's this good, this cheap, why buy less?"*

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PC Magazine said: "(SlimLine) doesn't take up a lot of room...but it delivers plenty of computer for a price you might expect to pay for a 286 system."

The heart of the system is a new Northgate proprietary motherboard with built-in hard and floppy disk controllers, 2 serial and 1 parallel port and 16-bit VGA video. Smaller than a sheet of legal paper. It gives you a host of features that are add-ons in others' systems. Even our clock/calendar method is guaranteed for 5 years without using old-fashioned batteries. And with five expansion slots, you have plenty of room for all your peripherals.

Use it at office or home. Run the latest multi-tasking applications under Windows® or Northgate's OS/2.® Crunch numbers on the biggest spread sheets. Sort, search and select data in your databases at the blink of an eye. Use it as a file server, and if you're looking for high performance terminals in a network environment, SlimLine 320 is an ideal solution.

And remember... your Northgate SlimLine 320 is backed by expert technical support any time you need it. Call toll-free, 7 days a week, 24 hours a day. On-site deskside service is available 6 days a week (to most locations) if we can't solve your problem over the phone.

Of course, SlimLine 320 comes with a 1-year limited warranty on parts and labor; 5-years on the *OmniKey* keyboard. If a part fails, we'll ship a replacement to you overnight at our expense before you return your part.

SYSTEM FEATURES

- Intel 80386-20MHz microprocessor
- 2Mb of RAM; expandable to 16Mb (8 on motherboard)
- 40Mb hard drive with 28ms access time
- 3.25" 1.44Mb and 5.5" 1.2Mb Floppy Disks (reads, writes and formats low density diskettes)
- Page mode memory system
- Integrated high performance 16-bit VGA color controller with 256K video RAM supporting 800x600 line resolution
- Integrated high performance floppy and hard disk controller on the motherboard
- 1 parallel and 2 serial ports
- 5 expansion slots (3 full-size 16-bit I/O boards; 2 half-length 8-bit)
- 14" NEC 2D VGA Color Monitor
- Exclusive *OmniKey*/PLUS Keyboard
- DOS 4.0 and GW Basic Software Installed
- FCC Class B Certified

**PC Magazine* December 26, 1989 reviewed the Northgate MicroStation 386/20. This system has been upgraded and is now named the "SlimLine 320."

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Wendy's modems of choice are the UDS Sync-Up™ V.32 and Sync-Up 2/V.32. They connect Wendy's remotely sited microcomputers with the corporate mainframe. Collectively they give Wendy's a full-duplex, 9600 bps data link to every company location, no matter how remote. UDS provides maximum reliability, ongoing customer support and a virtually error free communications environment.

If your modem requirements are too critical for compromises, do as Wendy's has done: contact Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805-1993. Phone 205/430-8000; FAX: 205/721-8926.

UDS

MOTOROLA

CIRCLE 367 ON READER SERVICE CARD

by
Frank J. Derfler, Jr.

Connectivity

AUTOMOTIVE CONNECTIVITY

Nobody asked, but I have to tell you about a neat connectivity product that will interest many of you. I'm comfortable with the insides of multiprocessor, multigigabyte servers, but the black boxes under the hoods of modern automobiles terrify me—they didn't exist when I learned my auto mechanic skills on a 1957 Chevy. My timing light and dwell meter still work on boat engines, but they aren't much good on today's automobiles. Current models use multiple microprocessors and an array of sensors and controls to keep everything running in a balanced system. Someone equipped with only a screwdriver and a timing light would need a lot of luck to get a modern engine running properly.

A product called *Diacom,* produced by Rinda Technologies and marketed by Mextel ((312) 595-4146), provides the software and hardware needed to connect a PC or laptop to almost all General Motors automotive computer systems. This is a connectivity product with some really practical at-home applications!

Diacom includes a wiring harness that connects to the diagnostic port under the hood and software that captures and decodes the output from GM's Computer Command Control system. The harness connects to the parallel port of a PC. The *Diacom* system works with GM cars from the 1981 model year and later.

After you connect, your PC's screen displays up to 30 real-time readouts including engine speed, carburetor settings, ignition performance, and voltages and temperatures around the car. Did you know you can get a real-time readout of the temperature in your catalytic converter? Car buffs will find a permanent way to cable the diagnostic port to the passenger compartment so that you can regularly benchmark-test performance on the road. Buckle a laptop into the passenger's seat and you can compare parameters under actual loads.

Diacom includes an information database that offers help for interpreting the readings you see. Frankly, for anyone with an interest or business in cars, this is one super connectivity tool.

- **AUTOMOTIVE CONNECTIVITY: Did you ever think you'd be able to connect your car to your PC? Here's a product that lets you do just that!**
- **YOU GET WHAT YOU PAY FOR: Low-quality network components cost more than you think.**
- **MOVING DATA THE EASY WAY: Portable hard disk drives provide extra storage and an easy way to ship data to distant locations.**
- **LINKING PCs TO SPERRY MAINFRAMES: Make transferring data an easier task.**

YOU GET WHAT YOU PAY FOR

We found out, the hard way, the *real* cost of using low-quality network components. Our organization had several nagging problems with some of our thin-wire Ethernet LAN segments, and we later discovered that a previous contractor had cabled parts of our system with inferior components. As the installed cabling aged, we had problems ranging from machines that were unable to see the network to entire network segments crashing for no obvious reason.

Poorly formed crimp connections on our thin Ethernet segments caused some of the difficulties. We discovered this by using a Time Domain Reflectometer (TDR), an ohmmeter, and the tried-and-true "wiggle all the wires" method. Whenever we found a bad connector, we replaced it with a new, high-quality Amphenol connector and used the recommended crimping tool to apply it. A good crimping tool isn't cheap, but using the wrong tool, even with a good-quality connector, can lead to later problems.

It's also important not to skimp on the quality of T-connectors. A penny-pinching contractor installed some generic T-connectors in our system—they weren't military specifcation, and nothing identified the manufacturer.

The flaw with these T-connectors lies in their construction. The "T" portion of the connector is glued into the notch of a straight barrel connector. The glue appears to be a conductive epoxy, however, it fails over time—and then the fun begins. These little beauties caused us significant grief, including a single machine that never recognized the network, several machines that recognized the network intermittently, and torrents of electronic collisions that brought down the network segments and servers. We currently use Amphenol Mil-Spec connectors and haven't had any problems with them.

Here are some suggestions. If you're having problems related to aging thin-Ethernet cabling, inspect the connectors for a good solid fit. Then check your T-connectors for a Mil-Spec number and manufacturer's logo. If you don't see them, test the T-connector to see if you can break it apart with your bare hands. If you are able to, you should probably replace the connectors with a brand that meets the military specification UG-274. It's surprising how many problems arise from something as simple as a faulty T-connector. You won't regret using quality network components and you'll save yourself many headaches. Remember, you get what you pay for!

Greg Campbell
Oakton, Virginia

PC MAGAZINE I dumped an old LAN Labs T-shirt box, labeled T-connectors, on my desk and counted 43 T-connectors and several oyster shells that were left over from the last LAN Labs beach party. Out

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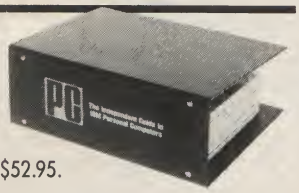

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of that assortment, we found six connectors constructed so that the splice between the male sleeve and the dual female barrel is a simple V-slot instead of a reinforced ring.

If a T-connector meets military specification UG-274, it will say so somewhere on the body of the barrel or on the lip of the male connector. You should look for that specification before you install or accept Ethernet T-connectors. We recommend replacing all unmarked generic connectors. With high-quality connectors retailing for $35 and crimping tools for $50, you'll probably have an urge to scrimp, but it just isn't worth it.

Similarly, don't scrimp on the cable itself. Markings on the cable should identify it as RG58/A-AU or as conforming to IEEE 802.3 specifications. Don't confuse the 53-ohm impedance RG58/A-AU cable with the 73-ohm RG59/A-AU used in IBM's 3270 system, ARCnet, and other systems.

The radio industry was recently plagued by low-quality coaxial cabling that allowed unacceptable power losses at high frequencies. I haven't heard of problems in the LAN industry yet, but to be safe, buy brand-name cabling that is clearly labeled with the standards it meets.

MOVING DATA THE EASY WAY

Can you use a portable hard disk drive with *NetWare?* We want to configure software in our Chicago headquarters and ship it to the field offices already installed on hard disk drives. Is there a good portable drive that runs *NetWare?*

John Nickelson
Chicago, Illinois

Iomega Corp.'s Bernoulli Box runs fine under *NetWare* as either a boot drive or a secondary storage device. The 5.25-inch cartridges hold 44MB and are easy to ship. Response time isn't great for shared-access purposes, but the main appeal is portability. A Bernoulli Box is also an excellent device for archiving important information. You can easily mail cartridges between offices for safekeeping. We've found that the Bernoulli Box drives are very reliable. Contact Iomega at (801) 524-2000 for more information.

But, if you're interested in a really fast, low-cost alternative with more storage capacity, consider the new Plus HardCard II 40 or 80 from Plus Development Corp. If you already have a server, don't bother with the $849 HardCard II 40; go for the $999 HardCard 80 and you'll get a *NetWare*-compatible drive-and-controller combination with 80MB of storage, an amazing 19-millisecond access time, and 64K of on-board cache. This is absolutely the perfect way to add another drive to your server or to configure a small server for initial operation. People in the sales or service industries can carry a HardCard II with them, and configure any machine with a free 16-bit slot as a *NetWare* server in about as much time as it takes to remove the cover.

A HardCard is more difficult to mail than a Bernoulli Box cartridge, but it gives faster data-retrieval times. The phone number for Plus Development Corp. is (408) 434-6900.

LINKING PCs TO SPERRY MAINFRAMES

One of our clients has a Unisys (Sperry) mainframe computer. We need to connect PCs to the mainframe as Sperry UTS 40 terminals so that we can pull data from the mainframe and capture it. What options do we have?

John Burbank
Crystal City, Virginia

Unisys can help you, of course, but there is another company that has a well-earned predominance in the PC-to-Sperry connection market. Chi (rhymes with *sky*) Corp. in Cleveland, Ohio provides solutions to tough multivendor communications problems. It has an excellent UTS 40 emulation package and can describe many different ways to transfer information between PCs and Unisys/Sperry machines. Contact Chi at (216) 831-2622.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay $50 for any tips we print. Please submit your letter on a disk along with a printout. Then mail your contributions to Connectivity, *PC Magazine,* One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (be sure to use Derfler's box named PC MAGAZINE LAN LABS). We're sorry, but we're unable to answer letters personally. ■

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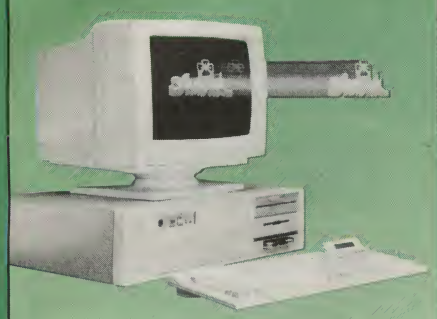

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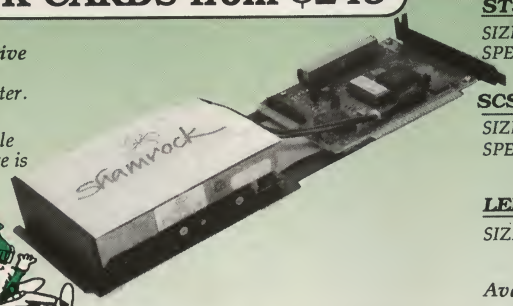

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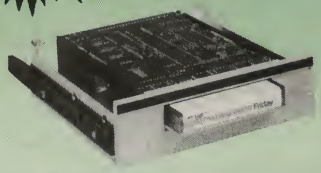

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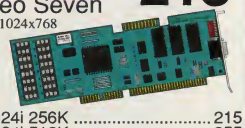

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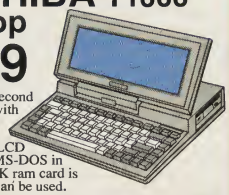

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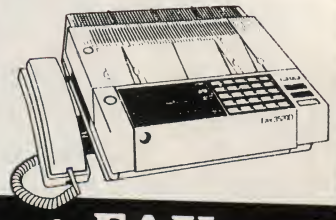

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June 27, 1989
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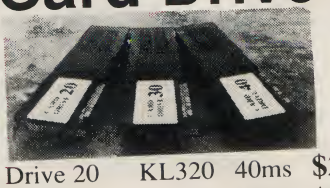
Card Drive™



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Card Drive 40	M8450	46ms	$319

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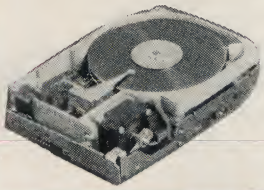

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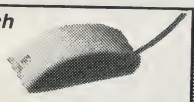

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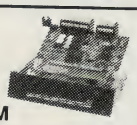

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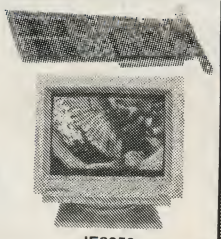
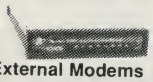


JE3050

Modems

9600E Pictured



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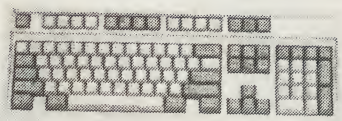

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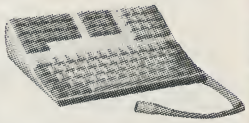

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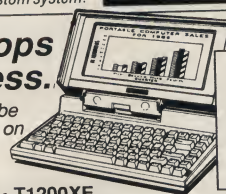

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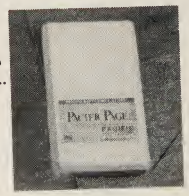

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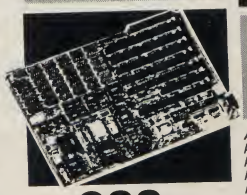

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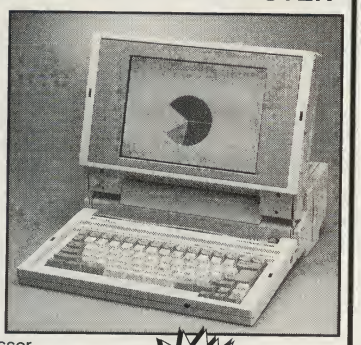

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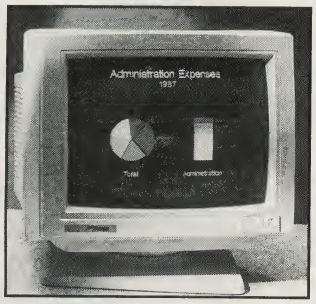

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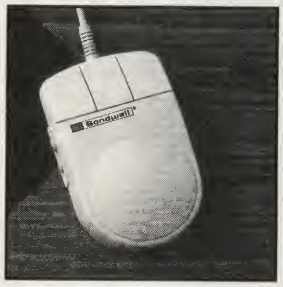

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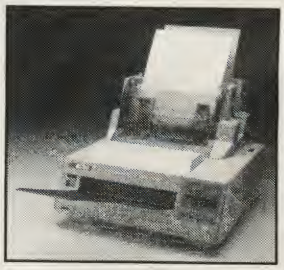

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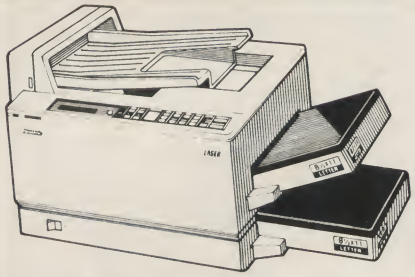

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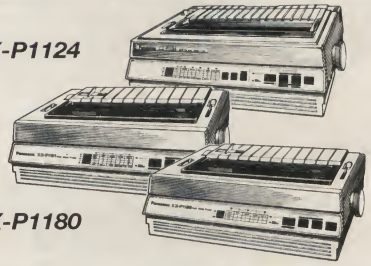

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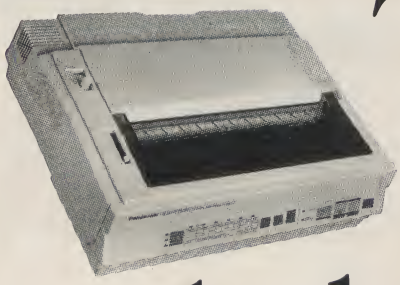

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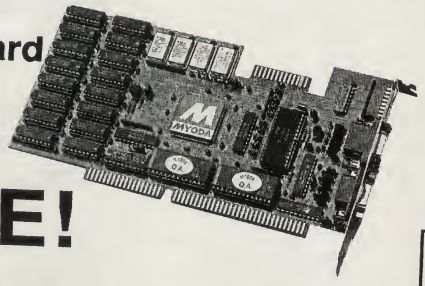

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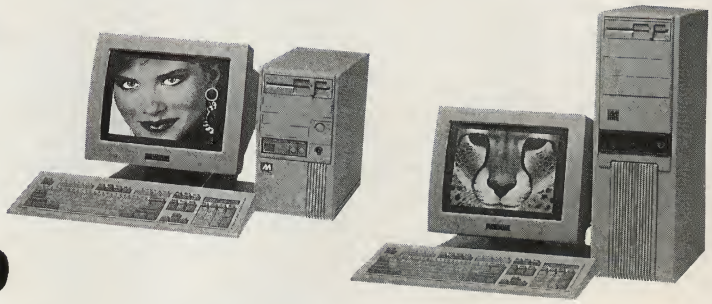

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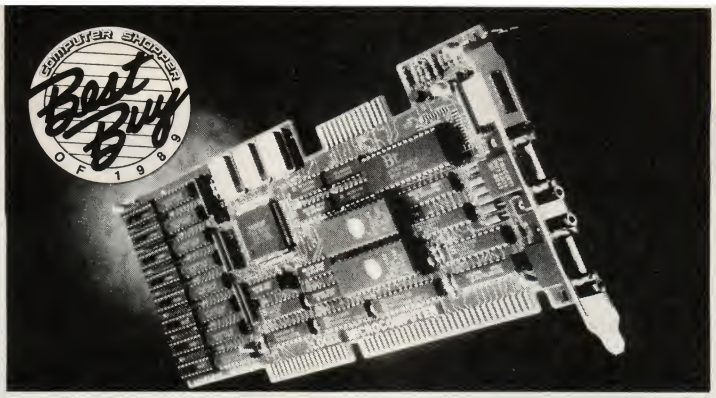

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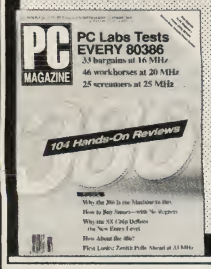

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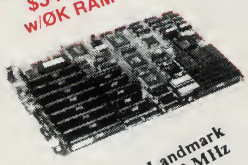

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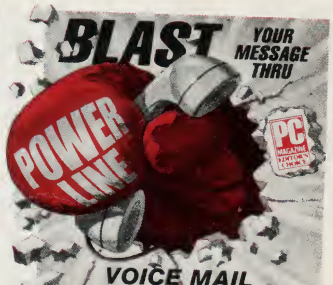

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Mail order sales are governed by rules of the Federal Trade Commission (FTC) and various state laws. These guidelines are published as a service to you. Remember, the many vendors advertising in this section are eager to serve your needs.

FTC rules say:

1. The Seller must ship your order within 30 days of receiving it, unless the advertisement clearly states it'll take longer.

2. If it appears that your order will not be shipped when promised, the Seller must notify you in writing in advance of the promised date, giving a definite new date, if known, and offering you the opportunity to cancel the order with a refund or consent to a definite delayed shipping date or an indefinite delay.

3. The Seller's notice must contain a stamped self-addressed card or envelope with which you can indicate your preference. If you don't respond to this notice, the Seller may assume you agree to the delay, but must either ship or cancel your order within 30 days after the original shipping date promised or required. A prompt refund must be made when an order is cancelled.

4. Even if you've consented to an indefinite delay, you retain the right to cancel the order at any time before the item has been shipped.

5. If you choose to cancel an order, that has been paid for by check or money order, the Seller must mail you a refund within seven business days. If you cancel an order for which you paid by credit card, the seller must credit your account within one billing cycle following receipt of your request. Store credits or vouchers in place of a refund are not acceptable.

6. In the event that the item you ordered is unavailable, the Seller may not send you substitute merchandise without your express consent.

TIPS WHEN ORDERING

When ordering by mail:

State precisely what merchandise you want, specifying details such as model, make, size, component parts, etc.;

Confirm the price and expected delivery date as stated in the ad;

Indicate whether you will accept a substitute product if the item you ordered is unavailable, and, if not, that your payment should be returned;

Don't send cash, you will have no record of payment if a problem arises, and;

Keep a copy of your order and all other correspondence with the Seller. Your records should include the company's name, address and phone number; a description of the item ordered; your cancelled check or a copy of the money order; record of the date you mailed the order, or the time and date of your conversation, and the name of the person you talk with; and any sales slips and shipping receipts.

Ask about servicing and refund/return policies and with whom you should correspond if there is a problem.

IF YOU HAVE PROBLEMS

1. If you have not received your order as promised or if the item is defective, immediately notify the Seller in writing referring to your order by description, price, date, as well as by account number and order number, if available. Make sure you keep a copy of the letter.

2. If you complain by telephone, send a follow-up letter to confirm what was said.

3. If you think the merchandise is defective, reread your product instructions and your warranty carefully to be sure you don't expect features or performance the product isn't designed to give. Then contact the Seller for instructions. Don't return it to the Seller until you have been instructed to do so.

4. When returning merchandise make sure you keep the shipper's receipt or packing slip; your right to be reimbursed for postal cost is determined by store policy.

5. If you have completely discussed your problem with the Seller and are still not satisfied, write to the consumer complaint agency in the Seller's state. If you paid for the merchandise by credit card, you may have rights to withhold payment under a Federal law called the Fair Credit Billing Act.

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PC 5/15-5

1. In which of the following sectors does your organization operate? (Check one.)
a. ☐ Private industry
b. ☐ Government
c. ☐ Education

2. Your primary job function is (check one):
d. ☐ MIS/DP, Communications Systems, Programming
e. ☐ Engineering/R&D
f. ☐ Finance/Accounting
g. ☐ Marketing/Sales
h. ☐ Administrative/General Management

3. Is your company a reseller?
i. ☐ Yes
j. ☐ No

4. For how many IBM PCs and compatibles do you specify brands of products?
k. ☐ 10 or less
l. ☐ 11-25
m. ☐ 26-100
n. ☐ 100 or more

5. Are there any PCs in your office? (Check all that apply.)
o. ☐ Linked to mainframe
p. ☐ Linked to mini
q. ☐ Networked together

6. Does your company own
r. ☐ Mainframe(s)
s. ☐ Mini(s)
t. ☐ VAXes

7. Do you plan to buy any PC product?
u. ☐ Now
v. ☐ In 4 to 6 months
w. ☐ In 6 to 12 months
x. ☐ No definite plans

8. Number of employees in your entire company?
y. ☐ 25 or less
z. ☐ 25-99
1. ☐ 100-499
2. ☐ 500-999
3. ☐ 1000 or more

9. Are there any Macintosh computers in your office?
4. ☐ Yes
5. ☐ No

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o. ☐ Linked to mainframe
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q. ☐ Networked together

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r. ☐ Mainframe(s)
s. ☐ Mini(s)
t. ☐ VAXes

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v. ☐ In 4 to 6 months
w. ☐ In 6 to 12 months
x. ☐ No definite plans

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z. ☐ 25-99
1. ☐ 100-499
2. ☐ 500-999
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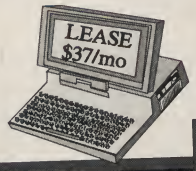

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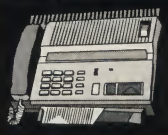

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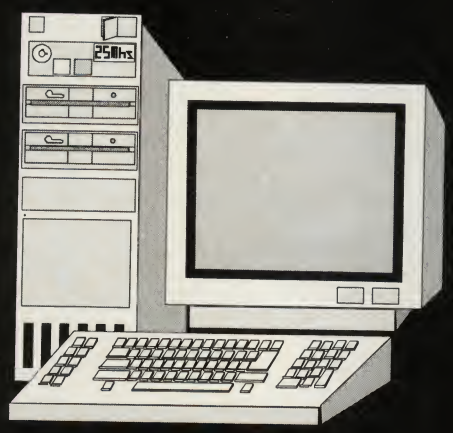

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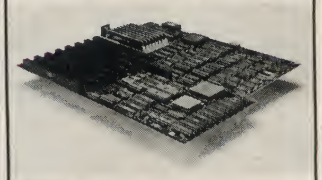

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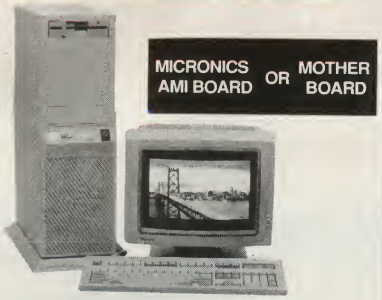

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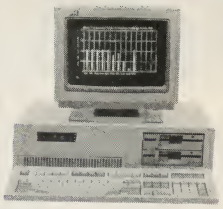

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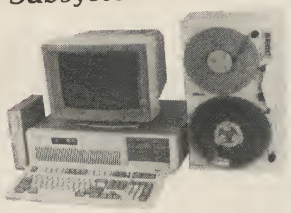

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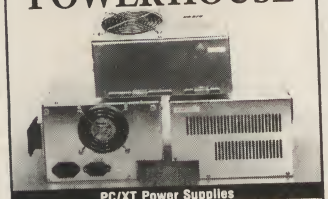

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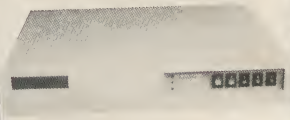

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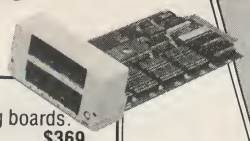

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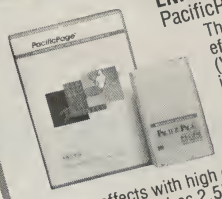

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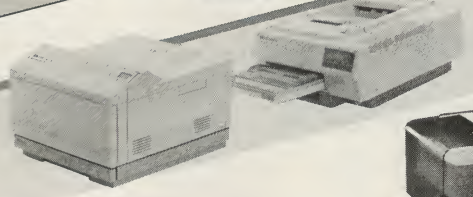

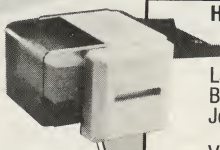

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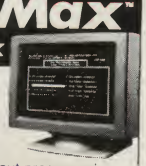

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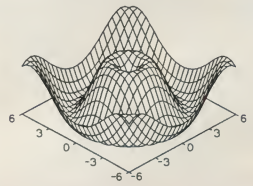

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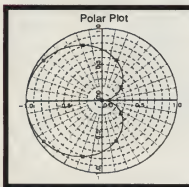

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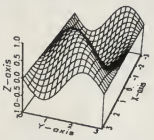

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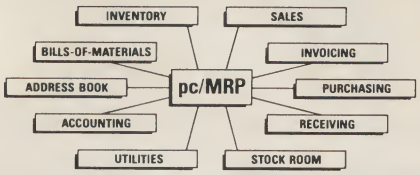

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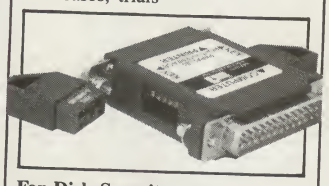

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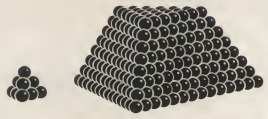

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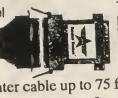

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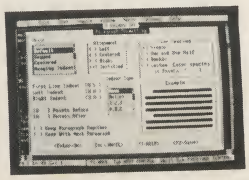

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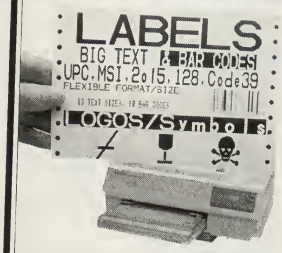

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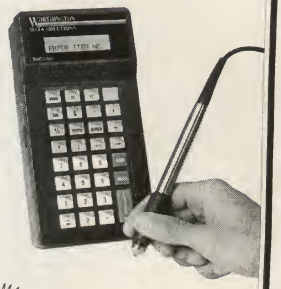

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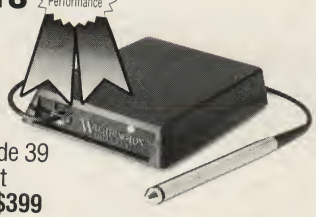

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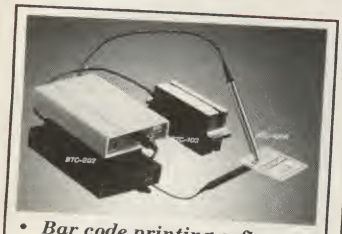

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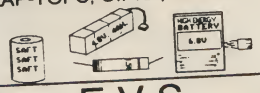

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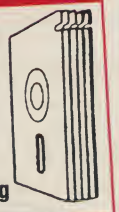

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COMING UP

PC MAGAZINE

■ SPECIAL ISSUE: THE POWER OF NETWORKING

PC Magazine's most comprehensive look yet at the hardware and software that make workgroup computing such an important part of enterprises of every size.

■ THE LATEST LAN OPERATING SYSTEMS

With each new version, complex multitasking network operating systems are getting friendlier, yet more powerful. PC LAN Labs evaluates the latest releases of eight leading network operating systems, including the many flavors of Microsoft's *LAN Manager*, Novell's *NetWare 386*, DSC's *NEXOS*, AT&T's *StarLAN*, and Banyan Systems' *VINES*.

■ LOW-COST DOS-BASED LANS

Even the smallest organization can reap the benefits of workgroup computing with an inexpensive (as low as $200 per node) LAN. Take a look at 11 low-cost systems, including Artisoft's *LANtastic*.

■ CAN LANS SPEED PAST MINIS?

PC LAN Labs and *Digital Review* Labs join forces for unprecedented real-world benchmark testing of a variety of PC-based LANs, Unix systems, and DEC VAXs.

■ SERVERS ON THE CUTTING EDGE

They aren't minicomputers, but you can't exactly call them PCs either. New servers from Compaq, American Mitac, and NetFrame Systems priced between $20,000 and $50,000 will make you reconsider the entire future of LANs.

■ PRINTING WITH LANS

Did you originally put your LAN together just so you could share laser printers? Many people did, only to be frustrated by confusing spoolers and queues. PC Labs takes a look at LAN printing utilities that do your print job right. ■

After Hours

Products for the Leisure Side of Personal Computing

Family Tree Maker Brings Easy Genealogy to Everyone

GENEALOGY
by Don Trivette

Is your third cousin, twice removed, really the granddaughter of Abraham Lincoln's mother's stepsister? If questions like that interest you, then consider buying a copy of *Family Tree Maker,* one of the newest products in the genealogy software market. Of course, no genealogy program will perform the research for you or tell you who your ancestors were, but *Family Tree Maker* can help you to preserve and display what you compile.

Family Tree Maker organizes ancestors in a card-file metaphor, which makes data entry and editing the slickest and most logical of any genealogy program I've ever used. For example, type in the name of your grandfather, his dates of birth and death, the name of his spouse, and the names of their children. Then, to enter a child's spouse and children, simply highlight the child's name and press F6—a new card pops up with the child's name at the top. There are no ID numbers to remember or codes to manipulate; the name field is free-form, so there are no specific spaces reserved for last, first, and middle names.

ATTRACTIVE OUTPUT

If input and editing are good, hardcopy output is even more impressive. Indeed, *Family Tree Maker* prints a family tree in pictorial form that is suitable for framing or publication. A variety of options allows you to select border design, box design, and text placement to achieve truly handsome results. Most trees are too big to be conveniently printed on a single sheet of ordinary paper, so the program produces overlapping sheets that can be taped together to make a large chart. There's even a preview feature that displays the tree before printing it. As a bonus, *Family Tree Maker* comes with 25 sheets of parchment-like paper.

Unfortunately, *FTM* lacks an import/export feature, so if your data is already recorded in another format, like the one used by the popular *Personal Ancestral File,* you'll have to retype it into *Family Tree Maker. FTM* also lacks a utility routine that computes the relationship of two given people. On the other hand, *FTM* does have a facility that makes it easy to record and trace medical data like high blood pressure, heart disease, and diabetes.

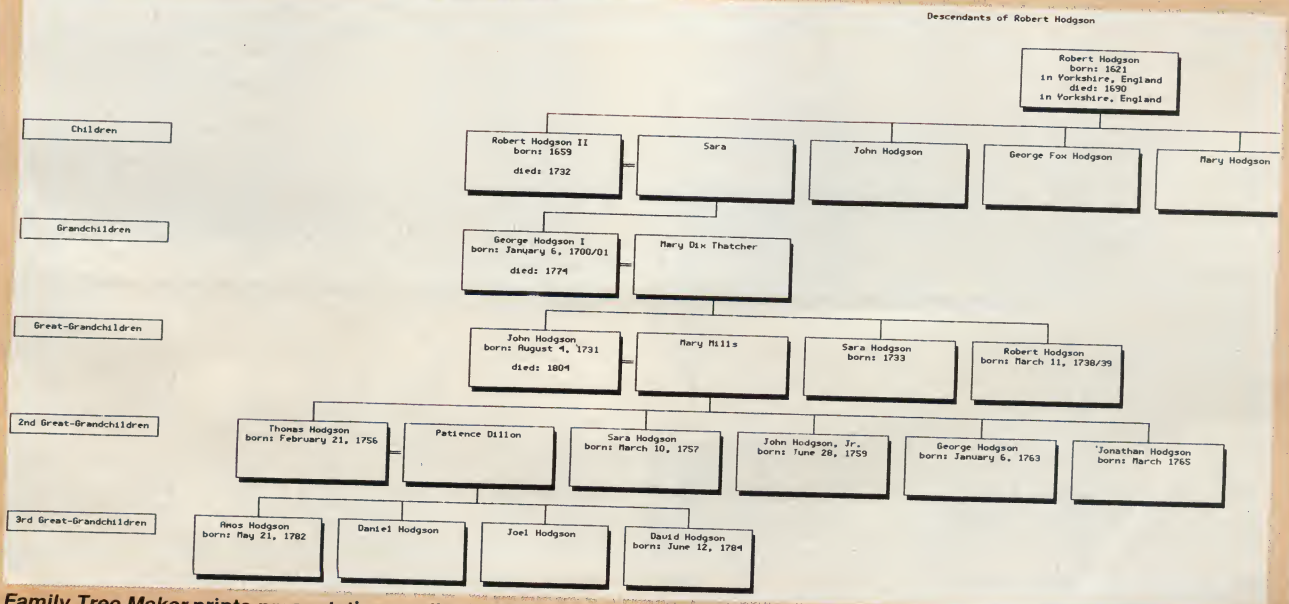
■ **ASTRONOMY**
Three programs that look skyward.

■ **GAMES**
***Wayne Gretzky Hockey*: Realistic hockey that won't cost you your teeth.**

Family Tree Maker has almost everything you could ask for in good genealogy software: easy input, easy editing, gorgeous output, and a modest price. This one is a good buy.

List Price: *Family Tree Maker,* $59.95. **Requires:** 384K RAM, DOS 2.0 or later, graphics adapter; printer recommended. Banner Blue, P.O. Box 7865 Fremont, CA 94537; (415) 794-6850.

CIRCLE **396** ON READER SERVICE CARD



***Family Tree Maker* prints presentation-quality family trees. The program comes with 25 sheets of parchment-like paper.**

Software Stars: Three Programs Take You Higher

ASTRONOMY
by Edward Mendelson

You can transform your 12-inch PC screen into a window that opens to the widest screen of all—the night sky. Three new programs, ranging in price from $29.95 to $165, convert your PC into a planetarium with capabilities approaching those of the monster Zeiss projection units in big-city museums. A VGA monitor may have lower resolution than the visible cosmos, but it's never obscured by smog or rain, and it's available even in broad daylight.

THE HOWINGTON ORRERY

The most straightforward and least expensive of the three programs is Logix Software's $29.95 *The Howington Orrery*. Many amateur astronomers will understand the name—an orrery is a seventeenth-century mechanical model of the solar system. This program is a twentieth-century digital version of an orrery and it is the work of David and Anne Howington.

The digital version displays the motions of the planets, with or without orbits, against a stylized representation of the stars. You can zoom in on the solar system and change your location from a point near Earth to a point near Pluto. You can also change the speed of the planets so that centuries pass in a few seconds, or you can make the planets run backwards to the day you were born and beyond. The display can be frozen at any moment.

By pressing the number keys (1 through 9) you can point to the locations of the nine planets. You can also view the movement of Halley's Comet and the two Voyager planetary probes launched in 1977.

Compared with other more-ambitious programs, *The Howington Orrery* doesn't offer many extras, but the view is always pleasant. It works best with a Hercules adapter or with CGA through VGA monitors. The CGA screens are in monochrome, but EGA and VGA adapters allow the display of color graphics. The program is strikingly fast, partly because its restriction to the planets and our solar system limits the calculations involved. If you're curious about computer-simulated planetariums, but don't want to spend a whole night under the stars, this is the program for you.

EZCOSMOS

For a far more detailed view of the skies, try Future Trends Software's $49.95 *EZCosmos*. This program displays the planets, thousands of stars (down to 20th magnitude), and scores of galaxies and other NGC (New Galactic Catalog) objects. You can zoom from a 270-degree view to a field only 1-degree wide.

EZCosmos **lets you place the cursor on any object in the sky to obtain more-detailed information about it.**

EZCosmos doesn't have a manual, and you really don't need one. The opening text screen prompts you for a location to use as your point of view, and also asks for a date to calculate the display. After a few seconds the sky is displayed in brilliant color (except on a monochrome screen). The Spacebar brings up a menu, but you can ignore it and use shortcut keys or type in a name to find an object.

You can also move a cursor-like square over a particular object and identify it with a tap of the Enter key. Whichever way you choose an object, the program displays accompanying astronomical information. You can also animate the planets and adjust their speeds. Help screens, which include some moderately detailed astronomical information, are also available at the touch of a key.

The current version comes with about ten scanned photographs of Saturn and some interesting galaxies; future versions of *EZCosmos* will include many more. These images are viewed by placing the cursor over the desired object and tapping the "L" key.

Additional scanned images will flesh out this feature, but it's a long way from being a guided tour of the cosmos.

With its intuitive interface, speedy performance, and enormous range of information, *EZCosmos* is an astronomical program that may interest the widest range of users.

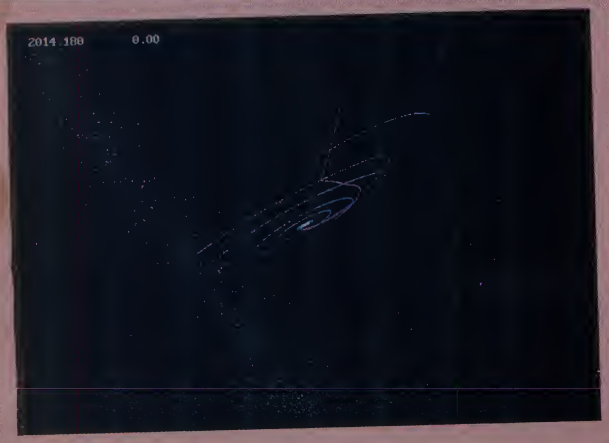
DANCE OF THE PLANETS

However, the most advanced PC astronomers will want to investigate A.R.C. Software's stunningly powerful *Dance of the Planets*. Currently sold for $165, *Dance of the Planets*, Version 1.30, is a serious program that needs serious hardware. Although it supports EGA adapters, you really need VGA graphics to take advantage of the software's capabilities. Because it calculates so many variables, the package is somewhat pokey on any system without a math coprocessor—even with a 33-MHz CPU.

Dance of the Planets offers more than just planets. It displays all of the planets' known satellites and calculates their orbits—it even gives detailed accounts of the interactions among satellites, planets, and the sun. It also does the same for more than 4,000 asteroids and comets. For example, it will show how Jupiter moves a comet from a distant orbit to a path closer to the sun. You can even create hypothetical asteroids and see how they behave over a period of 11,000 years.

If you find it hard to decipher

CONTINUES



The Howington Orrery **tracks the orbits of the planets against a stylized background of stars. The two Voyager probes appear in red and magenta.**

Aer Hours

Aronomy Pgrams

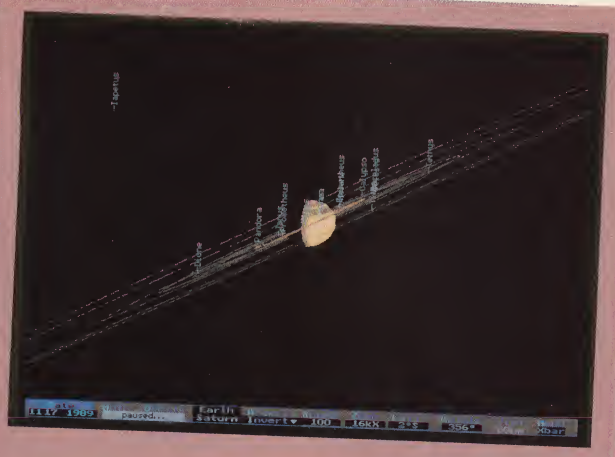
COIED

thdial relationships that occuong the orbits, you can swto a 3-D viewing mode an the pair of 3-D glasses sul in the package. It is also ea switch from an earthly pdive to a cosmic view frside the confines of our sctem.

most spectacular features ote *of the Planets* are its cl views. You can zoom in planetary system until lanets, like Jupiter and Slmost fill the screen with al, subtly colored image. Tw isn't merely a static pph—the image is altered achange your date and lkand it shows sun and sncluding the planet's ss it obscures the orbits cellites.

on 1.30 gives you a tnd of 1,500 stars up to the 6th magnitude. Version 1.50 ($195) will include more than 6,000 stars and non-stellar objects. User-modifiable database files, accessible from within the program, provide you with detailed information on every object included.

Dance of the Planets is reasonably easy to use once you study the thick manual, which almost doubles as an astronomy textbook. The interface tends to require one keystroke too many, but the results compensate for the extra effort. No program can be as remotely breathtaking as the night sky, but *Dance of the Planets* comes closer than any software package we have examined.



Dance of the Planets **swoops in for close-up views of planets and their satellites.**

List Price: *The Howington Orrery,* $29.95. **Requires:** 256K RAM for Hercules, 512K RAM for EGA, 640K RAM for VGA, DOS 2.0 or later. Logix Development Corp., 17149 Chatsworth St., #208, Granada Hills, CA 91344; (818) 360-8147.

CIRCLE **397** ON READER SERVICE CARD

List Price: *EZCosmos,* $49.95. **Requires:** 384K RAM, CGA, EGA, or VGA, DOS 2.0 or later. Future Trends Software, P.O. Box 3927, Austin, TX 78764; (800) 869-3279, (512) 443-6564.

CIRCLE **398** ON READER SERVICE CARD

List Price: *Dance of the Planets,* Version 1.30, $165; Version 1.50, to be $195. **Requires:** 512K RAM, EGA or VGA, hard disk, DOS 2.0 or later. Math coprocessor strongly recommended. A.R.C. Software, P.O. Box 1974, Loveland, CO 80539-1974; (303) 663-3223.

CIRCLE **399** ON READER SERVICE CARD

LLECTING STELLAR IMAGES: ter Space Via Your Modem

PC users would like to library of high-quality al images. Today's highion VGA displays can ice full-color photographs ery credible results, and of outer space bring out d in even the most jaded . Imagine being able to the same images beamed astrophysicists who study vens.

even the most dedicated s fan will probably have time convincing his or use that a $6,000 color r is a necessary addition PC arsenal. However, tainly doesn't mean that 't have access to a variascinating, beautiful sky

pupuServe and other onvices maintain downe files of full-color l NASA photography. ut every graphics resolution is accommodated, from CGA and Hercules up to 256-color super-VGA. On CompuServe, type GO GALLERY to find the library.

Or go directly to CompuServe's main source, Event Horizons, a bulletin board located in Portland, Oregon. They buy slides directly from NASA and use a $25,000 DigiComm scanner to store 8,096- by 8,096-pixel images with 32-bit color. The common format is CompuServe's GIF, which can be displayed with any of a half-dozen shareware viewing programs. (John Bridges' PICEM viewer, available on Event Horizons' bulletin board or CompuServe, is one of the best of the shareware programs.)

Event Horizons sells images from $7 to $18 per disk (ranging from CGA to super VGA); call (607) 697-7700 to order, or register for its bulletin board at (607) 77-1758 with your modem set at 1200/2400, N,8,1.

This shot of the earth, taken from the lunar surface, was digitized by Event Horizons.

Shots of Neptune and deep space galaxies from the Voyager II mission are the latest images available.

—Gus Venditto ■

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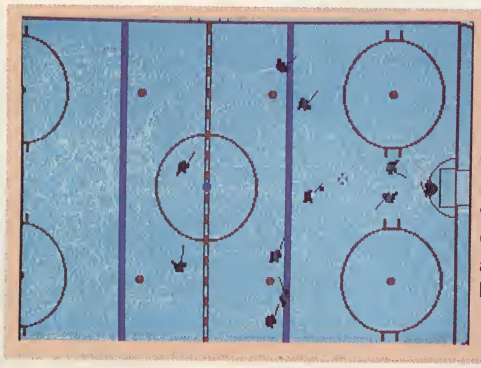
After Hours

Gretzky Hockey Pits You Against The Great One

GAMES
by Don Trivette



***Wayne Gretzky Hockey* offers multiple skill levels and if you prefer, you can sit back and watch the Great One play against himself.**

Wayne Gretzky Hockey from Bethesda Softworks is so realistic that you can almost feel the ice hitting your face and a stick jabbing into your stomach as you play.

Designed for both the novice and the pro, *Gretzky Hockey* lets you test your skill in one of four playing modes. In the first, you control a player but leave coaching decisions to the computer; this level is recommended for beginners. The second mode lets you continue playing, but you are also faced with coaching decisions like line changes. In the third mode you can devote all your energies to coaching, and the fourth level is for bench-potatoes—you just sit back and watch Gretzky play Gretzky. In the first three modes your opponent can be either another human player or the computer.

Unless you are Bobby Orr or Gordie Howe, you'll want to begin gradually. Set your opponent's skill to the high school level and your own to professional, then lower the speed to slow and play a practice match. In addition to varying modes and speeds, you can select from high school, college, junior, and professional action levels. In fact, there are so many levels, speeds, modes, fights, replays, and other options to choose from that you can almost forget that the game is hockey.

If you don't like the built-in teams, you can use the Team Construction menu to create players by assigning values to 11 characteristics, including aggression, power, fatigue, and puck control. And if you try setting all values of all players to the maximum, you will surely come up with a guaranteed Stanley Cup winner.

The worst part of *Gretzky Hockey* is deciding on the settings, but once that's done the game is a lot of fun to play. I especially like the added control achieved with a mouse. Click on the head of the team player you want to control, and his helmet turns white. He then chases the puck like it's a million dollar contract; the greater the distance from the cursor, the faster he skates. If your guys are aggressive enough you'll see some bad digital fights on the scoreboard screen, although the manual suggests turning the fight switch off if your're playing at the Olympic level.

I tried to reach Wayne Gretzky to see what happens when *he* plays on the computer, but his agent said the Great One was unavailable. I wonder if Mario Lemieux has a copy?

List Price: *Wayne Gretzky Hockey,* $54.95. **Requires:** 384K RAM, graphics adapter, DOS 2.11 or later. Joystick and mouse optional. Bethesda Softworks, 15235 Shady Grove Rd., #100, Rockville, MD 20850; (301) 926-8300.

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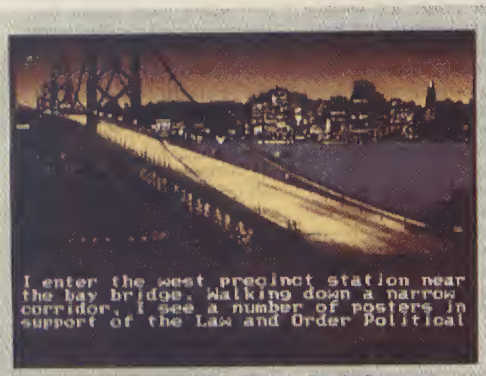
CIRCLE 158 ON READER SERVICE CARD

by Bill Howard

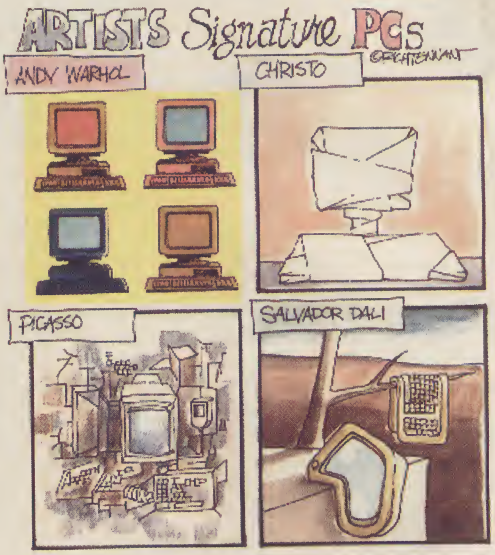
Abort, Retry, Fail?

The Lighter Side of Personal Computing



As you jet around San Francisco while playing *Mean Streets*, you'll pass the Golden Gate Bridge, among other landmarks.

Mea culpa: Not every bridge in San Francisco is the Golden Gate. This one (in Access Software's *Mean Streets, PC Magazine,* January 30, 1990), is the Oakland Bay Bridge.



BATTLE OF THE MEDIA STARS, CONT'D

Why You Shouldn't Buy a 386: Because OS/2 Is for 286s

Report from the front in the latest skirmish between Britt Hume and *PC Magazine*. The story so far: *Washington Post* computer columnist and ABC News White House Correspondent Britt Hume charged that *PC Magazine* ignores owners of XTs and ATs. *PC Magazine* Editor Bill Machrone later wrote (*PC Magazine*, December 26, 1989), ''He [Hume] sez that we sez that everybody should have a 386 system. He also claims that our enthusiasm for OS/2 is just another contribution to the hype surrounding the product.'' (*PC Magazine*'s position: buy 386, SX, or 486 systems as you add PCs or replace worn-out systems, but don't discard functioning PCs and ATs.)

Hume's rebuttal, in the January 8, 1990, *Washington Post*:

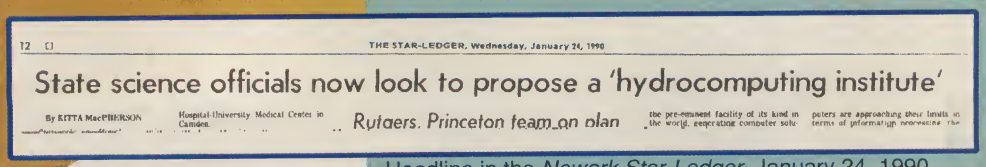
''[*PC Magazine*'s] decision to endorse only the 386 comes despite what Machrone admits is his 'enthusiasm' for OS2 [sic], the advanced operating software for IBM compatibles. The trouble is, OS2 was written for the 80286 or AT-class computers. There is no operating system yet designed for 386 computers. So his magazine's position is contradictory: *PC* is 'enthusiastic' about OS2, but won't recommend the computers for which OS2 was written. You figure it out.''

As a Side Benefit, When You Exceed the Speed of Light in the Lab, th Researchers Grow Younger

Superquick supercomputers solve problems by mathematically simulating conditions that can't be duplicated in a laboratory, such as tornado winds, black holes or speeds that are many times faster than the speed of sound or light."
The State (Columbia, S.C.), February 25, 1989

Of Course, Some Reviewers Might Read the Manual and Configure the Modem Before Installing It.

"Supra's 2400i half-slot internal modem is a bit more complicated to install than its near twin, the 2400 external. "The biggest problem I encountered was changing the port assignments. The 2400 will address any serial port up to COM 4. As configured by the factory, the modem runs as COM 3. Once installed in an expansion slot, the computer must be opened and the board removed to change the jumpers that control port assignment. I would have preferred a DIP switch accessible from the rear of the computer."—*CompuServe Magazine*, January 1990


12 C THE STAR-LEDGER, Wednesday, January 24, 1990

State science officials now look to propose a 'hydrocomputing institute'

By KITTA MacPHERSON

Hospital-University Medical Center in Camden.

Rutgers, Princeton team on plan

the pre-eminent facility of its kind in the world, generating computer solu

peters are approaching their limits in terms of information processing the

Headline in the *Newark Star-Ledger*, January 24, 1990. The article describes plans for a hypercomputing institute.

Receive a *PC Magazine* T-shirt and $50 if we use your submission in Abort, Retry, Fail. Winners this issue: Marc S. Klein (hydrocomputing), John Turner (faster than the speed of light), Deo Maynard and Norman Meyer (RightWriter), A. Chon (Bay Bridge), Marcio Paulino (AST Cupid-32), George P. Valentine (Supra 2400i modem).

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PC MAGAZINE EDITORS' CHOICE 11-29-88

THE DELL SYSTEM® 310
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The best combination of performance and value in its class.

STANDARD FEATURES:
- Intel 80386 microprocessor running at 20 MHz.
- Standard 1 MB of RAM, optional 2 MB or 4 MB of RAM* expandable to 16 MB (using a dedicated high speed 32-bit memory slot).
- Advanced Intel 82385 Cache Memory Controller with 32 KB of high speed static RAM cache.
- Page mode interleaved memory architecture.
- VGA systems include a high performance 16-bit video adapter.
- Socket for 20 MHz Intel 80387 or 20 MHz WEITEK 3167 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots (6 available).
- 12-month On-Site Service Contract provided by Xerox.△

*****Commercial Lease Plan. Lease for as low as $123/month.***
△Xerox Extended Service Plan pricing starts at $251.

40 MB TTL Monochrome System	$3,299
40 MB VGA Color Plus System	$3,799
100 MB VGA Color Plus System	$4,399
100 MB Super VGA Color System (800x600)	$4,499

Prices listed reflect 1 MB of RAM. 80, 150 and 322 MB hard drive configurations also available.

THE DELL SYSTEM® 316SX
16 MHz 386SX.

The perfect low profile mainstream computer, combining 386SX power and compatibility with unprecedented value and support.

STANDARD FEATURES:
- Intel 80386SX microprocessor running at 16 MHz.
- Standard 512 KB of RAM, optional 640 KB, 1 MB or 2 MB of RAM* expandable to 16 MB (8 MB on system board).
- Page mode interleaved memory architecture.
- LIM 4.0 support for memory over 640 KB.
- Integrated diskette and high performance 16-bit VGA video controller on system board.
- Socket for Intel 80387SX math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Integrated high performance hard disk interface on system board.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 3 full-sized 16-bit AT expansion slots available.
- 12-month On-Site Service Contract provided by Xerox.△

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40 MB VGA Color Plus System	$2,399
40 MB Super VGA System (800x600)	$2,499
100 MB Super VGA System (800x600)	$3,099

Prices reflect 512 KB of RAM. 640 KB versions of the above systems are available for an additional $50, 1 MB versions for an additional $150, and 2 MB versions for an additional $300. 80 and 170 MB configurations also available.

PC MAGAZINE EDITORS' CHOICE 3-13-90

THE NEW DELL SYSTEM® 316LT
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This new full-featured, battery powered 386SX laptop costs less than most 286 laptops.

STANDARD FEATURES:
- Intel 80386SX microprocessor running at 16 MHz.
- Standard 1 MB of RAM, optional 2 MB of RAM* expandable to 8 MB (on the system board using 1 MB SIMMs).
- LIM 4.0 support for memory over 1 MB.
- Adjustable and detachable 640 x 480 VGA Liquid Crystal Display.
- One industry standard half-size 8-bit expansion slot.
- Socket for 16 MHz Intel 80387SX math coprocessor.
- 3.5" 1.44 MB diskette drive.
- 83-key keyboard with embedded numeric keypad and separate cursor control keys.
- 1 parallel, 1 serial, and external VGA monitor port.
- Connector for 101-key keyboard or numeric keypad.
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- AC Adapter.
- 12-month On-Site Service Contract provided by Xerox.△

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40 MB, 1 MB RAM	$3,799
40 MB, 2 MB RAM	$3,999

PC WORLD BEST BUY

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12.5 MHz 286.

The price says this is an entry-level system. The performance says it's a lot more.

STANDARD FEATURES:
- 80286 microprocessor 12.5 MHz.
- Standard 512 KB of RAM, optional 640 KB, 1 MB or 2 MB of RAM* expandable to 16 MB (6 MB on the system board).
- Page mode interleaved memory architecture.
- LIM 4.0 support for memory over 640 KB.
- Integrated diskette and high performance 16-bit VGA video controller on system board.
- Socket for Intel 80287 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Integrated high performance hard disk interface on system board.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 3 full-sized 16-bit AT expansion slots available.
- 12-month On-Site Service Contract provided by Xerox.△

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20 MB VGA Color Plus System	$1,899
40 MB VGA Monochrome System	$1,799
40 MB VGA Color Plus System	$2,099

Prices listed reflect 512 KB of RAM. 640 KB versions of the above systems are available for an additional $50, 1 MB versions for an additional $150, and 2 MB versions for an additional $300. 80 and 100 MB hard drive configurations also available.

THE DELL SYSTEM® 325 25 MHz 386.

An even better value at these low prices.

STANDARD FEATURES:
- Intel 80386 microprocessor running at 25 MHz.
- Standard 1 MB of RAM, optional 2 MB or 4 MB of RAM* expandable to 16 MB (using a dedicated high-speed 32-bit memory slot).
- Advanced Intel 82385 Cache Memory Controller with 32 KB of high speed static RAM cache.
- Page mode interleaved memory architecture.
- VGA systems include a high performance 16-bit video adapter.
- Socket for 25 MHz Intel 80387 or 25 MHz WEITEK 3167 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots (6 available)
- 12-month On-Site Service Contract provided by Xerox.△

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100 MB VGA Color Plus System	$4,899
100 MB Super VGA Color System (800x600)	$4,999
150 MB Super VGA Color System (800x600)	$5,499

Prices listed reflect 1 MB of RAM. 80, 150 and 322 MB hard drive configurations also available.

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PC MAGAZINE EDITOR'S CHOICE 2·14·89

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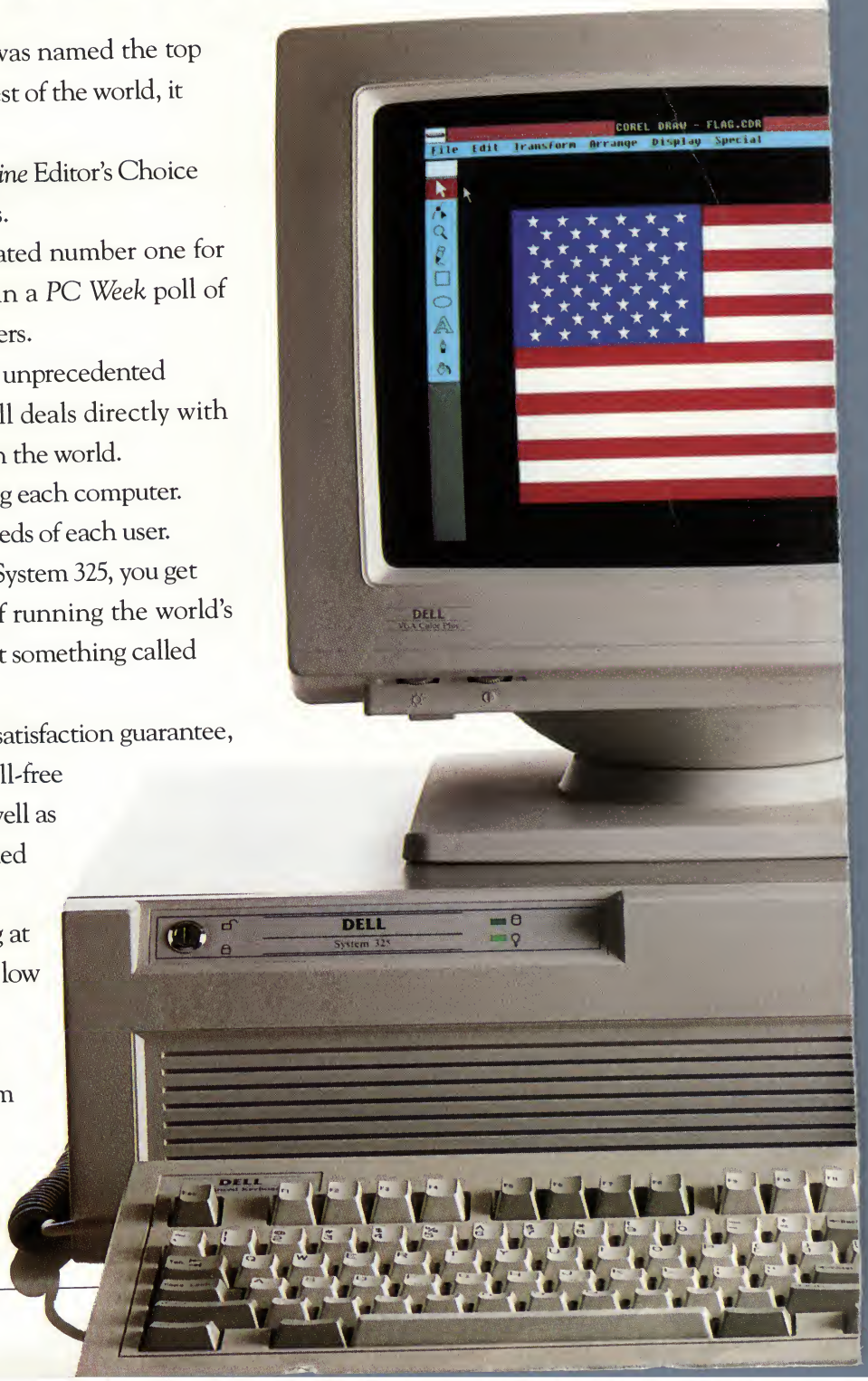

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